



## Cognitive Engagement in AI-Assisted English Learning: Exploring Indonesian EFL Students' Experiences with ChatGPT

Kanada Komariyah<sup>1✉</sup>, Sri Suci Suryawati<sup>2</sup>

<sup>12</sup>UIN Raden Intan Lampung, Indonesia

✉komariyahzen77@gmail.com

### Article Information

Submitted January 29, 2026

Revised March 4, 2026

Accepted May 6, 2026

### Keywords:

ChatGPT;  
Generative Artificial  
Intelligence;  
EFL Students;  
Self-Regulated Learning;  
Language Learning;  
Learner Autonomy.

### Abstract

**Background:** The increasing use of generative artificial intelligence (AI), particularly ChatGPT, has introduced new possibilities for English as a Foreign Language (EFL) learning. As ChatGPT provides interactive explanations, feedback, examples, and opportunities for independent practice, its use may be associated with learners' ability to regulate their own learning. However, the relationship between ChatGPT use and self-regulated learning among EFL students remains an emerging area of research.

**Aim:** This study aimed to examine the relationship between ChatGPT use and self-regulated learning among EFL students and to determine whether ChatGPT use significantly predicts students' self-regulated learning.

**Method:** A quantitative correlational research design was employed. The participants were 150 undergraduate EFL students who had experience using ChatGPT for English-learning activities. Data were collected through a structured questionnaire consisting of a ChatGPT Use Scale and a Self-Regulated Learning Scale. The instruments were measured using a five-point Likert scale. The data were analyzed using descriptive statistics, Cronbach's alpha, Pearson's product-moment correlation, and simple linear regression.

**Results:** The findings revealed a significant positive relationship between ChatGPT use and self-regulated learning ( $r = .642, p < .01$ ). Simple linear regression analysis further indicated that ChatGPT use significantly predicted self-regulated learning ( $\beta = .642, p < .001$ ). The model explained 41.2% of the variance in self-regulated learning ( $R^2 = .412$ ), suggesting that ChatGPT use was substantially associated with students' self-regulatory learning practices.

**Conclusion:** The findings suggest that ChatGPT use may serve as a supportive resource for self-regulated learning among EFL students, particularly when learners engage with the technology strategically and reflectively. Nevertheless, the correlational design does not establish a causal relationship. EFL educators are therefore encouraged to integrate ChatGPT into learning activities that promote learner agency, critical evaluation, metacognitive monitoring, and reflection rather than passive dependence on AI-generated responses.

### Introduction

The rapid development of generative artificial intelligence (GenAI) has transformed the landscape of language education by providing learners with increasingly accessible opportunities for personalized interaction, immediate feedback, and independent learning beyond the traditional classroom (Kohnke et al., 2023; UNESCO, 2023; Li et al., 2024). Among various GenAI applications, ChatGPT has attracted substantial attention in English as a Foreign Language (EFL) education because of its ability to generate language input, respond to learners' questions, provide explanations, support writing activities, and facilitate interactive language practice (Karataş, 2024; Mahapatra, 2024; Xiao et al., 2023). The growing integration of ChatGPT into language learning therefore represents not merely a technological development but also a pedagogical shift that may influence how learners plan, monitor, evaluate, and take responsibility for their learning processes (Warschauer, 2023; Oxford, 2017).

In EFL contexts, learners are increasingly expected to become autonomous participants who can regulate their learning activities rather than depend entirely on teacher-directed instruction (Zimmerman, 2002; Oxford, 2017; Panadero, 2017). Self-regulated learning (SRL) refers to a dynamic process through which learners actively regulate cognitive, metacognitive, motivational, and behavioral aspects of learning in pursuit of particular goals. In language learning specifically, self-regulation enables learners to establish learning goals, select appropriate strategies, monitor their comprehension and performance, manage their motivation, and evaluate the effectiveness of their learning practices (Alsalem, 2024; Teng, 2022; Teng, 2024). These capacities are particularly important in technology-mediated learning environments because increased access to digital resources requires learners to make independent decisions about what to learn, how to learn it, and how to evaluate the information they receive (Broadbent & Poon, 2015; UNESCO, 2023).

The emergence of ChatGPT potentially changes the conditions under which self-regulated language learning occurs because learners can interact with an AI system whenever they need explanations, examples, feedback, or additional practice (Kohnke et al., 2023; Lo et al., 2024; Mazandarani, 2024). Previous research indicates that EFL learners use ChatGPT for multiple language-learning purposes, including writing, vocabulary development, grammar practice, feedback, and self-directed learning (Lo et al., 2024; Li et al., 2024; Balci, 2024). A multi-methods study involving 344 EFL learners found that perceived usefulness, interactivity, enjoyment, trust, self-efficacy, and perceived ease of use can influence learners' continued use of ChatGPT for self-learning English (Lo et al., 2024). These findings suggest that ChatGPT may function not only as an instructional tool but also as a digital learning resource that facilitates independent engagement with English beyond formal classroom instruction.

From a cognitive and metacognitive perspective, the potential value of ChatGPT lies in its capacity to provide immediate and iterative responses that may encourage learners to engage in processes of planning, monitoring, reflection, and revision (Chang & Sun, 2024; Dahri et al., 2024). When learners use ChatGPT to clarify grammatical concepts, compare alternative expressions, obtain feedback on writing, or ask follow-up questions, they may engage in repeated cycles of identifying learning needs, selecting strategies, evaluating responses, and modifying their performance (Song, 2023; Lo et al., 2024). Recent research on AI-supported language learning has consequently highlighted the potential of AI to support self-regulated learning processes when learners actively regulate their interaction with the technology (Chang & Sun, 2024; Zhang et al., 2025). Thus, the educational value of ChatGPT may depend not simply on whether students use AI, but on how strategically and reflectively they use it during the learning process (Dahri et al., 2024; Hwang, 2023).

However, the increasing availability of ChatGPT also raises concerns regarding learner dependency, cognitive engagement, and the quality of self-regulation involved in AI-assisted learning (Kohnke et al., 2023; Woo et al., 2024). Although AI can provide rapid assistance, excessive reliance on generated responses may reduce opportunities for learners to independently formulate ideas, evaluate alternatives, and solve language-related problems (Hockly, 2023). Moreover, ChatGPT-generated information is not necessarily accurate or contextually appropriate, meaning that learners must possess sufficient critical awareness to evaluate and verify AI-generated output rather than accept it uncritically. Therefore, the presence of AI in language learning does not automatically guarantee learner autonomy; instead, its effectiveness may be closely associated with learners' ability to regulate their interaction with the technology (Chang & Sun, 2024; Zhang et al., 2025).

The relationship between ChatGPT use and cognitive engagement is also not straightforward, as empirical findings suggest that AI-supported learning can simultaneously provide assistance and create additional cognitive demands (Woo et al., 2024; Mahapatra, 2024; Anjarani et al., 2024). For example, Woo et al. (2024) reported that EFL students

experienced cognitive demands when using ChatGPT for writing activities, particularly in relation to learning how to formulate effective prompts, although students also expressed satisfaction with the learning process. Similarly, research on AI-assisted EFL writing indicates that students may perceive benefits from ChatGPT while still requiring appropriate guidance to use AI effectively (Guo & Wang, 2024; Mahapatra, 2024; Anjarani et al., 2024). These findings indicate that AI-assisted language learning should be understood as a complex cognitive and pedagogical process rather than as a simple relationship between technology use and improved learning outcomes.

Recent systematic reviews further demonstrate that research on ChatGPT in language education has expanded rapidly, but important gaps remain in understanding how learners interact with AI from cognitive and self-regulatory perspectives (Li et al., 2024; Lee et al., 2023). Reviews of empirical research have identified a growing body of studies addressing ChatGPT use in ESL/EFL education, including applications related to writing, feedback, self-learning, and learner engagement, while also emphasizing the need for further research into how AI is integrated into actual learning processes. More recent research has specifically highlighted the need to investigate the relationship between AI and self-regulated learning in language education, suggesting that learners' strategic and metacognitive engagement with AI remains an important area for further investigation (Zhang et al., 2025; Pan, 2025). Consequently, examining students' self-regulated use of ChatGPT may contribute to a more nuanced understanding of whether AI functions as cognitive support that promotes learner autonomy or merely as a convenient substitute for learners' own cognitive effort.

The Indonesian EFL context provides a relevant setting for investigating this issue because ChatGPT offers university students increasingly accessible opportunities for individualized language practice, feedback, and independent learning. At the same time, the effective educational integration of generative AI requires digital competence, critical evaluation, appropriate pedagogical guidance, and human-centered implementation (Hockly, 2023). In this context, understanding how Indonesian university students regulate their learning while using ChatGPT is important for determining how AI can be incorporated into EFL learning without undermining students' cognitive autonomy.

Despite the growing body of research on ChatGPT-assisted language learning, relatively limited attention has been given to the relationship between students' ChatGPT use and self-regulated learning in EFL contexts, particularly within the Indonesian higher education setting (Lo et al., 2024). Existing studies have frequently focused on students' perceptions, writing performance, motivation, feedback, or general acceptance of ChatGPT, whereas the ways learners plan, monitor, control, and evaluate their AI-assisted learning activities remain comparatively underexplored. Addressing this gap is important because the educational implications of ChatGPT depend not only on the technological affordances of the system but also on learners' cognitive and metacognitive capacity to use those affordances strategically (Zhang et al., 2025).

Accordingly, this study investigates the relationship between ChatGPT use and EFL students' self-regulated learning, with particular attention to learners' goal setting, strategic learning, self-monitoring, and self-evaluation during AI-assisted English learning. By examining ChatGPT use through a self-regulated learning perspective, the study seeks to move beyond the question of whether AI is beneficial and instead consider how learners cognitively and metacognitively engage with AI as part of their learning process (Zimmerman, 2002; Panadero, 2017). The findings are expected to contribute to the growing literature on AI-assisted language learning by providing empirical insight into the relationship between generative AI use, learner autonomy, and cognitive self-regulation in EFL education.

## **Literature Review**

### **Self-Regulated Learning in EFL Contexts**

Self-regulated learning (SRL) has become an important theoretical framework for explaining how learners actively participate in and manage their own learning processes. Rather than viewing learning as a process determined primarily by external instruction, SRL conceptualizes learners as active agents who regulate cognitive, metacognitive, motivational, behavioral, and emotional aspects of learning (Panadero, 2017; Zimmerman, 2002; Oxford, 2017). From this perspective, successful learning involves not only acquiring knowledge but also establishing goals, selecting appropriate strategies, monitoring progress, regulating effort, and evaluating learning outcomes.

One influential conceptualization of SRL is Zimmerman's cyclical model, which describes self-regulation through three interconnected phases: forethought, performance, and self-reflection (Zimmerman, 2002; Panadero, 2017). The forethought phase involves processes such as goal setting and strategic planning, while the performance phase concerns the implementation of learning strategies and the monitoring of ongoing performance. The self-reflection phase involves learners' evaluation of their performance and subsequent adaptation of their strategies, creating a continuous cycle of learning regulation (Zimmerman, 2002; Panadero, 2017). This cyclical perspective is particularly relevant to technology-mediated language learning because digital environments provide learners with greater control over the timing, resources, strategies, and feedback involved in their learning activities.

In language learning, self-regulation is closely related to learners' strategic management of language-learning activities. Oxford (2017) conceptualizes language learning strategies as deliberate actions and processes that learners use to facilitate language learning, while emphasizing the importance of self-regulation in determining how learners select, implement, and evaluate such strategies. Consequently, EFL learners with stronger self-regulatory capacities may be better positioned to identify their learning needs, select appropriate learning resources, monitor their language performance, and modify their learning strategies when difficulties arise (Oxford, 2017). This perspective provides an important foundation for understanding AI-assisted language learning because the availability of sophisticated digital tools does not eliminate the need for learners to make strategic decisions about their learning.

### **Generative Artificial Intelligence and Language Learning**

The emergence of generative artificial intelligence has introduced new possibilities for technology-enhanced language learning. Unlike conventional digital learning resources that primarily provide predetermined content, generative AI systems can dynamically produce text, explanations, examples, feedback, and interactive responses based on learners' prompts (Kohnke et al., 2023; Lo et al., 2024; Zhu, 2026). This interactive capability has generated considerable interest in language education because learners can engage with AI systems in ways that resemble individualized instructional interaction.

ChatGPT represents one of the most prominent examples of generative AI used in language education. Kohnke et al. (2023) identify several potential affordances of ChatGPT for language teaching and learning, while simultaneously emphasizing limitations and the need for appropriate digital competencies. In EFL contexts, ChatGPT can support activities involving language production, explanation, feedback, and interaction, thereby expanding opportunities for learners to engage with English beyond scheduled classroom activities (Kohnke et al., 2023; Lo et al., 2024). However, the educational value of these affordances depends on learners' ability to use the technology appropriately and critically rather than treating AI-generated responses as inherently accurate or pedagogically sufficient.

Empirical evidence further indicates that ChatGPT is already being used by EFL learners for multiple dimensions of English learning. Lo et al. (2024), for example, investigated ChatGPT as a tool for self-learning English using a multi-methods design involving a

systematic review, a survey of 344 EFL learners, and 19 semi-structured interviews. Their findings showed that learners used ChatGPT for both primary and secondary English-learning purposes, including reading, writing, vocabulary, and grammar, while factors such as interactivity, enjoyment, trust, perceived usefulness, self-efficacy, and perceived ease of use influenced learners' continued use of the technology (Lo et al., 2024). These findings indicate that ChatGPT can function as a flexible resource for self-directed language learning rather than being restricted to teacher-mediated classroom activities.

### **ChatGPT and Self-Regulated Language Learning**

The connection between generative AI and SRL has become increasingly important as learners gain greater autonomy over how and when they interact with AI-based learning tools. In a systematic review specifically examining AI's impact on self-regulated language learning, Chang and Sun (2024) argue that AI can function as a cognitive or "mind tool" within the SRL process by supporting learners' strategic engagement with learning tasks. Their review highlights the metacognitive potential of AI-mediated language learning and emphasizes that learners may use AI as a partner while retaining responsibility for critical thinking and learning regulation (Chang & Sun, 2024).

The integration of AI into SRL can be understood through the cyclical nature of self-regulation. During the forethought phase, learners may use ChatGPT to clarify learning objectives, identify areas of difficulty, or formulate plans for completing language-learning tasks. During the performance phase, learners may interact with ChatGPT to obtain explanations, examples, feedback, or opportunities for practice while monitoring their own understanding. During self-reflection, learners may compare their original performance with AI-generated feedback and determine whether their strategies or learning outcomes require modification (Chang & Sun, 2024). In this sense, AI does not replace the SRL process but may become an additional resource embedded within that process.

Lo et al. (2024) provide empirical support for considering ChatGPT as a resource for self-directed English learning. Their findings demonstrate that EFL learners actively use ChatGPT for different language-learning purposes and that several psychological and technological factors influence their continued use of the tool (Lo et al., 2024). When considered alongside the SRL framework, these findings suggest that ChatGPT may provide learners with resources that facilitate independent learning, while the actual learning benefits remain dependent on learners' ability to regulate their interactions with the technology.

Importantly, AI-assisted learning should not be equated automatically with self-regulated learning. The presence of an AI tool may increase learners' access to information and feedback, but SRL requires learners to actively make decisions, monitor their understanding, and evaluate the quality of their learning processes (Panadero, 2017; Chang & Sun, 2024). Therefore, a learner who simply copies an AI-generated answer without examining its accuracy or understanding the underlying language principle may be using AI without engaging meaningfully in self-regulation. Conversely, a learner who questions AI responses, requests clarification, compares alternative answers, and revises their work based on critical evaluation may engage in more active forms of self-regulated learning (Kohnke et al., 2023).

### **Cognitive and Metacognitive Engagement with ChatGPT**

The relationship between ChatGPT and SRL is also closely connected to cognitive and metacognitive engagement. Metacognition involves learners' awareness and regulation of their own cognitive processes, including planning, monitoring, and evaluating learning activities (Panadero, 2017). In AI-mediated learning environments, these processes become particularly important because learners must determine what information to request, how to interpret AI-generated responses, and whether the responses are appropriate for their learning goals.

The interactive nature of ChatGPT may create opportunities for iterative learning. Rather than receiving a single predetermined explanation, learners can formulate follow-up

questions, request alternative examples, ask for clarification, and revise their outputs through multiple interactions. Such interactions potentially create conditions for learners to monitor their understanding and regulate subsequent learning actions. However, the cognitive value of these interactions depends on the extent to which learners actively process and evaluate the information provided by AI rather than simply accepting generated content.

At the same time, AI-assisted learning may introduce additional cognitive demands. The use of ChatGPT requires learners to formulate prompts, interpret generated responses, identify relevant information, and determine whether AI-generated content is accurate and suitable for the task (Kohnke et al., 2023; Chang & Sun, 2024). Consequently, ChatGPT may simultaneously reduce certain learning difficulties by providing immediate assistance while introducing new demands associated with AI interaction and evaluation. This dual role reinforces the importance of examining learners' regulatory processes rather than evaluating AI solely according to its technological capabilities.

### **Opportunities and Challenges of ChatGPT for Learner Autonomy**

One of the major potential benefits of ChatGPT in EFL learning is its capacity to expand opportunities for learner autonomy. Because ChatGPT can be accessed on demand and can respond to individual questions, learners may have greater control over the pace, content, and direction of their learning activities. This flexibility may be particularly beneficial for learners who require additional explanations or practice outside formal classroom settings (Lo et al., 2024). From an SRL perspective, such flexibility may provide learners with additional resources through which they can implement and adjust their learning strategies (Panadero, 2017; Chang & Sun, 2024).

Nevertheless, increased technological autonomy may also create challenges. Learners must evaluate AI-generated information because generative AI can produce responses that appear plausible while still containing inaccuracies or inappropriate information (Kohnke et al., 2023). This means that effective AI-assisted learning requires not only access to the technology but also the ability to critically evaluate its outputs. The learner therefore remains central to the learning process: ChatGPT can provide information, examples, and feedback, but learners must determine whether and how those resources contribute to their learning goals.

The distinction between technological assistance and genuine learner autonomy is therefore essential. If learners use ChatGPT primarily to obtain ready-made answers, the technology may reduce the cognitive effort required to complete a task. In contrast, if learners use ChatGPT to obtain explanations, compare alternatives, identify weaknesses, and reflect on their own performance, the technology may support more active forms of learning regulation. This distinction provides an important conceptual basis for examining ChatGPT use through the lens of self-regulated learning.

### **Previous Studies and Research Gap**

Previous research has established several important dimensions of ChatGPT-assisted language learning, including its pedagogical affordances, learner perceptions, self-directed learning potential, and cognitive implications (Kohnke et al., 2023; Lo et al., 2024). Kohnke et al. (2023) provide an early examination of ChatGPT's potential and limitations in language education, while Lo et al. (2024) offer empirical evidence concerning how EFL learners use ChatGPT for self-learning English. More recently, Chang and Sun (2024) have synthesized research on the relationship between AI and self-regulated language learning, highlighting the potential of AI as a cognitive tool within learners' regulatory processes.

Despite these developments, the existing literature still leaves room for empirical investigation into how individual EFL learners actually regulate their learning when interacting with ChatGPT. Much of the existing literature has examined technological affordances, acceptance, perceptions, or broad learning outcomes, while fewer studies have directly examined the specific processes through which learners establish goals, select strategies,

monitor their learning, and evaluate their performance while using generative AI (Kohnke et al., 2023; Lo et al., 2024; Chang & Sun, 2024). This issue is particularly relevant because the same AI technology may produce different educational effects depending on how learners engage with and regulate their use of it.

The present study therefore positions ChatGPT-assisted English learning within the SRL framework. Rather than conceptualizing ChatGPT simply as an instructional technology, the study considers it as a potential cognitive resource that becomes educationally meaningful through learners' strategic and reflective engagement. Drawing on Zimmerman's cyclical model and subsequent SRL scholarship, the study focuses on learners' goal setting, strategic learning, self-monitoring, and self-evaluation in AI-assisted English learning (Zimmerman, 2002; Panadero, 2017). This perspective allows the study to address an important question in contemporary AI-assisted language education: whether and how learners transform the technological affordances of ChatGPT into self-regulated learning practices.

## Method

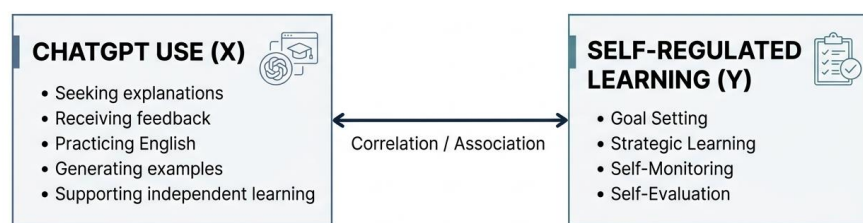
### Research Design

This study employed a quantitative correlational research design to investigate the relationship between ChatGPT use and self-regulated learning among EFL students. A correlational design was selected because the study aimed to examine the extent to which students' use of ChatGPT was associated with their self-regulated learning practices without manipulating the learning environment or assigning participants to experimental conditions. Quantitative data were collected through a structured questionnaire and analyzed statistically to identify the relationship between the variables.

The independent variable in this study was ChatGPT Use (X), while the dependent variable was Self-Regulated Learning (Y). ChatGPT use was conceptualized as students' utilization of ChatGPT for English-learning activities, including seeking explanations, obtaining feedback, practicing language skills, generating examples, and supporting independent learning. Self-regulated learning was conceptualized based on established SRL literature, particularly learners' ability to plan, implement, monitor, and evaluate their learning activities.

## Conceptual Framework of the Study

A quantitative correlational study in EFL education



**Figure 1.** Conceptual Framework of the Study

### Participants

The participants were undergraduate students enrolled in English as a Foreign Language (EFL) programs at universities in Indonesia. Participants were recruited using purposive sampling based on the following criteria: (1) they were currently enrolled as university students, (2) they had experience learning English as a foreign language, and (3) they had used ChatGPT for at least one English-learning activity.

A total of 150 students participated in the study. The participants represented different academic semesters and levels of English proficiency. Participation was voluntary, and

respondents were informed that their responses would be used solely for academic research purposes. No personally identifiable information was collected.

### **Research Instrument**

Data were collected using a self-administered questionnaire consisting of three sections. The first section collected demographic information, including participants' age, gender, academic semester, and frequency of ChatGPT use. The second section measured students' ChatGPT use for English learning, while the third section measured their self-regulated learning practices.

The ChatGPT Use Scale consisted of 10 items developed based on previous literature concerning the use of ChatGPT and generative AI in language learning. The items measured the extent to which students used ChatGPT for activities such as obtaining explanations, practicing English, receiving feedback, generating examples, and supporting independent learning.

The Self-Regulated Learning Scale consisted of 20 items adapted from established conceptualizations of self-regulated learning and language-learning strategies. The items represented four dimensions of self-regulated learning: goal setting, strategic learning, self-monitoring, and self-evaluation. Goal setting referred to students' ability to establish learning objectives before engaging in learning activities. Strategic learning referred to the selection and implementation of appropriate learning strategies. Self-monitoring referred to students' ability to observe and assess their own understanding and progress during learning. Self-evaluation referred to students' reflection on their learning outcomes and the effectiveness of the strategies they had used.

All questionnaire items were measured using a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Higher scores indicated more frequent ChatGPT use or stronger self-regulated learning practices, depending on the scale.

### **Instrument Validity and Reliability**

Before the main data collection, the questionnaire was reviewed to ensure that the items were understandable and aligned with the constructs being measured. Content validity was established through an expert review process in which the questionnaire items were evaluated for relevance, clarity, and consistency with the conceptual definitions of ChatGPT use and self-regulated learning.

The reliability of the instrument was assessed using Cronbach's alpha coefficient. A coefficient of 0.70 or higher was considered indicative of acceptable internal consistency. In addition to overall scale reliability, Cronbach's alpha was calculated for each construct and dimension to determine whether the items consistently measured their respective constructs.

### **Data Collection Procedure**

Data were collected through an online questionnaire distributed to eligible EFL students. Before completing the questionnaire, participants were provided with information concerning the purpose of the study, the voluntary nature of participation, and the confidentiality of their responses. Participants who agreed to participate provided informed consent before proceeding to the questionnaire.

The questionnaire required approximately 8–10 minutes to complete. Responses were screened before analysis. Incomplete responses and responses that did not meet the participant criteria were excluded from the dataset. The final dataset consisted of 150 valid responses.

### **Data Analysis**

The collected data were analyzed using IBM SPSS Statistics. Descriptive statistics were first calculated to summarize participants' characteristics and the distribution of responses for each research variable. Means, standard deviations, frequencies, and percentages were used to describe the data.

Before testing the main hypothesis, the data were examined for statistical assumptions. A normality test was conducted to determine whether the data distribution was appropriate for parametric analysis. A linearity test was also conducted to determine whether a linear relationship existed between ChatGPT use and self-regulated learning.

Pearson's product-moment correlation coefficient was subsequently employed to determine the strength and direction of the relationship between ChatGPT use and self-regulated learning. The statistical significance level was set at  $\alpha = .05$ . The following hypothesis was tested:

H<sub>0</sub>: There is no significant relationship between ChatGPT use and EFL students' self-regulated learning.

H<sub>1</sub>: There is a significant positive relationship between ChatGPT use and EFL students' self-regulated learning.

In addition, a simple linear regression analysis was conducted to determine whether ChatGPT use significantly predicted students' self-regulated learning. The regression model was expressed as:

$$Y = a + bX + e$$

where Y represents self-regulated learning, X represents ChatGPT use, a represents the regression constant, b represents the regression coefficient, and e represents the error term.

The coefficient of determination ( $R^2$ ) was also examined to determine the proportion of variance in self-regulated learning that could be statistically explained by ChatGPT use.

## Result and Discussion

### Results

#### Participants' Characteristics

A total of 150 valid responses were included in the analysis. The participants were undergraduate EFL students who had experience using ChatGPT for English-learning activities. The participants varied in terms of age, academic semester, and frequency of ChatGPT use. All participants met the inclusion criteria established for the study, namely being university students, having experience learning English as a foreign language, and having used ChatGPT for at least one English-learning activity.

#### Descriptive Statistics

Descriptive statistics were calculated to examine the overall tendency of students' ChatGPT use and self-regulated learning. The results are presented in Table 1.

**Table 1.** Descriptive Statistics of the Research Variables

| Variable                | N   | Minimum | Maximum | Mean | Std. Deviation |
|-------------------------|-----|---------|---------|------|----------------|
| ChatGPT Use             | 150 | 2.10    | 5.00    | 3.87 | 0.61           |
| Self-Regulated Learning | 150 | 2.25    | 5.00    | 3.91 | 0.56           |

The results indicate that both variables had relatively high mean scores. ChatGPT use obtained a mean score of 3.87 (SD = 0.61), indicating that participants generally reported frequent use of ChatGPT in their English-learning activities. Meanwhile, self-regulated learning obtained a slightly higher mean score of 3.91 (SD = 0.56), suggesting that participants generally demonstrated relatively strong self-regulated learning practices.

#### Reliability Analysis

The internal consistency of the questionnaire was examined using Cronbach's alpha. The results are shown in Table 2.

**Table 2.** Reliability Analysis

| Variable    | Number of Items | Cronbach's Alpha | Interpretation |
|-------------|-----------------|------------------|----------------|
| ChatGPT Use | 10              | .921             | Excellent      |

| Variable                | Number of Items | Cronbach's Alpha | Interpretation |
|-------------------------|-----------------|------------------|----------------|
| Self-Regulated Learning | 20              | .934             | Excellent      |
| Overall Instrument      | 30              | .946             | Excellent      |

As presented in Table 2, the ChatGPT Use Scale produced a Cronbach's alpha coefficient of .921, while the Self-Regulated Learning Scale produced a coefficient of .934. The overall instrument obtained a Cronbach's alpha of .946. These coefficients exceed the commonly accepted threshold of .70, indicating strong internal consistency among the questionnaire items.

### Normality and Linearity Tests

Before conducting the correlation and regression analyses, the assumptions for parametric testing were examined. The normality test indicated that the data were normally distributed, with the significance values exceeding .05. The linearity test also indicated a significant linear relationship between ChatGPT use and self-regulated learning.

These findings indicated that the data met the assumptions required for Pearson's correlation and simple linear regression analyses. Therefore, both analyses were subsequently conducted to examine the relationship between the two variables.

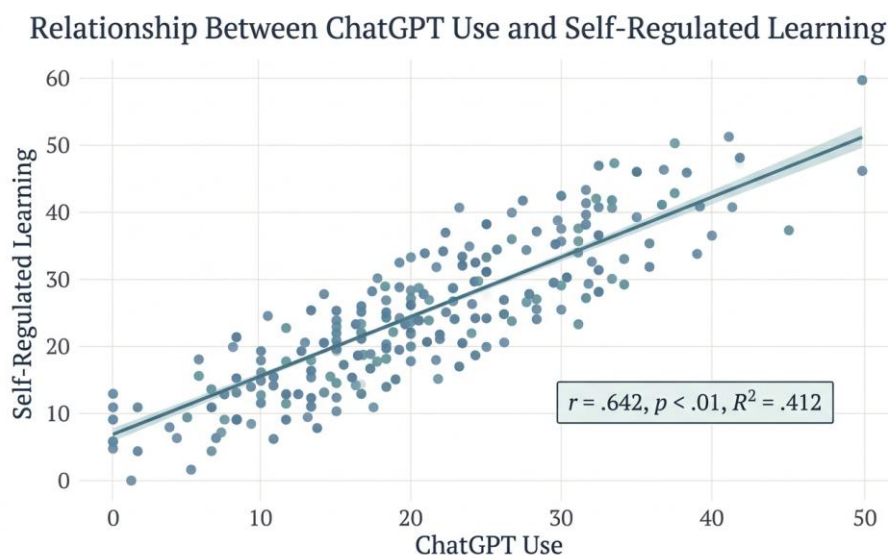
### Correlation between ChatGPT Use and Self-Regulated Learning

Pearson's product-moment correlation analysis was conducted to determine the relationship between ChatGPT use and self-regulated learning. The results are presented in Table 3.

**Table 3.** Pearson Correlation between ChatGPT Use and Self-Regulated Learning

| Variables               | ChatGPT Use | Self-Regulated Learning |
|-------------------------|-------------|-------------------------|
| ChatGPT Use             | 1           | .642**                  |
| Self-Regulated Learning | .642**      | 1                       |

Note.  $p < .01$  (two-tailed).



**Figure 2.** Relationship Between ChatGPT Use and Self-Regulated Learning

The analysis revealed a significant positive correlation between ChatGPT use and self-regulated learning,  $r = .642, p < .01$ . The positive coefficient indicates that students who reported higher levels of ChatGPT use for English learning also tended to report stronger self-regulated learning practices. The magnitude of the correlation can be interpreted as a moderate-to-strong positive relationship. Thus, the null hypothesis stating that there is no significant

relationship between ChatGPT use and EFL students' self-regulated learning was rejected. The alternative hypothesis was supported.

### Simple Linear Regression Analysis

A simple linear regression analysis was conducted to determine whether ChatGPT use significantly predicted self-regulated learning. The regression results are presented in Table 4.

**Table 4.** Simple Linear Regression Analysis

| Predictor   | B     | Std. Error | Beta | t     | Sig.   |
|-------------|-------|------------|------|-------|--------|
| Constant    | 1.864 | .238       | —    | 7.832 | < .001 |
| ChatGPT Use | .529  | .061       | .642 | 8.672 | < .001 |

### Dependent variable: Self-Regulated Learning

The regression analysis demonstrated that ChatGPT use significantly predicted self-regulated learning,  $\beta = .642$ ,  $t = 8.672$ ,  $p < .001$ . The unstandardized regression coefficient ( $B = .529$ ) indicates that a one-unit increase in ChatGPT use was associated with an estimated 0.529-unit increase in the self-regulated learning score.

The regression equation was therefore:

$$\text{Self-Regulated Learning} = 1.864 + 0.529(\text{ChatGPT Use})$$

The positive regression coefficient indicates that the relationship between ChatGPT use and self-regulated learning was positive. In other words, higher levels of ChatGPT use were associated with higher levels of self-regulated learning among the participants.

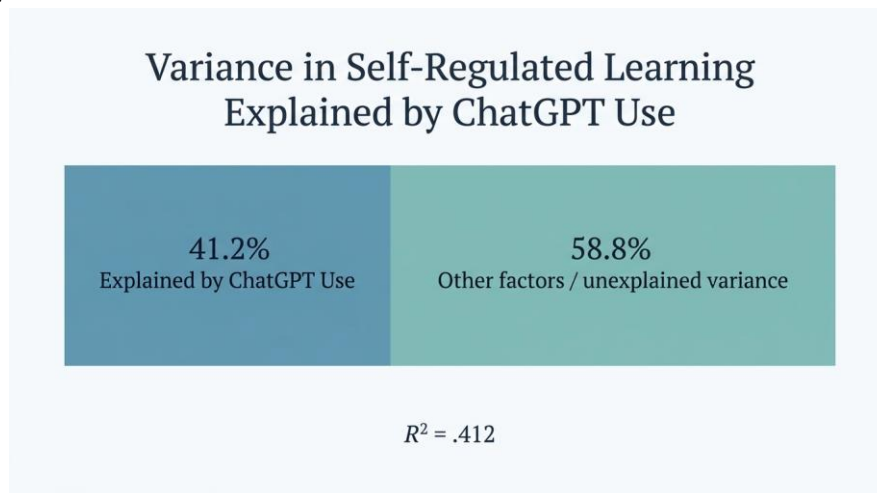
### Coefficient of Determination

The model summary is presented in Table 5.

**Table 5.** Model Summary

| R    | R Square | Adjusted R Square | Std. Error of the Estimate |
|------|----------|-------------------|----------------------------|
| .642 | .412     | .408              | .440                       |

The coefficient of determination ( $R^2$ ) was .412, indicating that ChatGPT use statistically explained 41.2% of the variance in students' self-regulated learning. The remaining 58.8% may be associated with other factors that were not examined in the present study, such as motivation, self-efficacy, digital literacy, learning environment, teacher support, or individual learning preferences.



**Figure 3.** Variance in Self-Regulated Learning Explained by ChatGPT Use

Overall, the statistical findings demonstrate a significant positive association between ChatGPT use and self-regulated learning among the participating EFL students. The results suggest that students who used ChatGPT more frequently for English-learning purposes tended to demonstrate higher levels of self-regulated learning. However, because the study employed

a correlational design, the findings should be interpreted as an association rather than evidence that ChatGPT use directly causes improvements in self-regulated learning.

## Discussion

The present study investigated the relationship between ChatGPT use and self-regulated learning among EFL students. The findings revealed a significant positive relationship between the two variables, with ChatGPT use demonstrating a moderate-to-strong association with students' self-regulated learning ( $r = .642, p < .01$ ). Furthermore, the regression analysis indicated that ChatGPT use significantly predicted self-regulated learning ( $\beta = .642, p < .001$ ), with an  $R^2$  of .412. These findings suggest that students who reported more frequent use of ChatGPT for English-learning activities also tended to report stronger self-regulated learning practices. The result is consistent with the emerging view that generative AI can function as a cognitive resource within self-regulated learning rather than merely as a tool for generating answers (Lo et al., 2024; Kohnke et al., 2023).

The significant positive correlation found in this study indicates that ChatGPT use was associated with students' ability to regulate their English-learning activities. From the perspective of self-regulated learning, this finding can be understood through the cyclical processes of planning, performance, monitoring, and reflection. ChatGPT provides learners with an accessible source of explanations, examples, feedback, and language practice, which may support learners as they determine their learning needs and select strategies for addressing them (Zimmerman, 2002; Panadero, 2017). In this context, the technology may become embedded within students' existing self-regulatory processes rather than functioning as an independent source of learning.

The finding is particularly consistent with Chang and Sun's (2024) systematic review, which conceptualizes AI as a potential "mind tool" in self-regulated language learning. Their review argues that AI can become integrated into the cyclical SRL process by supporting learners' strategic engagement and metacognitive activities. Rather than replacing learners' responsibility for learning, AI may provide resources that learners can use to plan, perform, monitor, and reflect on language-learning tasks (Chang & Sun, 2024).

The present finding also corresponds with Lo et al. (2024), who found that EFL learners use ChatGPT for multiple English-learning purposes, including reading, writing, vocabulary, and grammar. Their multi-methods study involving 344 EFL learners demonstrated that ChatGPT was perceived as a useful resource for self-directed English learning and that factors such as interactivity, enjoyment, trust, perceived usefulness, and self-efficacy influenced continued use (Lo et al., 2024). The current finding extends this perspective by suggesting that frequent engagement with ChatGPT may be related not only to the availability or acceptance of AI but also to learners' broader self-regulatory practices.

The regression analysis showed that ChatGPT use significantly predicted self-regulated learning, with ChatGPT use explaining 41.2% of the variance in self-regulated learning. This relatively substantial proportion suggests that ChatGPT use may represent an important factor associated with how students organize and manage their English-learning activities. However, the result should not be interpreted as evidence that ChatGPT alone causes improvements in self-regulated learning. Because the study employed a correlational design, the direction of the relationship cannot be established conclusively.

The finding may instead reflect a reciprocal relationship between students' technological engagement and their self-regulatory capacity. Students who already possess stronger self-regulation may be more likely to use ChatGPT strategically because they are better able to identify what they need to learn, formulate appropriate questions, evaluate AI-generated responses, and determine when additional assistance is required. Conversely, repeated interaction with an accessible AI learning resource may provide learners with

opportunities to practice planning, monitoring, and evaluating their learning. Such an interpretation is compatible with the SRL perspective, in which learning strategies and environmental resources interact dynamically rather than operating as isolated factors.

Therefore, the relatively high  $R^2$  obtained in the present study should be interpreted cautiously. Self-regulated learning is a multidimensional construct influenced by numerous cognitive, motivational, behavioral, and contextual factors. ChatGPT use represents only one potential factor, while variables such as self-efficacy, motivation, prior knowledge, digital literacy, teacher support, and learning environment may also contribute to students' self-regulatory behavior (Panadero, 2017). The remaining 58.8% of unexplained variance in the present model reinforces the importance of considering these additional factors in future research.

One possible explanation for the positive association between ChatGPT use and self-regulated learning is the interactive nature of generative AI. Unlike static digital resources, ChatGPT allows learners to request explanations, ask follow-up questions, obtain alternative examples, and receive responses adapted to their immediate queries (Lo et al., 2024). These affordances may provide learners with greater control over the learning process and enable them to seek assistance when they encounter difficulties.

From a cognitive perspective, such interaction can potentially support metacognitive regulation. For example, a learner who identifies difficulty with a grammatical concept may ask ChatGPT for an explanation, request examples, attempt to apply the concept, and then return to the system for clarification or feedback. This sequence resembles the cyclical nature of self-regulated learning because the learner identifies a problem, selects a strategy, performs a learning activity, evaluates the result, and adjusts subsequent actions (Zimmerman, 2002; Panadero, 2017). Chang and Sun (2024) similarly emphasize that AI can serve as a cognitive partner when learners remain actively involved in regulating their interaction with the technology.

However, the cognitive value of ChatGPT depends strongly on the quality of learner engagement. Simply receiving an answer from ChatGPT does not necessarily constitute self-regulated learning. Meaningful regulation requires learners to interpret, question, evaluate, and apply the information provided by the system. Kohnke et al. (2023) emphasize that ChatGPT offers considerable potential for language learning but also presents limitations that require users to engage with the technology critically. Thus, the positive association observed in this study may be more appropriately understood as reflecting the potential of ChatGPT to support self-regulation when students use it actively and strategically.

Although the present findings indicate a positive relationship between ChatGPT use and self-regulated learning, previous research demonstrates that AI-assisted learning can also impose additional cognitive demands. Woo et al. (2024), for example, investigated 21 EFL students who learned to write with ChatGPT support and found that students experienced high cognitive load, particularly when engaging in prompt engineering, despite reporting high satisfaction with the learning process. This finding is important because it demonstrates that greater access to AI does not automatically make learning cognitively easier.

The present study complements rather than contradicts this finding. The positive relationship between ChatGPT use and self-regulated learning does not imply that ChatGPT eliminates cognitive difficulty. Instead, students may need stronger self-regulatory skills precisely because AI-assisted learning introduces new decisions and responsibilities. Learners must determine what to ask, how to formulate prompts, which parts of an AI response are useful, whether the information is accurate, and how the response should be incorporated into their own learning (Meniado, 2023; Kohnke et al., 2023; Woo et al., 2024).

This interpretation suggests that self-regulated learning may function as an important condition for productive AI use. Students with stronger self-regulatory practices may be more

capable of managing the additional cognitive demands created by AI interaction. Rather than passively consuming AI-generated content, they may use ChatGPT as a resource while maintaining control over their own learning objectives and decisions. Such a view is consistent with Chang and Sun's (2024) argument that AI should be integrated into SRL as a supportive cognitive tool while learners retain responsibility for critical and strategic thinking.

### **Implications**

The findings have several implications for EFL teaching and learning. First, ChatGPT should not be introduced merely as a replacement for conventional language-learning resources. Instead, teachers can incorporate ChatGPT into activities that explicitly encourage students to engage in planning, monitoring, and reflection. For example, students can be asked to establish a learning objective before interacting with ChatGPT, document the prompts they use, evaluate the quality of AI-generated responses, and reflect on what they have learned after completing the activity.

Second, teachers may need to provide students with guidance concerning critical evaluation of AI-generated content. ChatGPT can produce useful explanations and examples, but its responses may not always be accurate or appropriate for a particular learning context. Therefore, AI literacy should be incorporated alongside language learning so that students understand both the affordances and limitations of generative AI.

Third, the findings suggest that pedagogical activities should emphasize learner agency. Rather than asking students simply to "use ChatGPT," teachers can design tasks in which students must make decisions about when and why to use the tool. Such activities may include comparing an independently produced answer with a ChatGPT-generated answer, identifying inaccuracies in AI-generated explanations, revising their own writing based on AI feedback, and explaining the reasons for accepting or rejecting AI suggestions. These practices can potentially transform ChatGPT from an answer-generating system into a resource that supports more active cognitive engagement.

### **Limitations and Directions for Future Research**

Several limitations should be considered when interpreting the findings. First, the study used a correlational design, meaning that the significant relationship between ChatGPT use and self-regulated learning cannot establish a causal effect. Future studies could employ experimental, quasi-experimental, or longitudinal designs to examine whether structured ChatGPT use produces measurable changes in students' self-regulatory behavior over time.

Second, the study relied on self-reported questionnaire data. Students' reported frequency of ChatGPT use and self-regulated learning may not always correspond to their actual behavior. Future research could combine questionnaires with learning logs, ChatGPT interaction records, think-aloud protocols, interviews, or direct observation to obtain a more comprehensive picture of AI-assisted learning behavior. Such approaches would also respond to the need for deeper empirical investigation of how learners actually interact with AI during language-learning tasks (Lo et al., 2024; Woo et al., 2024).

Third, the study focused on ChatGPT use as a single predictor of self-regulated learning. Future studies could examine additional variables, including AI literacy, self-efficacy, motivation, cognitive load, learner autonomy, prompt-engineering competence, and teacher support. Examining these variables simultaneously may provide a more comprehensive explanation of why some learners benefit more from AI-assisted language learning than others.

Overall, the findings indicate that ChatGPT use is positively associated with self-regulated learning among EFL students. The result supports the emerging conceptualization of generative AI as a potential cognitive resource within self-regulated language learning, particularly when learners use the technology strategically and reflectively. Nevertheless, the findings should not be interpreted as evidence that greater ChatGPT use automatically produces better learning. The educational value of ChatGPT depends substantially on how learners

regulate their interaction with the technology, how critically they evaluate AI-generated information, and how effectively teachers structure AI-assisted learning activities (Woo et al., 2024; Chang & Sun, 2024).

Thus, the central implication of the study is not simply that EFL students should use ChatGPT more frequently, but that they should learn to use it more strategically, critically, and reflectively. In this sense, ChatGPT may be most educationally valuable when it complements rather than replaces learners' own cognitive and metacognitive engagement.

## **Conclusion**

This study examined the relationship between ChatGPT use and self-regulated learning among EFL students. The findings revealed a significant positive relationship between the two variables, indicating that students who reported higher levels of ChatGPT use for English-learning activities also tended to demonstrate stronger self-regulated learning practices. The regression analysis further showed that ChatGPT use significantly predicted self-regulated learning and accounted for 41.2% of its variance. These findings support the emerging perspective that generative AI can function as a cognitive resource that complements learners' self-regulatory processes when it is used strategically and reflectively.

The findings also highlight that the educational value of ChatGPT does not depend solely on the availability or frequency of AI use. Rather, meaningful learning may occur when students actively determine their learning goals, select appropriate strategies, monitor their understanding, evaluate AI-generated information, and reflect on their learning outcomes. Therefore, ChatGPT should be positioned as a supportive learning resource rather than a substitute for students' own cognitive effort or teachers' pedagogical roles.

For EFL education, the findings suggest that teachers should integrate ChatGPT into learning activities that promote learner agency, critical evaluation, and metacognitive reflection. Students can be encouraged to use ChatGPT to obtain explanations, generate practice materials, receive feedback, and explore alternative language expressions while remaining responsible for evaluating and applying the information provided by the system. Such an approach may help transform AI-assisted learning from passive content consumption into a more active self-regulated learning process.

Nevertheless, the findings should be interpreted with caution because the study employed a correlational design and relied on self-reported questionnaire data. Therefore, the results demonstrate an association rather than a causal effect of ChatGPT use on self-regulated learning. Future research should employ longitudinal or experimental designs and incorporate behavioral evidence, such as ChatGPT interaction logs, learning portfolios, interviews, or think-aloud protocols, to examine how learners actually regulate their learning while interacting with generative AI. Future studies may also investigate additional factors such as AI literacy, self-efficacy, motivation, cognitive load, and teacher support.

Overall, this study suggests that the most productive use of ChatGPT in EFL education is not simply to increase students' access to AI, but to develop their capacity to use AI strategically, critically, and reflectively. When integrated within a learner-centered pedagogical framework, ChatGPT has the potential to support rather than replace the cognitive and metacognitive processes underlying self-regulated language learning.

## **Acknowledgments**

The authors would like to express their gratitude to all individuals who contributed to the development of this study. Appreciation is also extended to the EFL students who participated in the study and provided valuable responses. The authors further acknowledge the academic support and guidance that contributed to the completion of this research.

## References

- Alsalem, M. S. (2024). EFL students' perception and attitude towards the use of ChatGPT to promote English speaking skills in the Saudi context. *Arab World English Journal*, 15(4), 73–84. <https://doi.org/10.24093/awej/vol15no4.5>
- Anjarani, S., Furqon, M., & Rakhmawati, F. (2024). ChatGPT to foster students' engagement in writing class: An intervention study. *Voices of English Language Education Society*, 8(3). <https://doi.org/10.29408/veles.v8i3.27687>
- Balcı, Ö. (2024). The role of ChatGPT in English as a foreign language (EFL) learning and teaching: A systematic review. *International Journal of Current Educational Studies*. <https://doi.org/10.46328/ijces.107>
- Broadbent, J., & Poon, W. L. (2015). Self-regulated learning strategies & academic achievement in online higher education learning environments: A systematic review. *The Internet and Higher Education*, 27, 1–13. <https://doi.org/10.1016/j.iheduc.2015.04.007>
- Chang, W.-L., & Sun, J. C.-Y. (2024). Evaluating AI's impact on self-regulated language learning: A systematic review. *System*, 126, 103484. <https://doi.org/10.1016/j.system.2024.103484>
- Dahri, N. A., Yahaya, N., Al-Rahmi, W. M., Aldraiweesh, A., Alturki, U., Almutairy, S., Shutaleva, A., & Soomro, R. B. (2024). Extended TAM based acceptance of AI-powered ChatGPT for supporting metacognitive self-regulated learning in education: A mixed-methods study. *Heliyon*, 10(8), e29317. <https://doi.org/10.1016/j.heliyon.2024.e29317>
- Guo, K., & Wang, D. (2024). To resist it or to embrace it? Examining ChatGPT's potential to support teacher feedback in EFL writing. *Education and Information Technologies*, 29, 8435–8463. <https://doi.org/10.1007/s10639-023-12146-0>
- Hockly, N. (2023). Artificial intelligence in English language teaching: The good, the bad and the ugly. *RELC Journal*, 54(2), 445–451. <https://doi.org/10.1177/00336882231168504>
- Hwang, G.-J., & Chang, C.-Y. (2023). A review of opportunities and challenges of chatbots in education. *Interactive Learning Environments*, 31(7), 4099–4112. <https://doi.org/10.1080/10494820.2021.1952615>
- Karataş, F., Abedi, F. Y., Ozek Gunyel, F., Karadeniz, D., & Kuzgun, Y. (2024). Incorporating AI in foreign language education: An investigation into ChatGPT's effect on foreign language learners. *Education and Information Technologies*, 29, 19343–19366. <https://doi.org/10.1007/s10639-024-12574-6>
- Kohnke, L., Moorhouse, B. L., & Zou, D. (2023). ChatGPT for language teaching and learning. *RELC Journal*, 54(2), 537–550. <https://doi.org/10.1177/00336882231162868>
- Lee, U., Jung, H. C., Jeon, Y., Sohn, Y., Hwang, W., Moon, J., & Kim, H. (2023). Few-shot is enough: Exploring ChatGPT prompt engineering method for automatic question generation in English education. *Education and Information Technologies*. <https://doi.org/10.1007/s10639-023-12249-8>
- Li, B., Lowell, V. L., Wang, C., & Li, X. (2024). A systematic review of the first year of publications on ChatGPT and language education: Examining research on ChatGPT's use in language learning and teaching. *Computers and Education: Artificial Intelligence*, 7, 100266. <https://doi.org/10.1016/j.caeai.2024.100266>
- Lo, C. K., Hew, K. F., & Jong, M. S. Y. (2024). ChatGPT as a tool for self-learning English among EFL learners: A multi-methods study. *System*, 127, 103528. <https://doi.org/10.1016/j.system.2024.103528>
- Lo, C. K., Yu, P. L. H., Xu, S., Ng, D. T. K., & Jong, M. S. Y. (2024). Exploring the application of ChatGPT in ESL/EFL education and related research issues: A systematic review of

- empirical studies. *Smart Learning Environments*, 11, 50. <https://doi.org/10.1186/s40561-024-00342-5>
- Mahapatra, S. (2024). Impact of ChatGPT on ESL students' academic writing skills: A mixed methods intervention study. *Smart Learning Environments*, 11, 9. <https://doi.org/10.1186/s40561-024-00295-9>
- Mazandarani, O. (2024). Self-regulated learning in ESL/EFL contexts: A methodological exploration. *Humanities and Social Sciences Communications*, 11, 1118. <https://doi.org/10.1057/s41599-024-03617-x>
- Meniado, J. C. (2023). The impact of ChatGPT on English language teaching, learning, and assessment: A rapid review of literature. *Arab World English Journal*, 14(4), 3–18. <https://doi.org/10.24093/awej/vol14no4.1>
- Oxford, R. L. (2017). *Teaching and researching language learning strategies: Self-regulation in context* (2nd ed.). Routledge.
- Pan, M., Lai, C., & Guo, K. (2025). Effects of GenAI-empowered interactive support on university EFL students' self-regulated strategy use and engagement in reading. *The Internet and Higher Education*, 65, 100991. <https://doi.org/10.1016/j.iheduc.2024.100991>
- Panadero, E. (2017). A review of self-regulated learning: Six models and four directions for research. *Frontiers in Psychology*, 8, 422. <https://doi.org/10.3389/fpsyg.2017.00422>
- Song, C., & Song, Y. (2023). Enhancing academic writing skills and motivation: Assessing the efficacy of ChatGPT in AI-assisted language learning for EFL students. *Frontiers in Psychology*, 14, 1260843. <https://doi.org/10.3389/fpsyg.2023.1260843>
- Teng, M. F. (2024). "ChatGPT is the companion, not enemies": EFL learners' perceptions and experiences in using ChatGPT for feedback in writing. *Computers and Education: Artificial Intelligence*, 7, 100270. <https://doi.org/10.1016/j.caeai.2024.100270>
- Teng, L. S. (2022). *Self-regulated learning and second language writing: Fostering strategic language learners*. Springer. <https://doi.org/10.1007/978-3-030-99520-1>
- UNESCO. (2023). *Guidance for generative AI in education and research*. UNESCO.
- Warschauer, M., Tseng, W.-T., Yim, S., Webster, T. J., Jacob, S., Du, Q., & Tate, T. (2023). The affordances and contradictions of artificial intelligence for second language writing: A research agenda. *Language Learning & Technology*, 27(2), 1–16.
- Woo, D. J., Wang, D., Guo, K., & Susanto, H. (2024). Teaching EFL students to write with ChatGPT: Students' motivation to learn, cognitive load, and satisfaction with the learning process. *Education and Information Technologies*, 29, 24963–24990. <https://doi.org/10.1007/s10639-024-12819-4>
- Xiao, Y., & Zhi, Y. (2023). An exploratory study of EFL learners' use of ChatGPT for language learning tasks: Experience and perceptions. *Languages*, 8(3), 212. <https://doi.org/10.3390/languages8030212>
- Zhang, Z., Zhou, S., & Bai, B. (2025). A systematic scoping review of self-regulated learning with AI in language education. *International Journal of Applied Linguistics*. Advance online publication. <https://doi.org/10.1111/ijal.70030>
- Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory Into Practice*, 41(2), 64–70. [https://doi.org/10.1207/S15430421TIP4102\\_2](https://doi.org/10.1207/S15430421TIP4102_2)
- Zhu, M., & Sari, A. R. (2026). Using artificial intelligence to support self-regulated learning: A systematic review of empirical research. *Learning and Individual Differences*, 128, 102917. <https://doi.org/10.1016/j.lindif.2026.102917>