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METACOGNITIVE STRATEGY USE IN ARGUMENTATIVE WRITING AT THE TERTIARY LEVEL: A SYSTEMATIC LITERATURE REVIEW (2015 - 2025)

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Abstract:
This systematic review synthesized empirical evidence on the role of metacognitive strategies in shaping students' argumentative writing quality, with particular attention to the moderating effects of individual learner characteristics and instructional contexts, as well as dominant research foci in the field. Guided by the PRISMA 2020 framework, a comprehensive search of Scopus, Web of Science, and ERIC identified 32 peer-reviewed studies published between 2015 and 2025 that met the inclusion criteria. Data were analyzed using an integrated mixed-analytical approach combining thematic synthesis and quantitative analysis. The findings indicated that metacognitive strategies are robust predictors of high-quality argumentative writing, consistently enhancing coherence, thesis articulation, critical reasoning, evidence integration, and overall task performance across both traditional and technology-mediated learning environments. Metacognitive engagement was also found to serve a regulatory affective function by reducing writing anxiety and strengthening self-efficacy, learner autonomy, and critical thinking, with evidence of sustained developmental benefits. Furthermore, metacognitive strategy use was found to be co-determined by individual learner characteristics and instructional conditions. The results further suggest that learner-tailored, collaborative, and cognitively enriched learning environments strengthen the influence of metacognitive awareness on writing quality, organizational coherence, and argumentative depth. The findings underscore the importance of scaffolded, adaptive, and context-sensitive metacognitive instruction and highlight the need for future research employing longitudinal designs and greater representation of underexplored educational contexts.

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1. Introduction

Metacognitive strategy deployment is widely recognized for its potential to enhance learning outcomes across disciplines (Anderson & Krathwohl, 2001; Higgins *et al.*, 2005). Pedagogies that emphasize metacognition have been implemented in diverse fields, including mathematics (Vorhölter, 2023), physics (Wider & Wider, 2023), and language learning (Veenman *et al.*, 2006). Within language learning, metacognitive strategies have been shown to positively impact a range of skills, including reading (Meniado, 2016; Bećirović *et al.*, 2017; Shen & Park, 2018; Pahrizal *et al.*, 2025), listening (Zeng & Goh, 2018; Al Khresheh & Alruwaili, 2024), speaking (Purwanto, 2025), vocabulary acquisition (Wang *et al.*, 2025) and writing (Teng, 2021).

Among these skills, argumentative writing is particularly complex, demanding not only linguistic competence but also critical thinking and strategic planning, thereby reflecting the multi-dimensional nature of the skills required in this genre (Qin *et al.*, 2025). Despite increasing attention to metacognitive strategy use in writing, the specific ways in which these strategies contribute to the development of argumentative writing remain underexplored. Accordingly, this systematic review aims to examine and synthesize existing evidence on the effectiveness of metacognitive strategies in enhancing students' argumentative writing performance, with particular attention to the role of individual, contextual, and instructional factors. In doing so, it seeks to highlight key findings, identify research gaps, and draw implications for both writing instruction pedagogy and future investigation.

To guide this inquiry, the review addresses the following research questions:

RQ1: What are the effects of metacognitive strategies on the quality of students' argumentative writing?

RQ2: How do individual, contextual, and instructional factors moderate the effectiveness of metacognitive strategies in argumentative writing?

2. Theoretical Background

2.1. Metacognitive strategies

The present study is grounded in Flavell's (1979) theory of metacognition, which emphasizes learners' awareness and control over their own cognitive processes. Central to this framework are metacognitive strategies, also referred to as executive functions, which encompass planning, monitoring, and evaluation (Teng & Qin, 2024). These strategies involve the skills learners use to regulate and guide their thinking, as well as to allocate the cognitive resources necessary to successfully complete specific tasks (Winne, 2011). Learners apply metacognitive strategies to acquire knowledge more

efficiently, ultimately fostering greater independence and autonomy in their learning (Efklides, 2008).

Numerous studies have explored the link between metacognitive strategies and language learning outcomes. Research has shown that metacognitive strategies have a strong relationship with reading proficiency (F. Teng, 2025). For example, Zhang *et al.* (2008) studied eighteen primary students and found that metacognitive reading strategies can be taught. Higher-proficiency learners used a broader range of strategies, such as connecting ideas, identifying structure, and summarizing, and showed greater awareness by verbalizing their thought processes. Targeting Hong Kong fifth graders', Teng (2020a) investigated the impact of metacognitive strategy instruction on reading comprehension. Using reading notes, reflection reports, group discussions, and test scores, the study showed that students taught in three stages, read and answer, reflect, and report, developed greater independence in reading.

In a similar vein, studies have consistently demonstrated that the use of metacognitive strategies enhances listening skills. For instance, Goh and Taib (2006) designed eight process-oriented listening lessons for primary school learners, organized into a three-phase sequence: listening and responding, reflecting, and reporting and discussing. Similarly, Vandergrift (2005), in a study of 57 French adolescents, found a strong link between intrinsic motivation and the frequent use of metacognitive listening strategies. Importantly, the results showed that higher levels of self-determined motivation were associated with increased use of these strategies.

Turning to vocabulary learning, researchers have also emphasized the value of metacognitive awareness. Mizumoto (2013) explored the role of self-regulation in vocabulary learning and found it influenced both strategy use and outcomes. In line with this, Teng *et al.* (2024) highlighted the role of metacognitive awareness in fostering a growth mindset and enhancing vocabulary acquisition. Teng (2024b) further noted that this awareness can lead to significant gains in vocabulary learning. Additionally, Alamer *et al.* (2024) confirmed the criterion-related validity of self-regulated vocabulary learning, reporting moderate positive correlations between metacognitive strategy use and L2 vocabulary achievement, underscoring self-regulation as a key contributor to vocabulary development.

With regard to writing outcomes, Teng (2020e) emphasized that metacognitive regulation is more crucial to writing performance than mere metacognitive knowledge. In a large-scale study, Teng and Zhang (2016a) examined 790 undergraduates from six Chinese universities and found that six of nine self-regulated learning (SRL) strategies, text processing, idea planning, goal-oriented monitoring and evaluation, feedback handling, emotional control, and motivational self-talk, were significant predictors of EFL writing proficiency. Expanding on this, Teng and Yue (2023) demonstrated the predictive value of both metacognitive knowledge and strategies in academic writing, while they highlighted strong connections between metacognition, critical thinking, and writing outcomes.

Building on this growing body of work, research on self-regulated learning underscores the central role of metacognitive strategies in writing development while revealing substantial individual variation in their use. Teng and Huang (2019), for instance, validated the SRL framework with 682 secondary students in China, demonstrating its positive influence on EFL writing proficiency and highlighting the role of age, gender, experience, and interest in shaping strategy use. More recently, Teng and Qin (2024) identified eight core metacognitive strategies, such as motivation and interest regulation, debugging, and metacognitive knowledge and control, as strong predictors of writing performance in multimedia environments. Similarly, as Forbes and Fisher (2018) observed, strategy use is inherently complex and deeply intertwined with learners' personalities, a complexity that helps explain the wide variation in language learning outcomes. Together, these findings point to the need for closer examination of how metacognitive strategies function within specific genres, such as argumentative writing.

2.2. Metacognitive Strategies and Argumentative Writing

Argumentative writing is a fundamental component of academic and professional communication, entailing subject-matter understanding, logical reasoning, and persuasive skills, which can be developed through the use of diverse learning strategies that support effective knowledge acquisition, retention, and application (Almashour & Davies, 2023).

The significance of metacognition in the writing process is well established (Wang *et al.* 2025; Shen et al., 2024). Hacker *et al.* (2009) described writing as a form of "*applied metacognition*" (p. 160), highlighting the strong interplay between writing processes and metacognitive engagement. Focusing on the argumentative writing genre, F. Teng and Qin (2024) observed that eight types of metacognitive writing strategies, motivation and interest, debugging strategies, declarative knowledge, procedural knowledge, text-processing skills, planning, monitoring, and evaluating, significantly predicted learners' argumentative writing performance in a multimedia environment. Likewise, F. Teng and Zhang (2024b) carried out two studies in a multimedia writing context: the first examined and validated the use of L2 self-regulated strategies in argumentative writing, while the second investigated how these strategies, along with working memory and L2 proficiency, predicted L2 writing performance. L. Teng and Zhang (2016) conducted a study with 790 undergraduates from six universities in northeastern China. The results indicated that six of the nine self-regulated learning (SRL) strategies, text processing, idea planning, goal-directed monitoring and evaluation, feedback management, emotional regulation, and motivational self-talk, significantly predicted EFL argumentative writing proficiency. In another study, L. Teng and Zhang (2018) examined the predictive effects of motivational regulation strategies on 512 EFL students' writing performance, mediated by SRL strategies. Structural equation modeling revealed a partial mediating effect, indicating that motivational regulation strategies affected participants' writing performance both directly and indirectly. These strategies were also significantly associated with students' self-reported use of cognitive, metacognitive, and social-

behavioral SRL strategies. However, within this model, only cognitive and metacognitive strategies served as significant mediators, whereas social-behavioral strategies did not. Wang *et al.* (2024) employed a quasi-experimental design with 62 Chinese EFL learners and found that collaborative writing interventions incorporating metacognitive instruction led to significant improvements in writing performance. Specifically, learners demonstrated enhanced lexical variation, greater accuracy, and increased fluency following the intervention.

Taken together, this body of evidence clearly demonstrates that metacognitive strategy use exerts a substantial and multifaceted influence on argumentative writing performance, reinforcing its centrality to effective writing development and providing a strong empirical foundation for situating the present review within, and extending beyond, previous reviews and syntheses on metacognition and writing.

2.3. Existing Reviews and Research Gaps

Previous systematic reviews and meta-analyses have provided valuable insights into the impact of metacognitive strategies on language learning. Plonsky (2011), in a meta-analysis of 77 studies, found that strategy instruction has a moderate positive effect on second language (L2) learning, with explicit instruction, extended duration, and focused interventions producing stronger outcomes. The study supports integrating strategy instruction into L2 teaching while emphasizing the need for more consistent research designs. Wongdaeng and Higgins (2023) reviewed the effectiveness of metacognitive interventions in tertiary EFL contexts, highlighting their strong potential, particularly when instruction is explicit and skill-based. They also called for more rigorous empirical research. Focusing specifically on academic writing, more recently, Chumbe (2024) conducted a systematic review of studies published between 2013 and 2023 across Scopus, Web of Science, and Scielo. The review found that strategies such as planning, monitoring, self-reflection, and revision enhance writing quality and coherence. Key findings emphasized the benefits of explicit instruction in self-regulation and the supportive role of digital tools like RedacText 2.0, advocating for the integration of metacognitive skills into writing instruction to improve academic performance.

In their meta-analytic study, Eberhart *et al.* (2024) examined how metacognition interventions affect young children's learning, focusing on typically developing pre- and elementary school students. Analyzing 349 effect sizes from 67 studies, the researchers found that metacognitive interventions significantly improved outcomes related to self-regulated learning and academic achievement, with moderate effects at post-test and smaller but still meaningful effects at follow-up. The interventions also enhanced children's self-efficacy, though this improvement appeared only at follow-up, suggesting delayed but lasting benefits. Notably, the study showed for the first time that metacognition interventions positively influence children's executive functions. Additionally, interventions delivered by teachers or embedded in task materials were more effective than those led by researchers, highlighting the value of teacher involvement and collaboration in program design.

Although previous syntheses have made valuable contributions to understanding metacognitive strategy use in EFL/ESL writing, their scope has generally remained broad and has not specifically addressed its impact on argumentative writing, a genre that demands critical thinking, structured reasoning, and evidence-based argumentation. Moreover, these reviews have often overlooked the influence of individual, contextual, and instructional factors that may moderate the effectiveness of metacognitive strategies in writing. Such limitations highlight the need for a more focused inquiry. Accordingly, the present systematic review aims to: 1) examine the effects of metacognitive strategies on the quality of argumentative writing; 2) explore the moderating role of individual, contextual, and instructional factors in the effectiveness of these strategies; and 3) identify major research trends and gaps in the literature on metacognitive strategy use in argumentative writing.

3. Methods

This study adopts a systematic literature review methodology, requiring data to be gathered following a structured and methodical review process. As outlined by Zawacki-Richter *et al.* (2020), this systematic literature review follows six steps; developing research questions, constructing selection criteria, developing search strategy, selecting studies using selection criteria, assessing the quality of studies and synthesizing results of the research.

3.1. Inclusion and Exclusion Criteria

The systematic review outlines well-defined inclusion and exclusion criteria, specifically formulated to identify studies focused on the use of metacognitive strategies in argumentative writing. These criteria have been carefully selected to ensure their relevance and direct alignment with the research objectives.

Table 1: Eligibility Criteria

Criterion	Inclusion	Exclusion
Population	• Tertiary-level students engaged in argumentative writing	• Non-tertiary populations (e.g., primary, secondary students)
Intervention/ Focus	• Studies focusing on metacognitive strategy use in argumentative writing	• Studies not focusing on argumentative writing (e.g., descriptive, narrative compositions).
Study Type	• Peer-reviewed • Empirical studies (qualitative, quantitative, mixed methods)	• Non-peer reviewed articles • Review and theoretical papers, editorials, published theses.
Language	• English	• Non-English publications
Publication Date	• July 2015 – July 2025	• Published before 2015
Availability	• Open access	• Abstracts only or unavailable full text

3.2. Search Strategy and Study Selection Process

The studies included in this review were identified through systematic searches of major online databases, including Scopus, Web of Science, and ERIC. The search was carried out during July and September 2025 and was limited to publications from 2015 to 2025 to capture the recent surge of scholarly interest in metacognitive strategies in argumentative writing. The search strategy across the databases employed combinations of the following terms:

Databases	Search terms
- SCOPUS **- WOS** **- ERIC**	*("metacognitive strategies" OR metacognition OR "self-regulated learning" OR "strategic learning") AND (writing OR "writing instruction" OR "essay writing" OR composition OR "persuasive writing") AND ("college students"* OR universit* OR undergraduate* OR postsecondary)

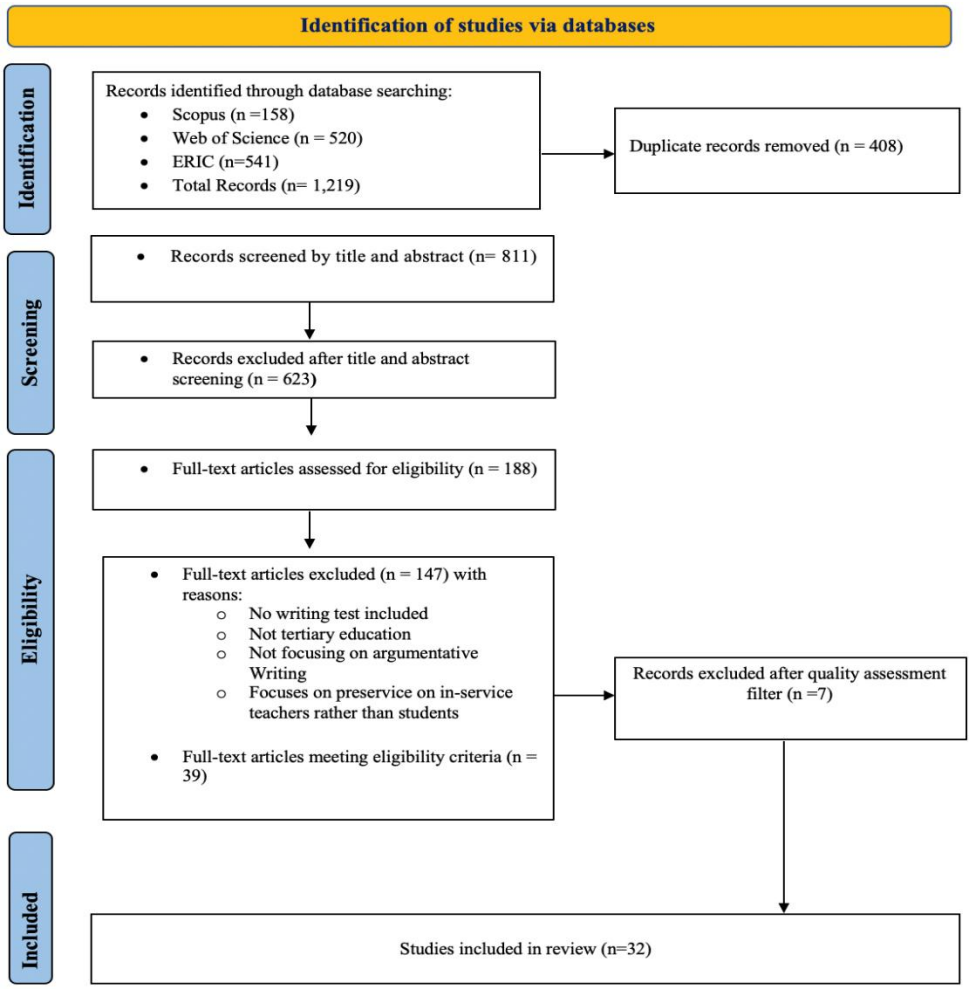

Figure 1: PRISMA 2020 Flow Diagram for Study Selection

The initial database search identified 1,219 records, which were imported into Zotero reference management software for systematic deduplication and subsequent screening. After removing duplicate entries (n = 408), 811 records remained and were screened based on titles and abstracts. Of these, 623 records were excluded for not

aligning with the scope of the review. The remaining 188 articles were retrieved for full-text assessment. Following the application of the predefined inclusion and exclusion criteria, 147 articles were excluded for reasons such as 1) the absence of a writing test, 2) lack of focus on tertiary-level contexts, 3) limited relevance to argumentative writing, or 4) focus on preservice or in-service teachers rather than students. This resulted in 39 studies meeting the eligibility criteria. A subsequent quality appraisal led to the exclusion of 7 additional studies.

Consequently, a total of 32 studies were included in the final review. The overall screening and selection procedures are illustrated in Figure 1.

3.3. Quality Assessment

Assessing the methodological quality of the included studies constituted an additional procedure alongside the inclusion and exclusion criteria. To this end, a quality assessment checklist based on the Mixed Methods Appraisal Tool (MMAT) 2018 version, comprising ten criteria was employed to evaluate a set of 39 selected studies. The checklist examined key aspects such as the clarity of research objectives, definition of constructs, adequacy of research context, appropriateness of data collection and analysis methods, and the reporting of results, biases, and implications (Table 2). Each criterion was rated using a three-point scale (Yes =1, No = 0, Partially = 0.5), assigning a score ranging from 0 to 10, with higher scores indicating sufficient methodological quality for inclusion in the subsequent analysis. This assessment was not intended as a critique of individual studies but as a means of ensuring that only methodologically sound research informed the synthesis and interpretation of findings.

Table 2: Quality Appraisal Criteria

Criteria	Yes	No	Partially
1. Are the research objectives clearly stated?	☐	☐	☐
2. Are the key variables or constructs clearly defined and specified?	☐	☐	☐
3. Is the research context (e.g., participants, setting) clearly described?	☐	☐	☐
4. Are the data collection methods clearly described and appropriate?	☐	☐	☐
5. Does the study address the reliability and validity of its measurement tools?	☐	☐	☐
6. Are the data analysis methods and procedures fully described and appropriate?	☐	☐	☐
7. Are the results clearly presented and do they contribute meaningfully to existing literature?	☐	☐	☐
8. Are potential biases or confounders identified and controlled?	☐	☐	☐
9. For mixed-methods studies, are qualitative and quantitative components well integrated and interpreted?	☐	☐	☐
10. Does the study discuss implications, recommendations, or future research directions?	☐	☐	☐

The quality appraisal was performed independently by two reviewers, and any disagreements were resolved through discussion to reach consensus. Only studies

satisfying the established standards were retained to ensure the robustness and credibility of the review, resulting in an exclusion of 7 articles and a final sample of 32 studies included in the synthesis.

3.4. Data Coding and Analysis

To address the research questions in a systematic and rigorous manner, this study employed a multi-level analytical framework that integrated quantitative descriptive analysis with qualitative thematic analysis. First, key information was systematically extracted from each included study, including author(s), publication year, research design, participant characteristics, context, and principal findings. The quantitative component was used to examine main research trends, methodological approaches, and dominant focus areas in studies investigating metacognitive strategies in argumentative writing.

Subsequently, a qualitative thematic analysis was conducted to synthesize substantive findings across studies. The evidence was organized into analytically driven themes addressing: (a) the impact of metacognitive strategies on different aspects of students' argumentative writing; (b) the role of individual and contextual factors influencing the use of metacognitive strategies; and (c) The main research trends and focus areas in studies examining metacognitive strategies in argumentative writing. This integrated analytical process enabled a comprehensive synthesis of patterns, consistencies, and limitations in existing research, thereby providing a robust basis for answering the review questions and informing future research directions.

4. Results

4.1. The Effects of Metacognitive Strategies on the Quality of Students' Argumentative Writing

Across the 32 reviewed studies, metacognitive strategies consistently emerged as critical determinants of students' argumentative writing quality. Planning, monitoring, and evaluating, core regulatory skills, were repeatedly associated with improved writing outcomes. For instance, Teng (2020) reported that these skills, combined with procedural knowledge, accounted for over 60% of the variance in writing performance. Similarly, Teng and Qin (2024) found that metacognitive strategies explained approximately 48% of the variance in participants' writing outcomes, highlighting the substantial predictive power of self-regulatory behaviors.

Evidence further suggests that metacognitive strategies do not operate in isolation but interact synergistically with other cognitive abilities. Palenkahu *et al.* (2024) observed that combining metacognitive strategies with critical thinking produced notable gains in coherence, thesis clarity, and analytical depth, with mean scores rising from 63.33% to 81%. Han (2024) similarly emphasized that strategy-based instruction promotes reflective planning and iterative revision practices, underscoring the role of metacognition in fostering deliberate, structured writing processes. Longitudinal evidence supports the

durability of these effects; Teng (2016) reported sustained improvements over time, while Wang *et al.* (2025) found that collaborative metacognitive instruction led to enduring gains in content quality, language use, and vocabulary in delayed post-tests.

However, the efficacy of metacognitive strategies is not uniform. Teng and Huang (2021) noted that while metacognitive prompts significantly enhanced planning, revision, and accuracy, fluency and syntactic complexity were less affected, likely due to cognitive load constraints. Moreover, Farsani *et al.* (2019) reported non-significant effects of metacognitive awareness strategies on Iranian graduate students' argumentative writing, attributing this to educational contexts that discourage independent strategy use. Such findings underscore the importance of contextual and individual factors in moderating the benefits of metacognition.

In sum, the literature converges on the conclusion that metacognitive strategies enhance argumentative writing by fostering self-regulation, analytical reasoning, organization, and writing confidence, across both traditional and technology-mediated learning environments. Yet, their effectiveness is contingent upon learners' individual characteristics, as well as contextual and instructional dimensions.

4.2. The Mediating Role of Individual, Contextual and Instructional Factors in MSU

4.2.1. Individual Learner Factors

Learner characteristics critically shape both the use and the impact of metacognitive strategies. Language and writing proficiency, gender, motivation, prior strategic knowledge, cognitive style, critical thinking skills, self-efficacy, and writing anxiety consistently emerged as mediators of metacognitive strategy effectiveness.

Proficiency appears to be particularly influential. Higher-proficiency writers consistently demonstrate greater use of planning, monitoring, and evaluative strategies, producing texts with superior coherence, accuracy, and argumentative quality (Teng, 2020). Qin and Zhang (2019) similarly found strong correlations between metacognitive strategy knowledge and writing proficiency, noting that high-proficiency learners engage in more recursive planning and revision than their lower-proficiency peers.

Gender and study level also shape strategy deployment. Teng and Qin (2024) found that female students employed metacognitive strategies more effectively than males, and that second-year students outperformed first-year students in self-regulation, indicating that experience and exposure to academic writing instruction amplify strategy use.

Motivational and affective factors further modulate outcomes. Xu *et al.* (2025) reported that learners with a growth mindset and clearly defined "ideal" or "ought-to" selves engaged more effectively with metacognitive strategies, thereby indirectly enhancing writing performance. Learners demonstrating intrinsic interest or valuing writing tasks were more likely to employ metacognitive, cognitive, and affective strategies to improve performance (Raoofi & Maroofi, 2017). Positive motivation also supports self-efficacy through adaptive self-talk, highlighting the interplay between metacognition and affective regulation (Teng & Qin, 2024).

Prior strategic knowledge and cognitive style further influence strategy deployment. Han (2024) observed that learners with higher initial strategic awareness exhibited greater autonomy and problem-solving capacity during writing tasks. Attitudes such as openness to reflection and willingness to experiment also moderated the translation of metacognitive skills into improved writing (Khosravi *et al.*, 2023; Nourazar *et al.*, 2022). Critical thinking skills mediated strategy use as well, with EFL learners demonstrating stronger analytical reasoning producing more effective drafts and revisions (Shen *et al.*, 2024).

Self-efficacy emerges as a particularly salient factor. Raoofi and Maroofi (2017) reported significant correlations between self-efficacy and all categories of writing strategies except social strategies self-efficacy. Self-efficacy accounted for 28% of the variance in students´writing performance. Similarly, Dinsa and Taddese (2024) observed a positive albeit weak correlation between strategy use and writing self-efficacy, while Nevisi and Safiloo (2023) and Khosravi *et al.* (2023) showed that metacognitive strategy-based instruction, especially in flipped classrooms, enhances learners' confidence and reduces writing anxiety.

4.2.2. The Role of Contextual and Instructional Factors

Instructional design and learning environment play a decisive role in shaping both the adoption and effectiveness of metacognitive strategies. Studies consistently show that collaborative and scaffolded settings facilitate strategy use, enhance engagement, and improve writing outcomes. For instance, Wang *et al.* (2025) found that integrating metacognitive instruction into collaborative writing tasks significantly improved Chinese EFL learners' subsequent individual writing. Gains were reflected in better text organization, richer content, and more accurate vocabulary and grammar, ultimately translating into higher overall writing scores.

Teng and Huang (2021) demonstrated that combining metacognitive prompts with cooperative writing tasks increased planning by 30% and revision by 26.66%, while fostering structured, content-focused discussions and increasing the frequency of Language-Related Episodes. Teng (2021) similarly reported that cooperative learning paired with metacognitive scaffolding maximized metacognitive knowledge and regulation, accounting for 67% of variance in writing performance. These findings suggest that the learning environment acts as a catalyst, amplifying learners' ability to translate metacognitive awareness into concrete writing improvements.

4.2.3. Integration of Higher-Order Cognitive Skills, Scaffolding, and Learner Characteristics

Instruction that combines metacognitive strategy use with higher-order cognitive skill development has been shown to strengthen argumentative writing outcomes across proficiency levels. For example, Palenkahu *et al.* (2024) demonstrated that integrating metacognitive engagement with critical thinking instruction enhanced analytical depth, logical reasoning, coherence, and evidence-based argumentation. Similarly, Shen and

Tao (2024) reported that instructional approaches fostering AI-based self-efficacy alongside metacognitive guidance reduced writing anxiety while improving planning, monitoring, and evaluative behaviors.

Structured scaffolding, explicit instruction, and timely feedback are particularly important for lower-proficiency learners or those with limited prior strategy knowledge. Khosravi *et al.* (2023) and Nourazar *et al.* (2022) found that scaffolded interventions significantly improved standardized writing performance, with experimental groups achieving higher IELTS Task 2 scores (M = 6.78) compared to controls (M = 4.91). Wang *et al.* (2025) attributed gains in writing organization to co-construction and joint planning in collaborative tasks supported by metacognitive instruction, while Han (2024) reported that strategy-based instruction enhanced motivation, autonomy, and problem-solving skills, demonstrating that scaffolding amplifies both learning outcomes and learner agency.

Instruction type and modality further modulated specific writing dimensions. Collaborative metacognitive prompts improved accuracy and content quality but had limited effects on fluency and syntactic complexity, likely due to cognitive load constraints (Teng, 2021; Teng & Huang, 2021). Effectiveness also depended on individual learner characteristics: high-proficiency learners benefited most from cooperative, scaffolded instruction, whereas lower-proficiency learners achieved greater gains when structured prompts, collaborative engagement, and explicit guidance were provided (Teng, 2016, 2020; Teng & Huang, 2021). Motivational and affective factors further shaped outcomes; learners with a growth mindset and clearly defined ideal or ought-to writing selves engaged more deeply with strategies when instructional conditions emphasized self-regulation (Xu *et al.*, 2025).

These findings indicate that metacognitive strategies reach their full potential when integrated with higher-order skill instruction, scaffolded appropriately, and aligned with learner characteristics and motivational orientation. Effective instructional design thus requires a careful balance of scaffolding, feedback, cognitive challenge, and attention to individual differences, ensuring that strategy deployment is both supported and contextually relevant. An overview of the studies´ results is presented in Table 2, Figure 2, and 3:

Author(s)	Year of publication	Country	Research Design	Number of participants	Major results
1. Wang *et al.*	2025	China	Quasi-experimental design	62	MI combined with collaborative writing significantly improved students′ writing skills.
2. Xu *et al.*	2025	China	Correlational + Structural Equation modelling	242	MSs were key mediator between motivational factors (growth mindset and future selves) and writing outcomes.
3. Chen & Zhang	2025	China	Correlational+ Structural Equation Modeling	2495	pre-writing planning significantly predicts L2 argumentative writing. post-writing revision and self-reflection; significantly predicts writing performance.
4. Abate *et al.*	2025	Ethiopia	Quasi-experimental design	12	MSU impacted organization, coherence, clarity of arguments, and overall quality of essays.
5. Anggraeni *et al.*	2025	Indonesia	Quasi-experimental design	80	Strategy instruction improved students' writing skills, metacognitive awareness, and agency. across all self-efficacy levels.
6. Dinsa & Taddese	2024	Ethiopia	Correlational research design	150	Strategy instruction support writing skill development and boost students' self-efficacy, especially when integrated with reflective practices, and personalized guidance.
7. Wang *et al.*	2024	China	Quasi-experimental design	62	MI combined with collaborative writing significantly improved lexical variation, accuracy, and fluency performance.
8. Shen *et al.*	2024	China	Correlational + Structural Equation modelling	459	MSs had a discernible impact on the development of critical thinking abilities.
9. Xu & Zhu	2024	China	Correlational + Structural Equation Modeling	502	Learners who execute more metacognitive control in their writing processes scored relatively higher in their final written texts.
10. Pelenkahu *et al.*	2024	Indonesia	Action research design	18	Integrating metacognitive and critical thinking strategies significantly enhanced students' argumentative writing.
11. Zhang & Zhang	2024	China	Correlational research design	391	Higher writing self-efficacy profiles (i.e., students with high confidence in their genre-based writing ability) reported significantly more frequent use of metacognitive strategies.

12. Teng & Qin	2024	China	Correlational research design	957	MSU proved to be strong predictors for success in multimedia argumentative writing tasks.
13. Han	2024	China	Quasi-experimental design	50	MSI enhanced students´ autonomy, planning and reflection, increased self-evaluation, problem-solving skills and greater writing motivation.
14. Khosravi *et al.*	2023	Iran	Quasi-experimental design	45	MSI through flipped classrooms significantly enhanced the intermediate learners` argumentative writing ability, decreased writing anxiety, and enhanced writing self-efficacy.
15. Almashour & Davies	2023	Jordan	Correlational research design	60	MSU improved students´ overall writing performance. Females use strategies more than males in argumentative essays.
16. Nevisi & Safiloo	2023	Iran	Quasi-experimental design	50	Strategy instruction enhances both cognitive and motivational aspects of writing.
17. Huang & Zhang	2022	China	Quasi-experimental research design	72	The use of metacognitive strategies helped learners develop their genre-specific awareness of the audience, communicative purpose, language choices, style, and rhetorical structures.
18. Qin *et al.*	2022	China	Correlational research design	503	Curricula embedded metacognitive training has a strong effect on EFL writing.
19. Nourazar *et al.*	2022	Iran	Quasi-experimental	80	Scaffolded MI improved students´ posttests scores in IELTS Writing Task 2.
20. Shirvani & Porkar	2022	Iran	Quasi-experimental design	20	Individualized metacognitive strategies enhance learners' attention and allow them to engage in reflective practices.
21. Sun *et al.*	2021	China	Correlational research design	880	MSU helped learners in the process of writing regarding vocabulary use, grammar use, sentence structures, and organization.
22. Zhao & Liao	2021	China	Correlational research design	200	Metacognitive Planning strategies showed a weak but statistically significant positive effect on writing performance.
23. Murtadho	2021	Indonesia	Action research design	88	Integrating metacognitive and critical thinking strategies enabled students to develop robust essays with more varied contents, supported by references and arguments.
24. Apridayani *et al.*	2021	Thailand	Correlational research design	55	Students frequently used metacognitive strategies such as revising and editing multiple times, consulting expert writing

					examples, reviewing materials, and brainstorming ideas before beginning their drafts.
25. Teng & Huang	2021	China	Correlational research design	352	MI with collaborative writing improved students′ planning time, revising, and composing, indicating greater engagement in the writing process.
26. Teng	2021a	China	Quasi-experimental design	170	Metacognitive awareness and strategy use appeared to afford learners the capacity to regulate cognitive resources, identify personal strengths and weaknesses in writing.
27. Teng	2020a	China	Correlational research design	882	Procedural knowledge, planning, monitoring, and evaluating showed significant positive correlation with English writing performance.
28. Farsani *et al.*	2019	Iran	Correlational research design + Structural Equation modeling	250	Debugging strategy was the most frequent; and evaluating strategy was the least frequent one. Metacognitive strategies and self-regulation strategies had no influence on argumentative writing.
29. Qin & Zhang	2019	China	Correlational research design	126	High-EFL writing proficiency students undergoing planning, monitoring and evaluating processes were more aware of and focused more on the global levels when performing a writing task in multimedia environments,
30. Raoofi & Maroofi	2017	Malaysia	Correlational research design	304	MSU combined with strong motivational beliefs, such as self-efficacy and task value helped learners achieve a better writing performance.
31. Teng	2016	China	Quasi-experimental design	120	MI combined with cooperative learning had the strongest effect on writing improvement, helped students employ higher-order thinking, creativity, and self-regulation.
32. Silva & Graham	2015	UK	Quasi-experimental design	72	Strategy intervention improved students' sense of direction and strategic flexibility especially lower-proficiency L2 writers.

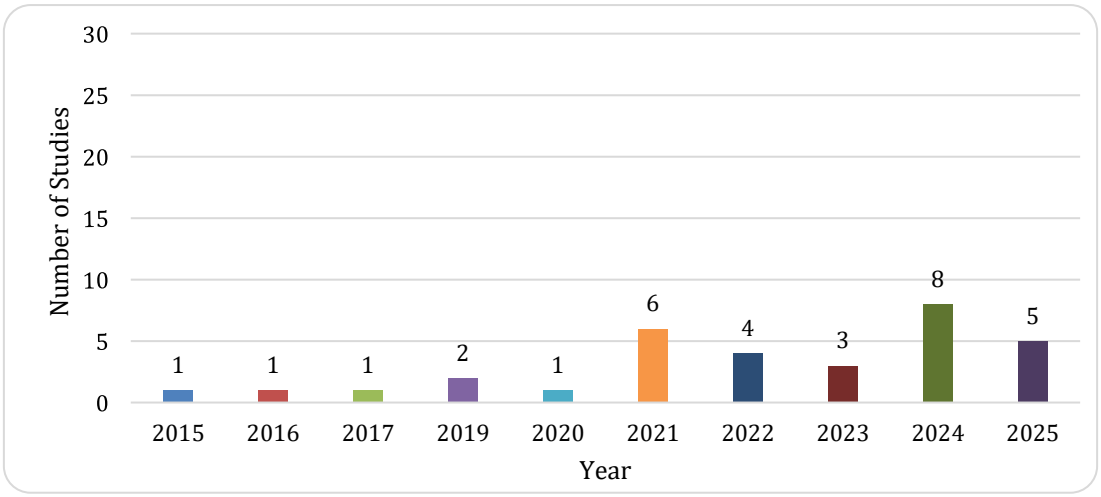

Figure 2: Publication Year Distribution of the Selected Articles

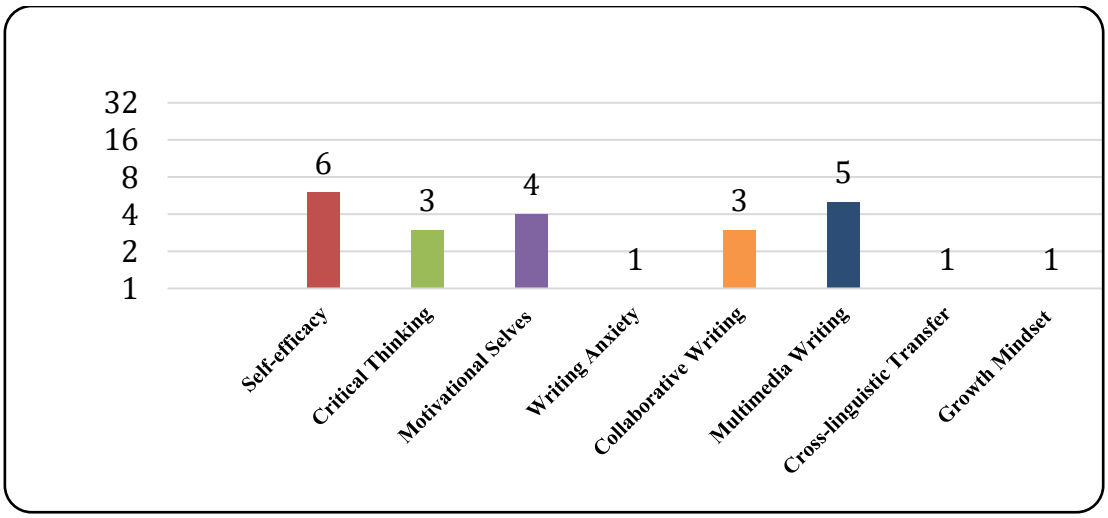

Figure 3: Frequency of Variables Investigated Alongside Metacognitive Strategies

5. Significant Trends and Gaps in Literature

The reviewed studies revealed several gaps and trends in the literature. Most of the studies relied on Flavell's (1979) theory of metacognition, which appeared in approximately 70% of the studies. This dominance is unsurprising, as Flavell's model is widely considered the most robust and comprehensive foundation for examining metacognitive processes. Other frameworks, such as Zimmerman's (2000) self-regulation theory, Oxford's strategy model (1990), Flower and Hayes' cognitive process model (1981), and, less frequently, Bandura´s socio-cognitive theory (1986) or Deci and Ryan´s self-determination theory (1985), were also used, but to a lesser extent. Overall, analysis demonstrates Flavell's framework serving as the central reference point for understanding metacognitive strategy use in argumentative writing.

Regarding methodological tendencies, the field shows a clear shift toward more rigorous and analytically powerful research designs. Quasi-experimental studies

constitute the largest proportion of the reviewed studies (42.4%), reflecting a growing effort to move beyond descriptive approaches and to examine causal relationships between metacognitive strategy use and writing outcomes. In parallel, the increasing use of Structural Equation Modeling (15.2%) signals methodological maturation, as this technique allows researchers to test complex relationships among latent constructs (Alamer, 2025). Together, these approaches enhance the explanatory depth and internal validity of research in metacognition and writing.

Concerning essay scoring systems, the findings indicate considerable variation in the assessment approaches adopted across the reviewed studies (N = 32). Holistic scoring rubrics were the most frequently employed, appearing in 12 out of 32 studies (35.5%). The widespread use of holistic scoring suggests a strong emphasis on evaluating overall writing quality, particularly in studies focusing on global performance outcomes rather than discrete linguistic features. The Jacobs *et al.* (1981) ESL Composition Profile, an analytic scoring rubric, was the second most commonly used assessment framework, adopted in 9 studies (28.1%). Its continued popularity reflects its well-established validity and reliability, as well as its capacity to capture multiple dimensions of writing quality, including content, organization, vocabulary, language use, and mechanics. IELTS writing rubrics were utilized in 4 out of 32 studies (12.5%), indicating a moderate reliance on standardized international assessment criteria. The use of IELTS rubrics, particularly those aligned with Task 2, can be attributed to their clearly defined descriptors and global recognition, which enable comparability across educational contexts.

Less frequently employed scoring approaches included Chinese education-based writing scoring systems, which appeared in 5 studies (15.6%), primarily within Chinese EFL contexts where national assessment frameworks strongly influence research design. CAF (complexity, accuracy, and fluency) measures were used in 2 studies (6.25%), reflecting their suitability for linguistically oriented analyses that prioritize fine-grained measurement of language performance. Overall, the distribution of scoring systems demonstrates a methodological balance between global evaluations of writing quality, analytic multi-trait assessment, and context-specific scoring frameworks, depending on the analytical focus and educational setting of each study. The distribution of these scoring systems is presented in Figure 4.

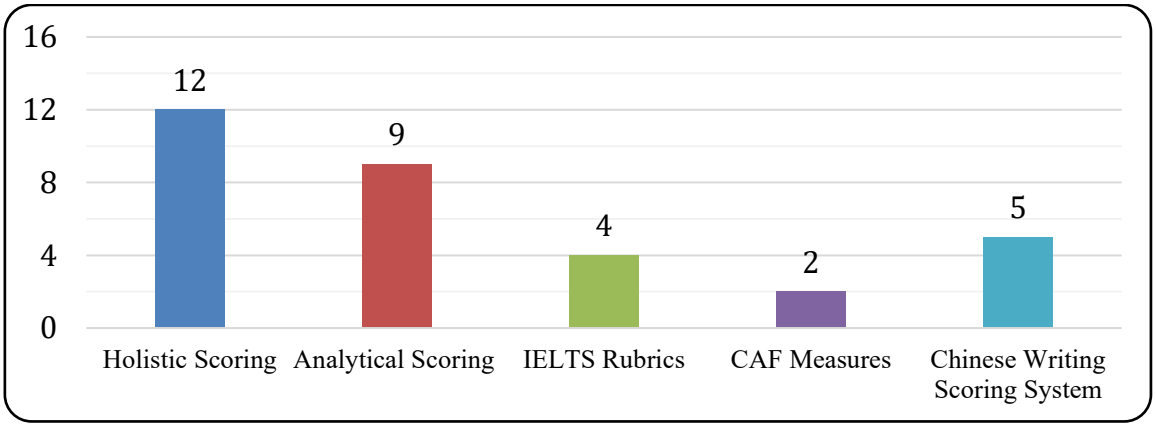

Figure 4: The Essay Scoring Systems Used in the Selected Studies

The analysis revealed a clear imbalance in the geographical distribution of reviewed studies, with findings concentrated in certain contexts while many regions remain underexplored. This reflects differences in research infrastructure, funding, publication culture, and the prioritization of EFL writing instruction. Countries like China, with established applied linguistics traditions and large EFL populations, are overrepresented, whereas fewer studies from other contexts likely stem from limited resources. Addressing this imbalance is essential to enhance the generalizability and contextual relevance of findings in metacognitive and EFL writing research. The findings are presented in Figure 5:

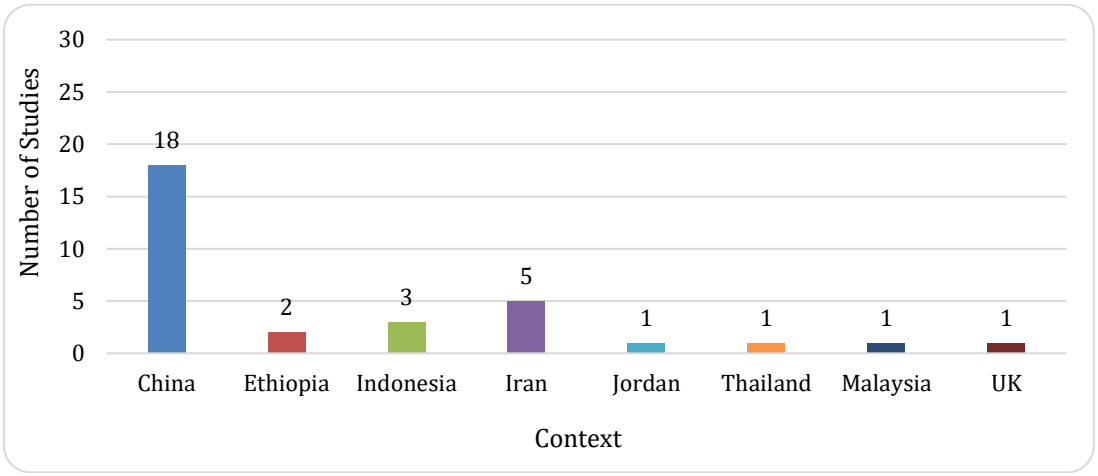

Figure 5: Distribution of Selected Studies by Context

6. Discussion

This systematic review explored the use and effectiveness of metacognitive strategies in developing argumentative writing skills and the moderating effects of individual, contextual and instructional factors.

RQ1: What are the effects of metacognitive strategies on the quality of students' argumentative writing?

Across the reviewed studies, metacognitive strategies emerged as robust predictors of improved argumentative writing performance. This consistent positive association suggest that metacognition enables learners to more effectively manage the cognitive demands of argumentative writing. Studies showing substantial explained variance in writing performance (e.g., Teng, 2020) and strong correlations between metacognitive knowledge and proficiency (e.g., Qin & Zhang, 2019) indicate that students who can strategically plan, monitor, and evaluate their writing are better equipped to produce coherent, logically structured, and analytically rich texts. These strategies appear to enhance not only surface-level accuracy and organization but also higher-order reasoning, thesis clarity, and the integration of evidence, features especially critical for argumentative genres.

Additionally, the results unveiled that metacognitive strategies function as both cognitive and affective supports. Reductions in writing anxiety (Shen & Tao, 2024) and increases in confidence and autonomy (Han, 2024) point to the role of metacognition in helping learners regulate emotional responses to writing tasks. The documented long-term retention of strategy gains (Teng, 2016) suggests that metacognitive instruction fosters durable writer development rather than short-term performance boosts. However, results indicating limited impact on fluency and syntactic complexity under certain conditions (Teng & Huang, 2021) imply that metacognitive regulation interacts with cognitive load, and that not all dimensions of writing respond equally to strategy training. These findings confirm the predictive effects reported in earlier studies, particularly the strong contribution of planning, monitoring, and evaluating to writing quality (Teng, 2020e; Teng & Zhang, 2016; Teng & Yue, 2023). The results align also with metacognitive strategy research in other language skills, where comparable patterns were documented, such as in reading (Zhang *et al.*, 2008; Teng, 2020a), listening (Goh & Taib, 2006; Vandergrift, 2005), and vocabulary learning (Mizumoto, 2013; Teng *et al.*, 2024). These cross-skill findings reinforce the idea that metacognitive regulation enhances learners' capacity to manage cognitive load, process information strategically, and monitor progress across different language skills.

RQ2: How do individual, contextual, and instructional factors moderate the effectiveness of metacognitive strategies in argumentative writing?

The findings indicated that individual differences shape how learners use and benefit from metacognitive strategies in argumentative compositions. Proficiency stood out as a decisive factor: high-proficiency students consistently engaged more deeply in regulation strategies and derived greater writing gains, while low-proficiency learners struggled with reflective processes and strategy transfer. These patterns suggest that learners lacking linguistic or cognitive resources may find it challenging to engage in advanced planning and monitoring without explicit scaffolding. Motivational constructs, including growth mindset, ideal/ought-to selves, writing self-efficacy and anxiety, also

played an important role, indicating that strategy use is partly driven by learners' beliefs about their abilities and goals. Prior strategic awareness and openness to reflective experimentation further influenced how effectively learners engaged with instruction. Overall, these results highlight that metacognitive strategy use is not uniform across learners but filtered through their language proficiency, motivation, dispositions, and cognitive preparedness. The consistent advantage observed among high-proficiency learners reinforces earlier evidence that advanced learners employ a broader range of strategies and engage more deeply in reflective regulation (Silva & Graham, 2015). The influence of motivational factors in this review also supports prior work showing that growth mindset self-determined motivation (Vandergrift, 2005), and self-efficacy mediate strategy use and learning outcomes (Teng *et al.*, 2024; Efklides, 2008; Winne, 2011).

Apropos of contextual factors, the findings showed that the instructional context critically shaped strategy adoption and its impact. Collaborative writing environments and scaffolded instruction consistently strengthened planning, monitoring, and revision behaviors. These contexts likely distribute cognitive demands and create opportunities for shared regulation, making metacognitive processes more accessible. Explicit instruction and structured prompts proved particularly effective for learners with limited metacognitive knowledge, indicating that unstructured exposure is insufficient for developing meaningful regulation skills. Integration of metacognitive strategies with higher-order skills, such as critical thinking or AI-assisted writing self-efficacy, further amplified gains in analytical reasoning, organization, and argument structure. At the same time, findings showing limited improvements in fluency and syntactic complexity suggest that metacognitive prompts may redirect cognitive resources toward accuracy and organization at the expense of linguistic expansion. These patterns mirror earlier research across reading, listening, vocabulary learning, and writing (e.g., Goh & Taib, 2006; Mizumoto, 2013; Teng & Zhang, 2016), which consistently shows that explicit, scaffolded, process-based instruction enhances metacognitive engagement and leads to stronger learning outcomes. These findings reinforce Forbes and Fisher's (2018) argument that the effectiveness of metacognitive strategies hinges on the interaction between individual learner characteristics and contextual supports. Fig 6 summarizes the interplay between metacognitive strategies, individual and contextual factors and how they jointly impact writing outcomes.

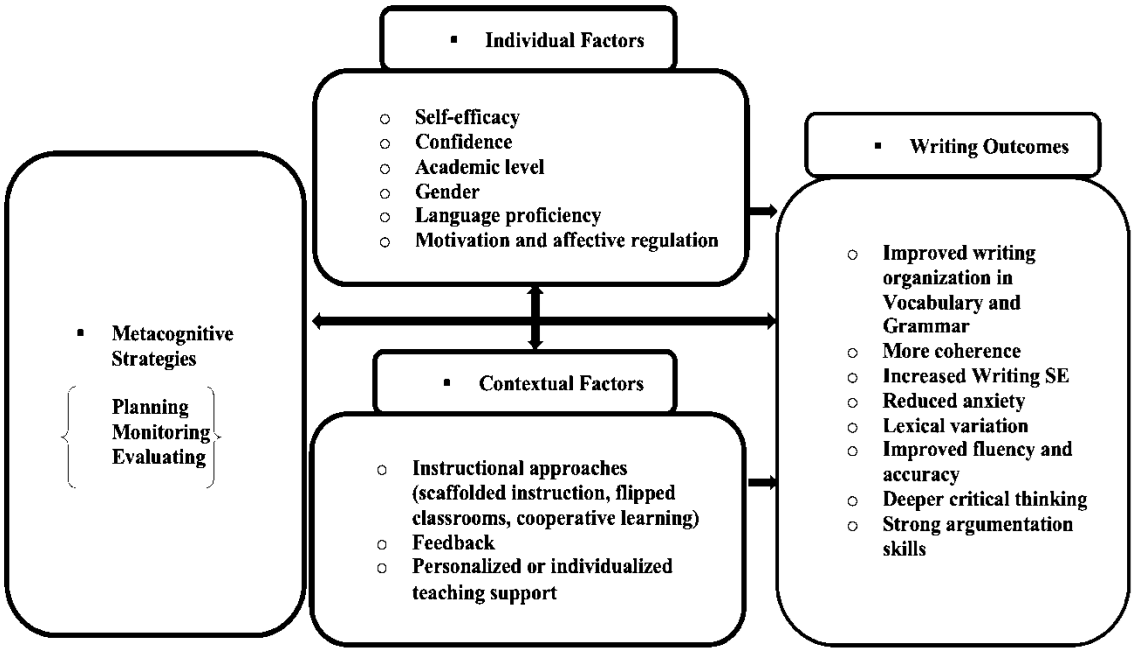

Figure 6: A Summary Diagram on How Metacognitive strategy Use Influence Argumentative Writing

7. Implications for Theory, Pedagogy, and Future Research

The findings from included studies provide robust evidence that metacognitive strategies, particularly planning, monitoring, and evaluating, are central to the development of high-quality argumentative writing. This has several theoretical implications. First, these results reinforce and extend metacognition theory by showing how cognitive, motivational, and affective dimensions interact in real writing contexts. Furthermore, the differential effects of strategy use among high- and low-proficiency learners highlight that strategic competence alone is insufficient without sufficient language proficiency and prior knowledge, supporting the notion of threshold effects in L2 writing development.

From a pedagogical perspective, the findings underscore the importance of explicit metacognitive instruction and context-sensitive scaffolding. Teachers should not assume that learners will spontaneously employ strategies effectively; rather, strategies need to be modeled, prompted, and practiced. This implies that writing instruction should combine peer interaction, guided reflection, and structured feedback to foster strategic engagement. Additionally, integrating critical thinking instruction with metacognitive strategies can strengthen argumentative quality by promoting reasoning, evidence use, and analytical depth. Teachers can also leverage technology-mediated tools, such as AI-assisted writing platforms, to enhance self-efficacy, reduce anxiety, and support recursive strategy application.

Moreover, the findings suggest that instruction should be differentiated to address individual learner factors. High-proficiency learners benefit most from opportunities to refine and transfer strategies independently, while lower-proficiency learners require

additional scaffolding and guided practice. Motivation and self-beliefs should also be considered: learners with a growth mindset or strong ideal/ought-to selves engage more actively with strategies and achieve better outcomes. Thus, instructors should integrate motivational supports alongside strategy instruction, such as goal-setting activities, reflection prompts, and opportunities for self-assessment.

For curriculum design, the findings advocate for a multi-dimensional approach to writing instruction. Metacognitive strategy training should be embedded across tasks rather than treated as a separate unit. Tasks should be designed to allow learners to practice planning, monitoring, and evaluating while addressing multiple writing dimensions; such as, accuracy, complexity, and fluency.

Finally, the results have implications for future research. As recommended by Xu and Zhu (2024) greater attention should be given to the cross-language transfer of metacognitive strategies across different academic majors. This cross-language effect could potentially reveal how L1 writing metacognitive skills support L2 writing development. There is also a need for more longitudinal studies investigating how the effects of metacognitive strategy training can be sustained among learners.

8. Conclusion and Limitations

This systematic review demonstrates that metacognitive strategies enhance the quality and development of students' argumentative writing, improving coherence, reasoning, organization, and reflective engagement. Their effectiveness is shaped by an interplay of learner-specific factors, such as proficiency, motivation, self-efficacy, and prior strategic knowledge, as well as by instructional conditions that provide explicit guidance, scaffolding, and collaborative opportunities. Metacognitive instruction not only strengthens writing performance but also supports affective outcomes, reducing anxiety and increasing learners' confidence, ultimately facilitating the production of more persuasive and well-structured essays.

Despite these clear benefits, several limitations constrain the generalizability and comprehensiveness of the findings. Most studies were conducted in Asian context, particularly China (18 studies), limiting the applicability of results to other cultural and educational settings, such as Africa, Latin America, and Europe. The research also shows an over-reliance on quantitative methods, primarily self-report surveys, while qualitative approaches, such as think-aloud protocols or interviews, remain underutilized, restricting insight into learners' real-time strategy use. Longitudinal research is scarce, with most studies examining short-term effects, offering a limited understanding of how metacognitive strategy use evolves over time. Additionally, instructional approaches are underexplored, leaving gaps in knowledge about the most effective ways to integrate strategy instruction into diverse writing contexts.

Further limitations arise from the review methodology itself. The literature search was confined to major databases, including Scopus, Web of Science, ERIC. Other researchers may consult specific research repositories such as ScienceDirect, Taylor &

Francis Online, and Springer. Further limitations arise from the review methodology itself. Restricting the search to peer-reviewed journal articles may have excluded valuable grey literature, including dissertations, theses, and conference proceedings, which can offer novel insights and help reduce publication bias. Future reviews should broaden database coverage, incorporate grey literature and non-English studies in order to enhance the comprehensiveness and applicability of findings.

Conflict of Interest Statement
The authors declare no conflicts of interest.

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