International Journal of Learning, Teaching and Educational Research
Vol. 25, No. 3, pp. 988-1010 March 2026
https://doi.org/10.26803/ijlter.25.3.44
Received Jan 11, 2026; Revised Mar 10, 2026; Accepted Mar 11, 2026

Self-Regulated Learning Writing Strategies among Chinese English-Major Undergraduates: Gender, Proficiency, Academic Year, and Interrelations

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Abstract. This study investigated the use of self-regulated learning (SRL) writing strategies by undergraduate English majors in China. It examined overall strategy profiles, group differences, and interrelations among the main categories of SRL strategies. Although SRL has attracted increasing attention in L2 writing research, there are few systematic studies of the multidimensional SRL model and its changes across academic years among English majors in higher education institutions. This study aimed to fill the gap in research on the group differences and interrelationships of SRL dimensions, in the context of English as a Foreign Language (EFL) in higher education institutions. It also aimed to investigate the operation mode of cognitive, metacognitive, social-behavioral, and motivational regulation strategies in a tertiary EFL writing setting. Questionnaire data were collected from 222 English-major undergraduates in Sichuan Province, China. Data analysis employed descriptive statistics, independent sample t-tests, one-way ANOVA, and Pearson correlation analysis. Results revealed that students' use of SRL strategies is moderate to high. Gender and English proficiency are not significantly differentiating factors, while the academic year shows a non-linear pattern. The correlation analysis results indicate that there are moderate to strong positive correlations among all dimensions of SRL. These results empirically support the systematic and multidimensional nature of SRL and indicate that its development may be stage sensitive rather than linear. Pedagogically, it is recommended to continuously implement coordinated and SRL-oriented scaffolding teaching.

Keywords: English-major undergraduates; group differences; interrelations; self-regulated learning; self-regulated writing strategies

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1. Introduction

Writing is a key tool for self-expression, identity formation, communication, and lifelong learning; it plays a central role in academic participation and social engagement (Harris, 2024; Kiuhara et al., 2024; McKeown et al., 2023). Proficient writing is a highly cognitive and iterative process that requires writers to generate and organize ideas, use appropriate discourse markers and rhetorical devices, and revise texts to enhance clarity and accuracy (Hyland, 2019). In addition to language skills, effective writing also involves problem-solving abilities with goal orientation, as well as the flexible and autonomous application of various strategies throughout the writing process. However, for learners of English as a Foreign Language (EFL), writing in a second language or foreign language (L2) is particularly challenging. They often face problems such as limited language resources, insufficient content knowledge, and poor critical thinking and research abilities (Sari & Han, 2024; Wang et al., 2023; Zhou et al., 2022).

To address these challenges, self-regulated learning (SRL) is increasingly regarded as a key factor in supporting the successful development of writing skills (Harris, 2024). As a fundamental ability for 21st-century learners, SRL refers to the ability of learners to actively plan, monitor, and regulate their own cognition, motivation, emotions, and behaviors during the pursuit of learning goals (Bai & Wang, 2020a; Zimmerman, 2013). It is typically conceptualized as a cyclical process, including goal setting, strategy planning, self-monitoring, and self-reflection. Writers who effectively apply SRL strategies tend to view writing as a controllable and purposeful activity, demonstrating greater perseverance, motivation, and control over the writing process (Adiyono et al., 2025; Habók et al., 2022a). Consequently, fostering SRL strategies has become a promising direction for enhancing EFL learners' writing performance.

In recent years, SRL writing strategies have attracted growing scholarly attention in EFL contexts. Current research has examined single dimensions of SRL, such as cognitive or metacognitive regulation (Camacho et al., 2023; Qin & Jun Zhang, 2019), and the development and validation of SRL-related measurement tools (Shen & Bai, 2024; Teng, 2021). Other studies have explored relationships between SRL strategies and learner-related variables, including self-efficacy (Adiyono et al., 2025; Xu et al., 2024), motivation (Asomani-Adem, 2023; Yang et al., 2025), and academic achievement (Bai et al., 2024; Chen et al., 2026; Huei-Ju, 2019). Moreover, an increasing number of intervention studies show that teaching oriented toward SRL can effectively enhance the writing proficiency of EFL learners (Lee et al., 2023; Liu et al., 2024; Shen & Bai, 2024; Sun et al., 2025). These studies collectively emphasize the importance of SRL in the development of L2 writing.

Despite these advancements, some shortcomings persist in the relevant literature. Systematic studies on the usage patterns of SRL writing strategies among Chinese undergraduate English students are relatively scarce, especially with respect to gender, grade, and English proficiency differences (Qin & Jun Zhang, 2019; Teng, 2021; Yang et al., 2025). Most previous research focuses on specific strategy types or the overall SRL tendency, while paying insufficient attention to differences at the group level.

Furthermore, although SRL is theoretically conceptualized as a multidimensional and interdependent system, few empirical studies have examined the interrelationships among the main categories of SRL strategies in tertiary EFL writing contexts. The lack of such research may lead to a fragmented understanding of the coordinated regulation process. Theoretically, the basic SRL model assumes the existence of a coordinated and cyclic regulation process, in which each component influences the others (Panadero, 2017; Zimmerman, 2000). Empirically clarifying these interrelations is essential for determining whether SRL is a tightly integrated system or a collection of semi-independent processes. Pedagogically, understanding dimensional interrelations is equally vital. If SRL dimensions are tightly coupled, interventions targeting one domain may leverage cross-dimensional synergies. Without empirical evidence, educators cannot optimize intervention design or predict whether improvements will transfer across domains.

Within the Chinese higher education context, increasing emphasis has been placed on learner autonomy and individual differences in EFL writing instruction. A clearer understanding of how students from diverse backgrounds employ SRL writing strategies is therefore essential for designing differentiated instruction and targeted pedagogical interventions (Adiyono et al., 2025; Habók et al., 2022b). Accordingly, this study aimed to investigate English-major undergraduates' use of SRL writing strategies by examining: (a) overall patterns of strategy use; (b) differences across gender, English proficiency levels, and academic years; and (c) the interrelationships among four major SRL strategy categories. By addressing these issues, this study sought to provide empirical insights into SRL as an integrated system in L2 writing and to inform instructional practices that support students' sustained development of self-regulated writing competence. The research questions were as follows:

1. What are the overall patterns of SRL writing strategy use among Chinese university students?
2. Are there significant differences in SRL writing strategy use across gender?
3. Are there significant differences in SRL writing strategy use across English proficiency levels?
4. Are there significant differences in SRL writing strategy use across academic years?
5. How are the four major SRL strategy categories related to one another?

2. Literature Review

2.1 Theoretical Framework of SRL

Self-regulated learning (SRL) refers to the process by which learners actively manage their cognition, motivation, emotions, and behaviors in order to achieve their academic goals (Zimmerman, 2002). Learners do not passively accept guidance but consciously transform psychological resources into goal-oriented actions, thereby enhancing academic performance (Schunk & Zimmerman, 2011). The theoretical development of SRL has been influenced by several important models. Boekaerts (1996, 1999) proposes the Dual Processing Self-Regulation Model, which emphasizes the interaction between cognition and emotion through two pathways: one is the growth (goal-oriented) pathway; the other is the happiness (emotional protection) pathway.

Zimmerman (2000) further conceptualizes SRL as a recurring process of thinking, execution, and self-reflection, highlighting that learners conduct self-monitoring and adaptive strategy adjustments when responding to feedback and outcomes (Zimmerman, 2013). Pintrich (2004) proposed a four-phase model: forethought, monitoring, control, and reflection—explicitly incorporating the influence of motivation and situational factors on regulation. Recent viewpoints have drawn more attention to metacognition and social–behavioral regulation: Winne and Hadwin (1998) emphasize how learners set standards, monitor the environment, and adjust strategies, while Hadwin and colleagues extend SRL to co-regulation and socially shared regulation, emphasizing how regulation is distributed among peers in cooperative learning processes (Hadwin et al., 2017).

Drawing on these traditions, SRL is commonly treated as a multidimensional construct comprising four interrelated domains that are particularly relevant to language learning and writing (Shen & Bai, 2024; Teng, 2021; Winke, 2007):

1. **Cognitive strategies** involve rehearsal, elaboration, and text processing that directly support comprehension and written production (Oxford, 2016).
2. **Metacognitive strategies** focus on planning, monitoring, and evaluating one's learning and task performance (Winne & Hadwin, 1998).
3. **Social–behavioral strategies** include help-seeking, collaboration, and feedback engagement that leverage interpersonal resources to support learning (Wang et al., 2023).
4. **Motivational regulation strategies** help learners sustain effort, interest, and emotional balance through techniques such as self-talk, goal monitoring, and affect management (Boekaerts, 1999; Wolters, 2003; Zhang & Zou, 2024).

Specifically, cognitive strategies and metacognitive strategies mainly function during the performance phase, supporting task execution, monitoring, and regulation of writing processes. Social–behavioral strategies reflect regulatory behaviors implemented in the social-mediated learning environment (especially in the richly feedback-oriented EFL writing environment) and can span both the writing execution and reflection stages. Motivational regulation strategies are closely related to the forethought phase, in which learners set goals and manage beliefs and effort related to the task. Therefore, these four categories of SRL

represent the manifestations of the cyclic SRL process in L2 writing in specific contexts. Together, these four domains provide the conceptual foundation for the present study, which examines Chinese tertiary EFL learners' self-regulated writing strategy use.

2.2 Individual Differences in SRL Writing Strategy Use

Individual differences are widely recognized as influencing learners' application with SRL strategies (Zhang & Zhang, 2024). In L2 writing, these differences manifest in how learners plan, monitor, and regulate their writing process, including how they respond to feedback and manage their emotions during longer writing tasks (Bai & Guo, 2018; Yang et al., 2025). Existing research suggests that gender, language proficiency, and academic year may be associated with learners' strategic behavior in writing (Bai et al., 2020; Umamah et al., 2022; Woo & Kim, 2024). However, empirical findings are not entirely consistent across different contexts, and evidence specifically from the EFL context in Chinese higher education institutions is still relatively limited. This has prompted people to conduct more in-depth contextual studies.

Gender has been a focus of research on SRL and writing; however, the research results remain inconsistent. Although some studies have shown that female learners use SRL writing strategies more frequently than male learners, especially in areas such as planning, feedback participation, and self-monitoring (Bai et al., 2020; Mohamed & Shaaban, 2023; Teng & Huang, 2019; Zhu et al., 2024). Other studies have found that gender differences are negligible or depend on specific contexts (Umamah et al., 2022; Wang et al., 2013). These inconsistent results indicate that the gender-related patterns in the use of SRL writing strategies may be influenced by contextual factors such as classroom feedback culture, teaching design, and task requirements, rather than reflecting a universal trend.

Language proficiency is another factor that frequently influences the application of SRL strategies. Higher-proficiency learners typically show more complex cognitive and metacognitive strategies, such as deeper text processing, goal-oriented monitoring, and revision planning—and stronger motivational regulation to manage anxiety and maintain learning enthusiasm (Bai et al., 2020; Bai & Guo, 2018; Luo & Gan, 2023). In contrast, lower-proficiency learners may rely more on surface-level strategies and have weaker monitoring and revision processes (Manchon et al., 2007). Recent studies have also shown that language proficiency is not only related to the frequency of strategy use but also to the flexibility of strategies in different task requirements, indicating a reciprocal relationship between SRL development and writing ability (Golparvar & Khafi, 2021; Habók et al., 2022a; Yang et al., 2025).

Academic years have also been linked to changes in the use of SRL strategies. Although it is generally expected that students will gradually develop stronger autonomous learning abilities during their university studies (Bai & Guo, 2018; Zimmerman, 2000). Empirical patterns do not develop completely linearly. However, the existing empirical research results are still inconsistent. Some studies show that students with stronger learning abilities use more cognitive and metacognitive strategies; this reflects their development in self-regulation ability

(Bai & Guo, 2019; Teng & Huang, 2019). But other evidence points to a non-linear pattern, with higher-level students having lower self-regulation participation than lower-level students (Bai et al., 2020). Taken together, these findings indicate that developmental trends in SRL are not strictly linear; they may be influenced by situational factors such as teaching design, task requirements, and transitional academic pressure. This highlights the necessity of conducting more systematic research on different stages of SRL patterns in tertiary EFL writing contexts.

2.3 Interrelations Among the Four SRL Strategy Dimensions

SRL is widely conceptualized as an interdependent system in which cognitive, metacognitive, motivational, and social–behavioral processes jointly support learning and performance (Boekaerts, 2011; Panadero, 2017; Zimmerman, 2000). In writing, cognitive operations such as conception, text processing, and revision are usually coordinated through metacognitive regulation (e.g., planning, monitoring, and evaluation). This is because writers must constantly align language choices and content development with constantly changing goals and task constraints (Winne & Hadwin, 1998; Zimmerman & Risemberg, 1997). Motivational regulation is believed to interact with cognition and metacognition by maintaining effort, managing emotions, and maintaining commitment to goals during the writing process (Boekaerts, 1999; Wolters, 2003). At the same time, social behavior can serve as an external regulatory resource: seeking help, collaborative work with peers, and using feedback can enhance learners' persistence and strategic participation (Hadwin et al., 2017).

Although these theoretical accounts imply robust interrelations among SRL strategy dimensions, there is limited empirical evidence that explicitly examines how major SRL dimensions interrelate within tertiary EFL writing contexts (Luo & Gan, 2023; Panadero, 2017). Clarifying these interrelationships is of crucial theoretical significance, as the SRL model emphasizes coordinated and cyclical regulation rather than isolated strategy application. It is also pedagogically important because interdependence implies that strengthening one domain (e.g., motivational regulation) may have spillover benefits for other domains (e.g., feedback engagement and social–behavioral regulation). Accordingly, this study examined not only subgroup differences but also interconnections among the four SRL dimensions in the context of Chinese universities.

3. Methodology

3.1 Research Participants

Participants were recruited using purposive sampling, targeting English-major undergraduates. The sample was drawn from two universities in Sichuan Province, China. Both universities are typical institutions in the southwest region that offer English-major courses; they have similar curricular structures and instructional practices to other EFL teaching environments. A total of 254 questionnaires were initially collected. After data screening, 32 questionnaires from non-English-major students were excluded to ensure that the research focus was consistent with the research subjects. The final analysis sample consisted of 222 English-major undergraduates (30 males and 192 females). Participation was voluntary, and students were informed that their responses would remain anonymous and would not affect their academic evaluation. No incentives were provided. Prior to participation, informed consent was obtained electronically.

English proficiency was classified using students' most recent standardized English examination, appropriate to their academic stage. Freshmen were grouped based on Gaokao English scores (< 90, 90–120, ≥ 120). Sophomores and juniors were categorized using their latest CET-4 scores (< 425, 425–549, ≥ 550). Seniors were classified based on TEM-4 scores (< 60, 60–79, ≥ 80), which better reflect English-major proficiency. In each group, proficiency was regarded as a categorical variable (low, medium, high) rather than a directly comparable raw score across different examinations.

3.2 Research Instrument

The questionnaire was adapted from Teng's validated tool (2021) for measuring SRL strategies in L2 writing. The original scale contains 40 items across nine subdimensions. In this study, five items were deleted to simplify the questionnaire and reduce the burden on respondents, while still covering the main SRL domains. The adapted version comprised 35 items grouped into four strategy categories: cognitive, metacognitive, social–behavioral, and motivational regulation.

To ensure linguistic equivalence, the instrument was translated into Chinese using a forward–backward translation procedure, followed by a pilot administration with English-major undergraduates (n = 259). Based on the feedback from the participants, some minor adjustments were made to the wording. All items were rated on a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). Sample items included "I revise my writing based on teacher or peer feedback" (feedback processing) and "I encourage myself to persist when writing becomes challenging" (motivational regulation).

3.3 Data Analysis

Data were collected through an online structured questionnaire administered via Questionnaire Star, a widely used Chinese survey platform, and analyzed using IBM SPSS Statistics (Version 27). Internal consistency reliability was evaluated using Cronbach's alpha. The coefficients for the four SRL dimensions ranged from 0.785 to 0.916 (see Table 1), indicating acceptable to excellent reliability.

Table 1: Internal Consistency Reliability of SRL Writing Strategy Subdimensions

Variable	Cronbach's α
Text Processing Strategies	0.873
Knowledge Rehearsal Strategies	0.813
Idea-Planning Strategies	0.811
Goal-Oriented Monitoring Strategies	0.807
Peer Learning Strategies	0.88
Feedback Processing Strategies	0.916
Interest-Enhancing Strategies	0.887
Motivational Self-Talk Strategies	0.903
Emotion-Regulation Strategies	0.785

Normality was examined using skewness and kurtosis values, and the results were all within the acceptable range. Homogeneity of variance was tested using Levene's test. When the homogeneity of variance assumption was not met, Welch's variance analysis was used. After calculating the descriptive statistics, independent sample t-tests and one-way ANOVAs were conducted to test the differences between groups. Pearson correlation analyses were used to evaluate interrelations among SRL dimensions. All tests were two-tailed with α set at.05. Effect sizes (Cohen's d and η^2) were reported.

4. Findings

This section reports the study's findings which addressed five research questions. Descriptive statistics are first presented to illustrate the overall profile of the SRL writing strategies used by undergraduate students majoring in English. Inferential analysis was conducted to examine the differences among students of different genders, English proficiency levels, and academic years. Correlational analyses were carried out to explore the interrelationships among the main SRL writing strategy categories. Together, these findings provide a comprehensive empirical overview of students' SRL writing strategy use from both individual differences and structural perspectives.

Table 2: Descriptive Statistics and Reliability Analysis of SRL Strategy Subdimensions

Subdimensions	No. of Items	Item Mean (1–5)	Total Score SD	Cronbach's Alpha
Text Processing Strategies	5	3.586	3.425	0.871
Knowledge Rehearsal Strategies	3	3.440	2.096	0.824
Idea-Planning Strategies	4	3.713	2.157	0.809
Goal-Oriented Monitoring Strategies	4	3.195	2.127	0.818
Peer Learning Strategies	3	3.343	2.249	0.880
Feedback Processing Strategies	4	4.048	2.695	0.921
Interest-Enhancing Strategies	4	3.615	2.733	0.879
Motivational Self-Talk Strategies	5	3.748	3.315	0.902
Emotion-Regulation Strategies	3	3.577	1.914	0.790

Table 2 presents the descriptive statistics and internal consistency of the nine SRL writing strategy subdimensions. All subscales demonstrated satisfactory to excellent reliability. Cronbach's alpha coefficients ranged from.790 to.921, indicating that the subdimensions could consistently reflect students' self-reported regulatory behaviors in English writing.

In terms of central tendency, item means ranged from 3.195 to 4.048, suggesting moderate to relatively high endorsement across subdimensions. Feedback Processing Strategies showed the highest mean score (M = 4.048), followed by Motivational Self-Talk (M = 3.748) and Idea-Planning Strategies (M = 3.713), respectively. In contrast, Goal-Oriented Monitoring Strategies received the lowest mean score (M = 3.195). Other subdimensions—such as text processing, interest-enhancing, emotion-regulation, knowledge rehearsal, and peer learning strategies—were at moderate to moderately high levels. This suggests that students' SRL strategies are distinct across subcomponents but generally well-balanced overall.

Based on the descriptive results from the subdimension analysis, the nine SRL strategy subdimensions were further combined into four higher-order factors to answer RQ1. As presented in Table 3, all four factors showed good to high internal consistency (α =.805–.901), which confirms the reliability of the higher-order structure.

Table 3: Descriptive Statistics and Internal Consistency of SRL Writing Strategy Dimensions

Dimensions	No. of Items	Item Mean (1–5)	Total Score SD	Cronbach's Alpha
Cognitive strategies	8	3.531	4.867	0.876
Metacognitive strategies	8	3.455	3.477	0.805
Social–behavioral strategies	7	3.746	3.844	0.824
Motivational regulation strategies	12	3.662	6.501	0.901

Note. Item means are reported on a five-point Likert scale. Standard deviations represent variability in total scores within each strategy dimension.

In terms of overall use of SRL strategy, students reported the highest engagement in social–behavioral strategies (M = 3.746), followed by motivational regulation strategies (M = 3.662). By comparison, cognitive strategies (M = 3.531) and metacognitive strategies (M = 3.455) received relatively lower mean scores, although both remained within the moderately high range. Taken together, these findings indicate that English-major undergraduates tended to rely more strongly on socially mediated and motivational forms of self-regulation than on cognitive and metacognitive strategies in English writing.

Table 4: Gender Differences in SRL Writing Strategy Use (Total Scores)

Dimensions	Gender	N	Mean	SD	t	p	d
Cognitive Strategy	Male	30	27.90	4.866	0.671	0.516	−0.084
	Female	192	28.31	4.878			
Metacognitive Strategy	Male	30	28.50	4.281	1.223	0.230	0.288
	Female	192	27.50	3.327			
Social–Behavioral Strategy	Male	30	27.43	4.400	1.868	0.063	0.367
	Female	192	26.03	3.728			
Motivational Regulation Strategy	Male	30	46.50	8.549	1.828	0.076	0.460
	Female	192	43.54	6.051			

To examine gender differences in SRL writing strategy use, independent-samples t-tests were conducted across the four SRL strategy dimensions. Skewness and kurtosis values for all SRL strategy dimensions fell within acceptable ranges (|skewness| < 0.6; |kurtosis| < 1.4), indicating approximate normality. Parametric analyses were therefore considered appropriate. As shown in Table 4, no statistically significant gender differences were identified (p >.05).

Specifically, male and female students reported comparable levels of engagement in cognitive strategies, t (220) = 0.67, p =.516, d = −0.08, metacognitive strategies, t (220) = 1.22, p =.230, d = 0.29, social–behavioral strategies, t (220) = 1.868, p =.063, d = 0.37, and motivational regulation strategies, t (220) = 1.828, p =.076, d = 0.46. Overall, the results indicate that English-major undergraduates did not differ significantly by gender in their use of SRL writing strategies. Effect size estimates ranged from trivial to moderate, with relatively larger effects observed for social–

behavioral and motivational regulation strategies, suggesting potential gender-related tendencies that merit further examination, particularly in future studies with more balanced gender distributions.

To examine whether SRL writing strategy use differed across English proficiency levels, both descriptive statistics and inferential analyses were conducted. Table 5 presents the descriptive statistics of SRL strategy use across high-, medium-, and low-proficiency groups. Overall, the mean scores across proficiency levels were largely comparable for all four SRL strategy dimensions, indicating no pronounced differences in the descriptive patterns. At the descriptive level, students in the high- and medium-proficiency groups reported very similar levels of SRL strategy use across dimensions.

For example, their mean scores for cognitive strategies were nearly identical (M = 28.40 vs. 28.25), and similar patterns were observed for metacognitive, social–behavioral, and motivational regulation strategies. Although the low-proficiency group tended to report slightly lower mean scores for cognitive and metacognitive strategies, this group consisted of a very small number of participants (n = 4). Therefore, these descriptive differences should be interpreted with caution.

Table 5: Descriptive Statistics of SRL Writing Strategy Use Across English Proficiency Levels

Dimension	High (n=112)	Medium (n=106)	Low (n=4)
Cognitive Strategy	28.40 (4.94)	28.25 (4.77)	24.00 (4.62)
Metacognitive Strategy	27.74 (3.32)	27.56 (3.67)	26.75 (3.30)
Social–Behavioral Strategy	26.14 (3.88)	26.33 (3.86)	25.50 (3.11)
Motivational Regulation Strategy	43.84 (6.23)	44.06 (6.85)	43.50 (5.80)

Note. Values are presented as Mean (SD). Scores represent total scores.

Levene's tests supported the homogeneity of variances assumption for all SRL strategy dimensions across proficiency levels (ps >.05). One-way ANOVAs were therefore conducted with English proficiency level as the independent variable and the four SRL strategy dimensions as dependent variables (Table 6). Results showed no significant differences in any of the SRL strategy dimensions across proficiency levels. Specifically, English proficiency level did not have a significant effect on cognitive strategies, $F(2, 219) = 1.59$, $p = .207$, metacognitive strategies, $F(2, 219) = 0.21$, $p = .813$, social–behavioral strategies, $F(2, 219) = 0.14$, $p = .874$, or motivational regulation strategies, $F(2, 219) = 0.04$, $p = .961$.

In line with these non-significant results, effect sizes ranged from small to negligible ($\eta^2 = .000–.014$), suggesting that proficiency explained only a very small share of the variance in students' use of SRL strategies. Taken together, these results indicate that English majors at different proficiency levels exhibited largely similar patterns of SRL strategy use in English writing. These findings challenge the view that SRL development is determined by individual ability; they also support socio-cognitive theories that prioritize contextual regulation over static differences in competence. However, the sample sizes across subgroups were highly unbalanced, particularly for the low-proficiency group (n = 4), which

greatly reduced statistical power and undermined the stability of the mean estimates.

Table 6: One-way ANOVA Results for SRL Writing Strategy Use across English Proficiency Levels

Dimension	F (2, 219)	p	η^2
Cognitive Strategy	1.588	0.207	0.014
Metacognitive Strategy	0.207	0.813	0.002
Social–Behavioral Strategy	0.135	0.874	0.001
Motivational Regulation Strategy	0.039	0.961	0.000

To examine differences in SRL writing strategy use across academic years, descriptive and inferential analyses were conducted. **Table 7** summarizes the mean differences among freshmen, sophomores, juniors, and seniors. Descriptively, juniors consistently achieved higher total scores across all four SRL strategy dimensions. In contrast, seniors generally reported lower levels of strategy use, especially in cognitive and motivational regulation strategies.

Table 7: Descriptive Statistics of SRL Writing Strategy Use across Academic Years

Dimension	Freshman (n=129)	Sophomore (n=15)	Junior (n=58)	Senior (n=20)
Cognitive Strategy	27.45 (4.47)	30.07 (2.66)	30.57 (4.78)	25.35 (5.93)
Metacognitive Strategy	27.13 (3.44)	27.33 (3.75)	28.95 (3.33)	27.30 (3.89)
Social–Behavioral Strategy	25.83 (3.63)	25.93 (3.31)	27.52 (4.19)	25.20 (3.89)
Motivational Regulation Strategy	43.70 (6.28)	43.87 (7.00)	45.57 (6.25)	40.80 (7.31)

Note. Values are presented as Mean (SD). Scores represent total scores

To further verify these trends, one-way ANOVAs were performed for each SRL strategy dimension (Table 8). Assumption checks showed that the homogeneity of variance assumption was satisfied for metacognitive, social–behavioral, and motivational regulation strategies (ps >.05). A slight violation was observed for cognitive strategies, with Levene's test returning p =.047. Nevertheless, Welch's robust test produced consistent results for cognitive strategies (p <.001), supporting the robustness of the overall findings. The ANOVA results revealed statistically significant differences across academic years in cognitive strategies, $F(3, 218) = 9.62$, $p < .001$, $\eta^2 = .117$; metacognitive strategies, $F(3, 218) = 3.91$, $p = .010$, $\eta^2 = .051$; social–behavioral strategies, $F(3, 218) = 3.24$, $p = .023$, $\eta^2 = .043$; and motivational regulation strategies, $F(3, 218) = 2.90$, $p = .036$, $\eta^2 = .038$.

Table 8: One-way ANOVA Results for SRL Writing Strategy Use across Academic Years

Dimension	F (3, 218)	p	η^2
Cognitive Strategy	9.622	< 0.001	0.117
Metacognitive Strategy	3.907	0.010	0.051
Social–Behavioral Strategy	3.238	0.023	0.043
Motivational Regulation Strategy	2.902	0.036	0.038

Post hoc analyses using the Tukey Honestly Significant Difference (HSD) test (Table 9) provided further details regarding this trend. Juniors showed significantly greater cognitive strategy use than both freshmen and seniors, as well as significantly higher metacognitive and social–behavioral strategy use than freshmen. Moreover, sophomores reported significantly more cognitive strategy use than seniors. No other pairwise comparisons reached statistical significance. The research results indicate that the development of SRL writing strategies follows a non-linear pattern, reaches its peak in the junior year, and does not steadily increase over time.

This non-linear pattern nuances the implicit developmental assumption in SRL models, suggesting that regulatory engagement may fluctuate across academic transitions rather than increase monotonically. The finding that seniors did not demonstrate a corresponding advantage in SRL strategy use highlights potential shifts in academic demands and engagement across the undergraduate years. However, the relatively small number of sophomores and seniors should be considered when interpreting the stability of these between-group differences.

Table 9: Significant Tukey HSD Pairwise Comparisons by Academic Year

Dependent Variable	Comparison (I − J)	Mean Difference (I − J)	p
Cognitive Strategy	Junior − Freshman	3.119	<.001
	Junior − Senior	5.219	<.001
	Sophomore − Senior	4.717	.016
Metacognitive Strategy	Junior − Freshman	1.816	.005
Social–Behavioral Strategy	Junior − Freshman	1.688	.027
	Junior − Senior	4.769	.024

Note. Only statistically significant comparisons are reported.

To examine the interrelationships among SRL writing strategy categories, Pearson correlation analyses were conducted based on the total scores of cognitive, metacognitive, social–behavioral, and motivational regulation strategies. As shown in Table 10, all correlations were positive and statistically significant (ps <.001), indicating systematic associations among the four SRL strategy categories.

Overall, the correlation coefficients range from moderate to moderately strong (r =.438–.654). Cognitive strategies are moderately correlated with metacognitive (r =.569), social–behavioral (r =.438), and motivational regulation strategies (r =.521). These interrelations provide empirical support for the cyclical and systemic architecture proposed in core SRL frameworks, reinforcing the view that regulatory processes operate through reciprocal interaction rather than a linear sequence. Metacognitive strategies also significantly positively correlated with social–behavioral (r =.552) and motivational regulation strategies (r =.608). Notably, the correlation between social behavior strategies and motivational regulation strategies is the strongest (r =.654), suggesting a particularly close connection between socially mediated regulation and motivational processes in English writing.

Table 10: Pearson Correlations among SRL Writing Strategy Categories (N = 222)

Dimension	Cognitive Strategy	Metacognitive Strategy	Social–Behavioral Strategy	Motivational Regulation Strategy
1. Cognitive Strategy	1			
2. Metacognitive Strategy	.569**	1		
3. Social–Behavioral Strategy	.438**	.552**	1	
4. Motivational Regulation Strategy	.521**	.608**	.654**	1

Taken together, these intercorrelations reinforce the view of SRL as a multidimensional and integrated regulatory system rather than a set of isolated skills. They align with cyclical SRL models in which regulatory components operate through reciprocal interaction rather than linear sequencing. Beyond supporting theoretical integration, the findings also suggest potential cross-domain influence: strengthening one dimension (such as motivational regulation) may indirectly enhance related domains, including social–behavioral and metacognitive engagement. Pedagogically, this systemic perspective implies that targeted interventions may yield broader regulatory benefits rather than affecting isolated skills alone.

5. Discussion

This study investigated English-major undergraduates' SRL writing strategy use across four major categories. It examined whether strategy use varied by gender, English proficiency, and academic year, and how these categories interrelate. Overall, the research results describe SRL in English writing as a multidimensional system. In this study, different regulatory components exhibit different usage patterns, and in this sample, the academic year has a stronger influence on SRL than demographic factors or proficiency differences. Furthermore, it has been proven that SRL is an integrated regulatory system rather than isolated skills.

The RQ1 findings indicate that participants reported moderate to relatively high SRL writing strategy use across the four dimensions, supporting multidimensional SRL perspectives (Boekaerts, 2011; Panadero, 2017; Zimmerman, 2000). Notably, social–behavioral strategies were endorsed most strongly, followed by motivational regulation and cognitive strategies, whereas metacognitive strategies were comparatively less endorsed. This pattern aligns with research in tertiary EFL contexts, suggesting that learners often rely on socially mediated regulation, particularly when writing is embedded in instruction and assessment cycles (Adiyono et al., 2025; Hadwin et al., 2017). The relatively strong endorsement of motivational regulation strategies further reflects learners' efforts to sustain engagement and manage affective demands during writing (Xu et al., 2024; Zimmerman, 2000).

In contrast, the acceptance of metacognitive strategies is relatively low, which indicates that without clear scaffolding guidance, high-level planning, monitoring, and self-assessment may be difficult to internalize. This issue has

been repeatedly confirmed in SRL and L2 writing research (Bai & Guo, 2019; Teng & Zhang, 2016a; Zimmerman & Risemberg, 1997). Panadero (2017) and Winne & Hadwin (1998) suggested that metacognitive monitoring can be automatized through repeated practice and operates at the unconscious level. According to this explanation, students' relatively low self-reported metacognitive awareness may conceal considerable implicit monitoring that functions outside conscious awareness. Therefore, this finding does not indicate a defect in metacognitive regulation. Rather, it indicates that self-report questionnaires have limitations in capturing the full picture of metacognitive processes. Pedagogically, these results highlight the need to emphasize metacognitive procedures (e.g., goal clarification, monitoring prompts, self-evaluation checklists) within SRL-oriented writing instruction rather than assuming that learners will spontaneously develop reflective regulation.

For RQ2, no statistically significant gender differences were observed across SRL strategy dimensions. This finding aligns with research suggesting that gender effects in SRL may be mitigated in higher education contexts, where students are exposed to comparable instructional practices, disciplinary expectations, and assessment demands (Umamah et al., 2022; C. Wang et al., 2013). Hadwin et al. (2017) emphasize that regulation is "heavily contextualized," influenced by prior experiences, and "socially situated" within specific learning contexts. When all students, regardless of gender, are in the same institutional environment with standardized homework structures, feedback mechanisms, and peer interactions, the influence of individual gender differences on shaping the use of SRL strategies may be less than that of of contextual factors. This explanation helps to explain the result of not observing gender differences. It is consistent with recent research indicating that in higher education settings, institutional practices—rather than individual characteristics—are the main drivers of SRL development.

Furthermore, in relatively standardized English-major programs, the uniform course structure and writing requirements may further reduce the gender differences in strategy usage. Importantly, the absence of significant differences does not mean that gender is completely irrelevant. Rather, it indicates that in the specific context, gender has not become a significant differentiating factor. In addition, the gender distribution in this sample is unbalanced, which may limit the sensitivity needed to detect small effects. Overall, these results support inclusive SRL-focused writing instruction that addresses shared regulatory needs rather than emphasizing gender-specific interventions (Panadero, 2017).

RQ3 indicated that there are no significant differences in the use of SRL writing strategies among different English proficiency groups, and the effect size is extremely small. This suggests that English proficiency has limited explanatory power for the differences in SRL strategy usage among English-major students. Descriptively, the strategy usage of the high-level group and the medium-level group is comparable, while the average values of the low-level group are slightly lower in certain dimensions. Similarly, the sample size of this subgroup is extremely small, which may limit the stability of these results (Field, 2018).

In standardized academic programs, regardless of students' language proficiency, they encounter the same assignment structures, feedback practices, and rubrics. Therefore, the development of SRL is mainly driven by situational factors rather than individual abilities. When learners share similar course structures, writing requirements, and feedback environments—regardless of language proficiency—they will develop similar regulatory mechanisms (Boekaerts, 2011; Habók et al., 2022b, 2022a). Thus, the institutional practices in EFL writing, such as repeated exposure to similar styles, grading criteria, and teacher/peer feedback, may standardize regulatory behaviors and reduce differences based on language proficiency (Oxford, 1990; Teng & Zhang, 2016a). In this sense, SRL functions as a cross-cutting regulatory mechanism rather than directly reflecting the level of language ability (Bai & Guo, 2019).

Another possible explanation concerns measurement sensitivity. Proficiency was categorized into broad levels based on different standardized examinations across cohorts. Although this classification method is reasonable in its developmental stage, it may reduce the sensitivity to more subtle differences in ability and weaken the identification of detectable differences in the use of SRL strategies. In conclusion, these findings suggest that instructional design and learning experience may play a more important role than proficiency in differentiating SRL strategy use within this English-major context.

Unlike gender and proficiency level, academic year has a significant impact on each dimension of SRL strategies, with effect sizes ranging from small to medium. This indicates that students' learning stage can explain a considerable portion of the differences. Descriptively, juniors reported the highest strategy use across dimensions, whereas seniors tended to report lower scores on several dimensions. This suggests that their development trajectory is not linear and does not simply increase monotonically.

This pattern is consistent with SRL models, which emphasizes that self-regulatory abilities develop through interaction between learners and shifting task demands, feedback, and motivational conditions. The pattern may therefore fluctuate across university stages (Hadwin et al., 2017). One plausible contextual explanation is that juniors often encounter intensive requirements for academic writing and assessment, which may strengthen the application of conventional strategies. While seniors may face other priorities (such as internships, exams, graduation requirements), these matters change their participation patterns and reduce (Kizilcec et al., 2017). The larger effect size for cognitive strategies across academic years suggests that repeated exposure to writing tasks may particularly enhance the automation and fluency of the basic writing process (Bai & Guo, 2019). Freshman students perform significantly better than senior students in the application of cognitive strategies, which indicates that the intense writing tasks during the freshman year provide the best conditions for consolidating the cognitive writing process.

In sum, these contextual and phased factors indicate that the development of SRL in L2 writing is a non-linear process and is influenced by the sequence of the

curriculum, assessment requirements, and changes in the developmental stages during undergraduate studies. Pedagogically, these findings emphasize the importance of distributing SRL instruction across the curriculum—continuing to reinforce strategic routines after the early stages of undergraduate studies and providing new support during transition phases.

Finally, RQ5 revealed moderate to moderately strong positive correlations among all SRL strategy categories, which supports the conceptualization of SRL as an integrated regulatory system rather than isolated skills. The association between cognitive strategies and metacognitive strategies is consistent with the circular SRL model, in which the execution and monitoring during the writing process interact with each other (Winne & Hadwin, 1998). The strongest link, which was between social–behavioral strategies and motivational regulation, highlights the close connection between interpersonal resources (e.g., peer interaction and feedback use) and sustained effort in demanding L2 writing tasks, particularly in socially scaffolded EFL contexts (Hadwin et al., 2017; Zhang & Zou, 2024). This pattern aligns with Hadwin et al.'s (2017) argument that regulatory factors "interact with each other," but it does not necessarily mean that the degree of influence on all dimensions is the same, or that they interact through the same mechanism.

The significant correlation between social–behavioral and motivation regulation (r =.654) holds theoretical importance. From the social-cultural perspective of Hadwin et al. (2017), this association reflects a principle: cooperative learning experiences—such as peer feedback, group discussions, and seeking help—create emotional conditions that directly affect the persistence of motivation. Conversely, strong motivation can also maintain the participation in seeking help and cooperative behaviors. This mutual influence indicates that in the writing context of EFL, social regulation and emotional regulation are functionally closely linked. They exert their effects through interrelated paths rather than as independent processes.

In contrast, the correlation between cognition and society was relatively low (r =.438), indicating that the basic cognitive processes of writing might operate more autonomously. Students can carry out core cognitive processes such as brainstorming, text organization, and revision without actively seeking social assistance. This difference is of great significance: social regulation and motivation regulation seem to be naturally interrelated, while cognitive regulation may develop independently to some extent, and thus may require explicit attention in teaching to integrate it with the social collaboration process.

The discovery that social–behavioral regulation and motivation regulation are closely coupled indicates that writing tasks that emphasize peer collaboration and formative feedback can leverage their inherent interdependence and simultaneously strengthen these two dimensions. However, the degree of cognitive-social coupling is relatively low, suggesting that we must pay special attention to how to combine the basic cognitive writing process with the social collaboration structure. Students may need scaffolding instruction to understand

how the feedback from peers on content organization (cognitive domain) is related to their seeking help behavior (social domain).

Recent empirical evidence further reinforces this systemic explanation. Research on Indonesian EFL vocational students demonstrates that SRL enhances self-efficacy, which in turn reduces academic procrastination, with self-efficacy serving as a significant mediating mechanism. This finding is consistent with the latest evidence provided by Adiyono et al. (2025). In the context of EFL vocational education in Indonesia, they demonstrate that SRL and social support jointly enhance self-efficacy, thereby reducing academic procrastination. This indicates that cognitive regulation and motivational beliefs operate dynamically and have observable effects on academic performance. These findings collectively reinforce the view that SRL is an interrelated but empirically distinguishable system.

Instructionally, this supports integrated SRL-oriented writing pedagogy that coordinates cognitive, metacognitive, motivational, and social regulation, while still targeting each component explicitly rather than treating SRL as a single undifferentiated construct (Adiyono et al., 2025; Harris, 2024). Overall, the discussion highlights that SRL writing strategy use among English-major undergraduates is multidimensional and interrelated, with academic year emerging as a more salient source of variation than gender or proficiency in this sample. These findings suggest that SRL development in writing may depend strongly on curricular experiences and shifting university-stage demands, reinforcing the value of sustained, stage-sensitive SRL scaffolding throughout the undergraduate writing curriculum.

6. Conclusion and Limitations

This study conducted a detailed and multidimensional analysis of the use of SRL writing strategies among a specific group, contributing to the relevant literature. The study challenged the assumption of linear ability development and empirically verified the interrelationships among the various dimensions of SRL in the context of EFL writing. Specifically, this study examined the multidimensional characteristics of SRL writing strategies used by Chinese undergraduate students majoring in English. It explored the group differences and interrelationships of the four SRL dimensions.

The research results indicate that students' strategy usage levels were at the medium to high level; also, that they relied more on social–behavioral regulation and motivation regulation strategies rather than cognitive strategies and metacognitive strategies. Although gender and English proficiency did not significantly affect the use of SRL, grade became an important factor, showing a non-linear development pattern. The SRL usage level of junior students was the highest. The moderate to strong correlations among the four dimensions further supported the conceptualization of SRL in L2 writing as an integrated and interdependent regulatory system.

Pedagogically, SRL instruction should integrate multiple regulatory domains rather than focusing solely on strategies. First, writing instruction could

incorporate cognitive feedback on text structure, metacognitive reflection on revision, peer interaction, and goal setting as motivational scaffolds to support the development of coordinated regulatory abilities. Second, teaching practice should explicitly focus on cultivating metacognitive habits, including setting clear goals, monitoring progress, and conducting structured reflection throughout the writing process. This is because metacognitive awareness may not be automatically developed solely through writing exercises.

Furthermore, SRL instruction should be integrated throughout the entire curriculum. In the early stage, basic regulation habits can be established; in the middle stage, when academic pressure increases, scaffolding teaching may need to be strengthened; in the later stage, real writing tasks should be incorporated to maintain students' engagement. Finally, institutions should support the development of SRL by creating a structured learning environment, which includes transparent assessment criteria, systematic peer review, and regular formative feedback that aligns with writing goals.

The following limitations need to be pointed out: The cross-sectional study design limits causal inference and fails to capture the development and changes of SRL strategies over time. In addition, the sample comes from English-major undergraduate students of two universities in the same province, which may limit the general applicability of the research results. The sample sizes of each subgroup are uneven, especially the sample size of the low-level group is relatively small, which may reduce the statistical power. Furthermore, the classification of English proficiency is based on different standardized tests, which may reduce the sensitivity to more subtle differences in abilities. It is recommended to conduct longitudinal studies and multi-method studies in the future.

Conflict of Interest

The authors declare no potential conflicts of interest with respect to the research, authorship, and publication of this article.

Acknowledgments

The authors would like to thank the participating universities and students for their support and cooperation in this study.

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