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Cognitive Apprenticeship in Secondary Writing Instruction: Fostering Metacognition and Self-Regulation

Georgia Theocharopoulou[1*], Ioannis Spantidakis[1], Eleni Vassilaki[1], & Smaragda Papadopoulou[2]

[1] Department of Primary Education, School of Education, University of Crete, Gallos Campus, 74100 Rethymno, Crete, Greece

[2] Department of Early Childhood Care and Education, International Hellenic University, P.O. Box 141, 57400 Sindos, Thessaloniki, Greece

[*] Georgia Theocharopoulou, Department of Primary Education, School of Education, University of Crete, Gallos Campus, 74100 Rethymno, Crete, Greece

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Abstract

This study examines, within an applied linguistics framework, the contribution of the Cognitive Apprenticeship (CA) model to the development of metacognitive and self-regulatory skills in senior high school students' argumentative writing. Using a quasi-experimental action research design, a year-long intervention was implemented in two first-year senior high school classes, with a third class serving as a comparison group. The intervention enacted core CA components—development of prior knowledge, modeling, coaching, scaffolding, articulation, reflection, and exploration—through structured metacognitive strategy instruction and targeted writing tasks aimed at transforming metacognitive knowledge into self-regulated writing competencies. Methodological rigor was ensured through data triangulation, including pre- and post-intervention writing assessments evaluated with a validated rubric, an open-ended metacognitive knowledge elicitation task, student interviews, and classroom observations. Writing samples were independently scored by two raters. Quantitative data were analyzed using paired-sample and between-group comparisons, while qualitative data were coded within a thematic framework. Results indicate significant gains in metacognitive awareness, self-regulatory behaviors, and writing quality among students in the intervention classes compared to the control group. Qualitative evidence highlights increased strategic engagement and learner autonomy during the writing process. Overall, the findings demonstrate that socio-cognitive instructional approaches support metacognition and self-regulation in secondary-level writing instruction.

Keywords

Cognitive Apprenticeship, metacognition, self-regulation, argumentative writing

1. Introduction

Students' proficiency in written discourse constitutes a critical determinant of success and advancement in school, in academia, and in the professional sphere. It also serves as an essential prerequisite for accessing the opportunities of lifelong learning in today's increasingly digitized world, where active participation and progress in all areas of life depend heavily on literacy. Consequently, fostering metacognitive knowledge and self-regulation strategies in writing is essential, equipping students with the cognitive capacity to address contemporary challenges. Despite its centrality, many students encounter difficulties in applying effective writing strategies, underscoring the need for instructional methods that cultivate metacognition and self-regulated learning.

Metacognitive knowledge and self-regulation strategies equip students with the cognitive tools to plan, monitor, and evaluate their writing processes. Prior research suggests that explicit instruction in these strategies enhances students' ability to manage cognitive demands, fosters deeper learning, and improves the quality of written texts (De La Paz et al., 2024; Stefaniak, 2013). However, evidence on effective instructional models for integrating metacognitive and self-regulatory skills into argumentative writing remains limited, particularly in high school settings.

This study therefore examines the use of the Cognitive Apprenticeship (CA) model in teaching metacognitive and self-regulatory strategies for argumentative writing to high school students. The model seeks to address the problem of inert knowledge by rendering thought processes and action strategies visible to both students and teachers (Collins et al., 1991), enabling educators to scaffold higher-order thinking and explicitly demonstrate heuristic and control strategies (De La Paz et al., 2024). In doing so, it fosters metacognitive knowledge and cultivates metacognitive and self-regulatory skills. Moreover, its social dimension supports the formation of a Community of Practice that promotes individual goal setting, facilitates the transfer of knowledge across learning contexts, and encourages engagement with diverse problem-solving approaches (Stefaniak, 2013).

2. The Cognitive Apprenticeship Model

This study applied the CA model (Collins et al., 1989) to high school students in order to provide instruction in concepts, processes, and strategies and to foster metacognitive skills across all stages of argumentative text production—planning, idea generation, organization, text production and revision. At each stage, the six core phases of the CA model—modeling, coaching, scaffolding, articulation, reflection, and exploration—were implemented, along with an initial preparatory phase proposed by Vassarmidou and Spantidakis (2015), namely the Development of Students' Prior Knowledge. In this initial phase, the teacher prompts learners to reflect on what they already know about the subject,

enabling them to identify cognitive gaps that provide intrinsic motivation to engage actively in the learning process and address their deficiencies (Wilby, 2022; Zimmerman & Risemberg, 1997). At the same time, recalling and developing prior knowledge functions as a crucial instructional tool and serves as the foundation for constructing new knowledge (Dewey, 1938; Bruner, 1960; Piaget, 1952).

Next, during the Modeling phase, the teacher verbalizes thoughts and procedures to externalize typically internal heuristic and control processes (Collins et al., 1989). Students observe both actions (behavioral modeling) and the underlying reasoning (cognitive modeling) (Dennen, 2004), which clarifies the rationale and strategies necessary for successful task execution (Kirschner & Hendrick, 2020). Through this process, learners gradually become familiar with—and, to some extent, internalize—the ways in which the expert thinks and acts, fostering their own cognitive and strategic development in similar situations.

During the Coaching phase, students—working individually or in groups—attempt to approximate the expert's performance as demonstrated in the modeling stage, while the teacher monitors their work and intervenes when necessary, providing immediate, precise, corrective, and interactive feedback—a technique of high instructional impact (Akhavan & Walsh, 2020). Such feedback helps students analyze and understand thought and action processes and incorporate them into their own performance. It also prevents them from completing tasks mechanically as memorized routines (Kirschner & Hendrick, 2020), in which case learning remains at the level of demonstration rather than genuine teaching (Matsagouras, 2006).

At the stage of Scaffolding, students are challenged with activities of gradually increasing complexity and differentiation, applied in various writing contexts. At this point, fading guidance is employed, and the teacher adopts the role of facilitator, helping learners reach skill levels beyond their current capacities (Stefaniak, 2013). The teacher provides targeted support and instruction, enabling students to achieve higher levels of performance than they could independently, thereby reaching the Zone of Proximal Development and extending beyond their current level of independent performance (Kellogg, 2008). At this stage, students progressively undertake responsibility for their own learning while the teacher's support is gradually withdrawn (Camacho et al., 2023). The key element of this stage is the gradual reduction of assistance, depending on the acquisition of the skill being developed (Dennen & Burner, 2007), so that students are encouraged to act autonomously and in a self-regulated manner in any writing activity.

One of the most constructive steps of CA is the stage of Articulation, in which students are encouraged by the teacher to externalize their knowledge, reasoning, and problem-solving processes (Collins et al., 1989), as well as their thoughts and concerns regarding the rationale and strategies taught and applied in earlier stages. In this study, this phase was implemented within the class group, where, through discussion and peer interaction, students shared their perspectives, described the difficulties they encountered and how they addressed them, justified their choice of strategies, and explained any

modifications made for task completion. Through this dialogical exchange, students were supported in grasping the metacognitive dimension of the strategies they had been taught, in developing control strategies, and in collaboratively assisting one another in addressing similar challenges. Exposure to peers with varying levels of expertise also allowed them to model their behavior on these examples and seek advice (Kirschner & Hendrick, 2020).

In the next stage, Reflection, each student evaluates the outcome of their own performance—or that of their group if they worked collaboratively—by comparing it with the teacher's or classmates' performance. Students reflect on and assess the quality of their actions, identifying strengths and weaknesses (Stefaniak, 2013) and determining which strategies were effective and which were not. In this way, they engage in self-discovery, a significant step towards independence and self-regulation (NASEM, 2018; Blake et al., 2024).

In the final stage, Exploration, the teacher encourages students to set goals that are of particular interest to them and to independently explore various subjects (Collins et al., 1989). Here, students are prompted to reflect on how they have assimilated new knowledge in order to plan for more effective use—or modification—of strategies so that these better meet their needs (Blake et al., 2024). In other words, learners are encouraged to personalize their actions and integrate new knowledge with prior cognitive resources and individual modes of expression. This process enhances the transfer of knowledge across different contexts and learning situations.

Table 1. Application of the CA Model to Teaching an Idea-Generation Strategy: A Framework of Teacher and Student Roles across the Seven Stages

STAGES OF COGNITIVE APPRENTICESHIP	ROLE OF THE TEACHER	ROLE OF THE STUDENT
1. Development of Prior Knowledge	Activates students' pre-existing knowledge about idea-generation techniques. Prompts them to recall experiences and identify gaps or difficulties.	Recall prior knowledge and experiences; recognize difficulties or gaps related to idea generation.
2. Modeling	Demonstrates step-by-step the metacognitive strategy of idea generation (e.g., SWOT analysis or Multidimensional Idea Generation Table) to examine positive/negative effects across domains (social, economic, cultural, spiritual). Thinks aloud, explaining how ideas are produced, selected, and organized.	Observe and follow the teacher's verbalized thinking to understand how idea generation unfolds through concrete steps and criteria.

3. Coaching	Assigns a similar idea-generation activity (preferably in groups). Facilitates work, provides targeted feedback, and intervenes with guiding questions (e.g., "How is this related to the social domain?").	Collaboratively apply the strategy by creating an idea diagram; discuss, revise, and refine ideas using feedback to improve their process.
4. Scaffolding	Prompts students to apply the strategy to new concepts/topics. Gradually reduces support, offering differentiated assistance as needed.	Apply the strategy to new concepts, assuming greater responsibility. Suggest their own categories or alternative organizational approaches.
5. Articulation	Encourages explanation of choices and reasoning -for example, how positive/negative consequences were identified and ideas grouped.	Verbalize and justify their thought processes; share and compare alternative groupings or analyses with peers.
6. Reflection	Guides comparison of students' diagrams/tables with peers' or the teacher's model to highlight effective practices and areas for improvement.	Reflect on their idea diagram's strengths and weaknesses, and on the idea-generation process for useful steps and potential refinements.
7. Exploration	Promotes autonomous use of the strategy in new topics or disciplines (e.g., applying SWOT or Multidimensional Tables in history to analyze historical events). Encourages adaptation and enrichment based on interests.	Independently apply the strategy, selecting steps that suit their learning style. Reflect on transferability to other subjects and tasks.

2.1. Research Evidence on the CA Model in Writing and Digital Learning Environments

Extensive research has demonstrated the positive impact of the CA model on teaching written discourse, primarily in university contexts and less frequently in secondary education. This imbalance underscores the rationale for the present study, which examines the model's pedagogical potential at the high school level. In written discourse, Boling and Beatty (2010) reported significant improvements in students' online writing performance, while Ding (2008) documented progress through the systematic use of modeling, coaching, and scaffolding. Likewise, Kolikant et al. (2006) and De La Paz et al. (2024) confirmed the model's effectiveness in teaching scientific reading and writing, and De La Paz et al. (2017) emphasized its value in developing historical argumentation among diverse learners.

Empirical evidence also supports the model's effectiveness in hybrid and digital learning environments. Studies show that it enhances learners' engagement, improves course completion rates, and increases instructional efficiency (Shah & Soosai Raj, 2024). More broadly, the model strengthens the quality of online education by cultivating learners' practical competencies and professional judgment within their disciplines (Delanoy & Mosher, 2021). Wu et al. (2022) found that its application significantly enhanced students' computer literacy and digital skills, findings corroborated by Yu and Wu (2024), who applied the model in a hybrid, computer-assisted co-teaching framework yielding measurable performance gains. Similarly, Hassan (2024) showed that an online collaborative program based on CA substantially improved pre-service English as a Foreign Language (EFL) teachers' argumentative writing and critical thinking, confirming its effectiveness in fostering higher-order cognitive and linguistic development in digital learning contexts.

3. Teaching Writing through Metacognition and Self-Regulation

3.1 Metacognitive Knowledge, Metacognitive Experience, and Metacognitive Skills

The concept of metacognition has been widely recognized as a key construct in learning (Flavell, 1987). Flavell (1979) defined it as both the knowledge individuals possess about their own cognitive processes and their ability to regulate and organize them. In this sense, metacognition encompasses awareness of mental operations and the executive strategies employed to control learning. As Schraw (2001) emphasizes, it provides both general knowledge and regulatory skills that enable individuals to direct cognition across domains. Flavell (1979) distinguished two core functions of metacognition: monitoring and control. Monitoring refers to the processes through which learners observe and reflect on their cognition, acquiring information about the relationship between their current cognitive state and their intended goals (Schwartz & Perfect, 2004), whereas control involves the conscious or unconscious decisions made to regulate these processes based on monitoring outcomes. Koriat (2002) highlighted that the interaction between metacognitive monitoring and control demonstrates that subjective experience is an active process shaping cognition and behavior. Through these functions, individuals construct a representation of their own cognitive system, enabling observation and regulation by the system itself and allowing conscious improvement of cognitive processes (Spantidakis, 2010). Efklides (2006) further emphasized that metacognitive knowledge and experiences belong to monitoring, whereas metacognitive skills pertain to control.

According to Flavell (1979), metacognitive knowledge includes knowledge about persons as cognitive processors, task knowledge, and strategy knowledge. Flavell (1985) further distinguished between declarative knowledge ("knowing that") and procedural knowledge ("knowing how"). This classification was later expanded by Brown (1987) and Schraw (1995) with the addition of conditional knowledge—knowing when, where, and why to use a strategy (as cited in Vassarmidou & Spantidakis, 2015).

Metacognitive experience integrates an emotional component and, as defined by Spantidakis (2010, p. 94), consists of *"a spectrum of cognitive and affective experiences (ideas, feelings, emotions, judgments, evaluations) that derive from monitoring the cognitive task and from the metacognitive knowledge experienced during engagement with it"*.

Finally, metacognitive skills—also referred to as metacognitive strategies or metacognitive regulation—include planning, monitoring, and evaluation (Schraw, 1998). Planning involves selecting strategies and allocating resources; monitoring refers to observing and directing task execution; and evaluation concerns assessing both regulatory processes and learning outcomes (Schraw & Dennison, 1994).

3.2 Self-Regulation in Writing—The Self-Regulated Writer

Metacognitive awareness, with its various dimensions, is a key factor in developing self-regulation skills. Zimmerman (1989) defines self-regulated learning as students' metacognitive, motivational, and behavioral participation in their own learning. This construct has become a central focus in fields such as metacognition, decision-making, motivation, and problem-solving, and over the past two decades has attracted sustained attention in education, leading to the development of multiple models of self-regulated learning (Winne & Hadwin, 1998; Pintrich, 2000; Zimmerman, 2000; Zimmerman & Schunk, 2011). Most models conceptualize self-regulated learning as a cyclical process comprising forethought, performance, and reflection, encompassing processes such as goal setting, planning, selecting and organizing information, time management, monitoring, self-assessment, and self-reflection. Alongside cognitive and metacognitive dimensions, they also integrate emotional and motivational components (Juhaňák et al., 2025). Higher levels of self-regulation are widely recognized as a defining characteristic of successful learners, enabling them to monitor understanding, evaluate progress, and correct errors—processes that play a pivotal role in fostering and fully realizing their learning potential.

In written discourse, the self-regulated student-writer approaches text composition as a self-directed activity characterized by confidence, flexibility, and precision in choices, judgments, and decisions. Such writers employ strategies insightfully, set goals, recognize and evaluate learning needs, devise methods, monitor progress, and assess outcomes, thereby moving from the role of "secretary" to that of "creator" (Spantidakis & Vassarmidou, 2015), using writing as a means of reflection, idea exploration, and knowledge construction (Spantidakis & Vamvoukas, 2007).

Within this framework, several models of self-regulated learning have been developed for writing. The models of Hayes (1996) and Scardamalia & Bereiter (1987), frequently employed as theoretical foundations, focus on the writing process, integrating key components of self-monitoring and self-regulation. Zimmerman and Risemberg (1997) proposed a socio-cognitive perspective, classifying self-regulating writing processes into environmental, behavioral, and personal categories while maintaining the cyclical phases of forethought, performance, and reflection. Harris and Graham's (1996) Self-Regulated Strategy Development (SRSD) model further combines text-composition strategies (e.g.,

POW, TREE, C-SPACE) with explicit instruction in self-regulation skills such as goal setting, self-monitoring, self-instruction, and self-reinforcement.

3.3 Previous Research on the Role of Metacognition and Self-Regulation in Writing Instruction

A growing body of research underscores the decisive role of metacognition and self-regulation in writing instruction, demonstrating positive effects across multiple aspects of the learning process. Studies have shown that metacognitive training enhances textual cohesion and coherence (Briesmaster & Etchegaray, 2017) and improves overall writing performance (Santelmann et al., 2018) across diverse contexts, including L2 writing (Alifafi, 2022). Cuenca-Carlino et al. (2018) employed the Self-Regulated Strategy Development (SRSD) model to teach L2 writing to students with learning difficulties, reporting gains in performance, strategy use, motivation, and self-efficacy. Bal et al. (2025) found that metacognitive writing strategies mediate the relationship between self-regulation skills and writing anxiety, underscoring their pivotal role. Other studies also report enhanced self-efficacy and more positive writing attitudes among secondary students (Türkben, 2021; Shen et al., 2024; Camacho et al., 2023), with Camacho et al. applying the SRSD model. The effectiveness of combining self-regulation strategies with writing strategies was confirmed by Brunstein and Glaser (2011), while Teng (2016) demonstrated that integrating collaborative learning with metacognitive instruction positively influenced students' idea-generation efficacy and overall writing performance. Similarly, Escott and McCrudden (2022) documented improvements in the writing outcomes of ethnically diverse students, and Teng (2020) highlighted the benefits of group-based metacognitive support for writing. Finally, Teng and Huang (2019) showed that metacognitive knowledge and experiences are significant predictors of students' writing performance.

4. The Current Research—Methodology

A quasi-experimental action research design was employed to investigate the impact of a Cognitive Apprenticeship (CA) intervention on students' metacognitive and self-regulatory development as well as their argumentative writing performance. This design was selected because it enables the examination of instructional effects in real classroom conditions while preserving a reasonable degree of control over alternative explanations. The intervention took place across one academic year in two first-year senior high school classes, while a third class—following the conventional writing curriculum—served as a comparison group. This structure supports internal validity by allowing systematic comparisons between intervention and non-intervention groups, while simultaneously ensuring ecological validity.

The CA intervention embedded the full range of Cognitive Apprenticeship components—Development of Prior Knowledge, Modeling, Coaching, Scaffolding, Articulation, Reflection, and Exploration—within sequenced instructional activities and writing tasks. These pedagogical processes were deliberately designed to develop students' metacognitive knowledge (declarative, procedural, and conditional) and to facilitate its transformation into metacognitive and self-regulatory strategies

applicable during writing tasks. For the purposes of the present study, metacognitive knowledge is conceptualized as students' explicit awareness and understanding of writing processes, whereas metacognitive and self-regulatory skills refer to students' capacity to plan, monitor, and evaluate their writing. Improvements in argumentative writing performance are conceptualized in terms of the structural, logical, rhetorical, content-related, and linguistic quality of the students' texts. The specific instruments and procedures used to capture these constructs are presented in a following section.

4.1 Research Questions

Previous research has consistently demonstrated the positive impact of metacognitive and self-regulation strategy instruction on students' writing development. Building on this foundation, the present study focuses on the pedagogical approach through which such strategies are taught, examining whether the CA model provides a more effective framework for supporting metacognitive growth and improved writing performance in argumentative writing.

Accordingly, the research questions investigate whether the implementation of CA in argumentative writing instruction:

(i) develops students' metacognitive knowledge,

(ii) cultivates their metacognitive and self-regulation skills, and

(iii) enhances the quality of their argumentative texts.

These questions are directly aligned with the theoretical assumptions underpinning the CA model, which asserts that activating prior knowledge, providing explicit modeling of expert cognitive processes, offering sustained coaching and scaffolded support and encouraging articulation, reflection, and eventually autonomous exploration collectively foster higher-order cognitive and metacognitive development. Each CA component is therefore hypothesized to contribute distinctly yet synergistically to the targeted learning outcomes.

4.2 Research Sample

The research sample consisted of 59 (31 boys and 28 girls) first-year senior high school students enrolled in three intact classes within the same public school. Two classes (n = 38) were assigned to the Experimental Group, while one class (n = 21) served as the Control Group. The use of intact classes ensured ecological validity by preserving natural instructional settings and avoiding disruptions to established school structures. All participating students were approximately 16 years old and had previously been introduced to argumentative discourse during junior high school. Nonetheless, senior high school instruction requires a more advanced engagement with complex societal issues—economic, social, political, and international—which in turn demands more sophisticated reasoning processes, perspective-taking abilities, and rhetorical synthesis.

The Experimental Group received instruction grounded in the CA model, implemented by the researcher-teacher following a structured intervention framework. In contrast, the Control Group received traditional writing instruction that reflects standard pedagogical practice in Greek senior high

schools. This contrast allowed for a quasi-experimental comparison between pedagogical approaches while maintaining fidelity to authentic classroom conditions.

To further support sampling validity, the three participating classes belonged to the same school environment, thereby minimizing variability related to institutional differences, teacher practices, or differences in school-level physical and technological resources. In addition, adherence to identical curriculum topics, writing tasks, and assessment timelines across groups ensured comparable instructional conditions throughout the academic year. Baseline equivalence between groups was examined through pre-test measures in metacognitive knowledge and argumentative writing performance, providing an initial check for comparability prior to the intervention. While generalizability is naturally bounded by the characteristics of a single-school sample, the ecological validity of the design enhances the relevance of findings for real-world classroom contexts, particularly within Greek senior high school settings.

All ethical procedures were rigorously observed. Ethical approval was granted by the Ethics Committee of the University of Crete, and formal authorization for the conduct of the study was obtained from the school principal in accordance with institutional guidelines and national regulations. Moreover, written informed consent was obtained from all parents, who provided signed authorization for their children's participation in the research. All procedures adhered fully to the applicable Greek legislative framework governing research involving minors.

4.3 Research Procedure

The study adopted core elements of action research to evaluate the effectiveness of the CA model through a year-long classroom intervention implemented in two first-year senior high school classes (the Experimental Group), with 56 instructional hours allocated to each class. During the action research the teacher-researcher operated within the authentic classroom environment, collaborating with students (Tomal, 2003) and systematically drawing on evidence from written assignments, interviews, reflective journals, and classroom discussions. Insights derived from these sources informed the ongoing refinement of instructional decisions, allowing action plans to be continuously shaped and adjusted throughout the school year.

Instruction in the Experimental Group was structured according to Matsagouras' (2014) text-process model, which comprises three concrete stages—pre-writing, text production, and post-writing—and aligns closely with Zimmerman's (2002) self-regulation cycle of planning, monitoring, and reflection. Classical classroom observations underscored the necessity of explicitly teaching time-management strategies and text-evaluation procedures; both areas were subsequently addressed in dedicated lessons that followed the complete seven-stage sequence of the CA model. Moreover, the same instructional approach was used to design lessons that integrated all previously taught metacognitive and self-regulation strategies, enabling students to develop a comprehensive and cohesive understanding of the overall writing process. This approach strengthened their abilities across all three stages—pre

-writing, text production, and post-writing—and ultimately led to the production of complete, coherent, and well-structured argumentative texts.

Table 2. Diagrammatic Analysis of the Metacognitive and Self-regulation Strategies Taught to Students through the CA Model during the Instructional Intervention

STAGES OF WRITING INSTRUCTION	STUDENT'S NEEDS AS IDENTIFIED FROM THEIR PRE-TEST WRITTEN TEXTS	METACOGNITIVE AND SELF-REGULATION STRATEGIES TAUGHT THROUGH THE CA MODEL	SKILLS DEVELOPED
Pre-writing Stage	1. Omission or incorrect use of key structural elements of the text genre (e.g., letters without salutation or closing, speeches without an introductory address). 2. Failure to consider the intended audience. 3. Lack of clear understanding of task requirements.	***Text Identification Strategy*** Use of: 1. Techniques for identifying the purpose, audience, and genre of the text through the analysis of the writing prompt.	Identification of the communicative context, purpose, and genre of the text to be produced.
	Poor and often repetitive argumentation.	***Idea Generation Strategy*** Use of: 1. SWOT Analysis 2. Multidimensional Idea Generation Table 3. Free Brainstorming 4. Identification of arguments in related texts	Development of fluency and flexibility in idea generation and ability to adapt ideas to the purpose and requirements of the task.
	Difficulty in organizing ideas.	***Idea Organization Strategy*** Use of: 1. Idea Organization Table 2. Categorization and Classification Techniques	Planning of structure and logical sequencing of arguments prior to writing.

	Incomplete arguments, lacking sufficient justification and containing repetitions.	***Argument Structuring Strategy*** Use of: 1.Toulmin argument model. 2. PEE (Point, Evidence, Explanation) 3.CER (Claim, Evidence, Reasoning) 4. Rogerian Argument Model	Understanding of the internal structure of argumentation and effective argument development.
	Monotonous writing style.	***Strategy for Variety and Precision in Expression*** Use of: 1. Integration of paragraph development methods into argument structure.	Ability to convey ideas with variety, precision, and subtlety of meaning.
	Insufficient coherence.	***Coherence Improvement Strategy*** Use of: 1. Linking Words Table 2. Techniques for the effective use of linking words and phrases during writing.	Improved intra- and inter-paragraph coherence across the entire text.
Text production Stage	Limited vocabulary.	***Vocabulary Enrichment Strategy*** Use of: 1. Concept Vocabulary Table 2. Vocabulary exploitation techniques (from model texts)	Use of richer, more precise, and varied vocabulary.
Post writing Stage	Inadequate revision: students either made no corrections or only superficial ones, focusing mainly on spelling.	***Revision Strategy*** Use of: 1. Revision and Improvement Sheet 2. Revision Question Sheet	Development of self-assessment and revision skills at the levels of structure, content, and expression.

	Lack of familiarity with text evaluation.	***Text Evaluation Strategy*** Use of: 1.Assessment technique evaluating the dimensions of content, structure, and expression. 2. Techniques for overall appraisal of written performance.	Ability to assess text quality and to apply both self- and peer-assessment effectively.
Time Management	Inefficient time allocation: some students failed to complete their writing, leading to stress during the process.	***Time Management Strategy*** Use of: 1. Techniques for managing and allocating time across the three stages of the writing process: planning, drafting, and revising. 2. Technique for monitoring and readjusting time allocation.	Balanced and effective time management.

4.4 Research Tools

I. Open-Ended Metacognitive Knowledge Elicitation Task

At the beginning of the school year, both groups responded in writing to the prompt: "*What instructions would you give to a friend who wishes to write an argumentative text so that he or she can produce a good text?"* This task (pre-test) was designed to elicit students' declarative, procedural, and contextualized metacognitive knowledge in argumentative writing and was repeated at the end of the school year (post-test). Responses were coded into four categories: (1) content Instructions (strategies for idea generation, argument and counterargument construction, integration of external sources, and conclusion synthesis); (2) structure Instructions (strategies for text organization, adaptation to communicative context and genre, section structuring, and coherent arrangement of arguments); (3) language Instructions (strategies for adapting language and style, selecting appropriate vocabulary, and employing cohesive devices); and (4) revision/Improvement Instructions (guidance on refining texts by checking key content, structural, and linguistic features). Each category was scored on a 0-5 scale reflecting the clarity, specificity, and procedural completeness of the instruction provided, ranging from 0 = no instruction; 1 = general instruction without a specific implementation method; 2 = one clear instruction with a specific implementation method; 3 = two clear instructions with specific implementation methods; 4 = three clear instructions with specific implementation methods; 5 = four or

more clear instructions with specific implementation methods.

II. Assessment of Students' Written Texts

Both groups produced a full argumentative essay on a common teacher-selected topic to allow pre- and post-intervention comparison. Essays were independently evaluated by two external raters using the nationally applied 0-30 analytic scale employed in Greek senior high schools and the Panhellenic Examinations (Content: 0-12; Structure: 0-10; Language Use: 0-8). This scale was retained to ensure objectivity and comparability, as students were already familiar with it through school-based self-assessment practices and the raters were experienced Panhellenic exam evaluators. The high level of agreement between raters confirmed the consistency and reliability of the scoring process.

III. Semi-structured Interviews

Semi-structured interviews were employed to explore participants' perspectives, learning strategies, and experiences in acquiring and integrating metacognitive and self-regulatory skills. This approach allows the examination of the teaching experience from multiple subjective standpoints, as individuals situated within their own lifeworlds may perceive a shared experience in distinct ways. Following Creswell (2007), the focus is on describing the texture and structure of lived experience to identify common elements, which constitute the initial step toward interpretive analysis (Denzin & Lincoln, 2017). The semi-structured interview targets specific aspects of teaching and writing activities while retaining the flexibility to probe deeper when necessary (Karatsareas, 2022). This method provides access to complex subjective processes that cannot be adequately captured through quantitative approaches.

IV. Structured Observation Checklist

A structured observation checklist developed by the researcher and adapted from established instruments (Aula Blasco, 2016; Farahian, 2017; Kanlapan & Velasco, 2009; Magno, 2009) was used to document students' metacognitive behaviors and self-regulation strategies during lessons and writing activities. The checklist captured behaviors related to planning, textualization, revision and improvement, as well as reflection and self-assessment processes.

V. Student-Produced Materials

Additional data were derived from students' artifacts, including planning diagrams, idea-generation schemes, organizational charts, and drafts produced during classroom writing tasks. These materials provided evidence of students' strategy use and development over time.

VI. Self-Reflective Journals

During designated phases of the intervention, students completed guided self-reflective journals documenting their reflections on the strategies taught, their perceived effectiveness, and the extent to which these strategies were incorporated into their writing practices. This process fostered awareness of cognitive and metacognitive development and corresponded to the Articulation and Exploration phases of the CA model, during which students shared experiences, verbalized reasoning, and evaluated their learning (Tahmasbi et al., 2022). In addition, the journals provided the teacher-researcher with direct

insight into students' perceptions, enabling her to evaluate the degree to which the techniques and strategies were being appropriately integrated and to make any necessary adjustments or reorganizations to the instructional sequence when deemed pedagogically appropriate.

4.5 Validity and Reliability

Methodological rigor was ensured through a range of procedures that confirmed the validity and reliability of both the research instruments and the data derived from them. Content validity for all instruments—the open-ended metacognitive task, the semi-structured interview, and the structured observation checklist—was ensured through their alignment with established theoretical frameworks of metacognition and self-regulated learning, as well as through adaptation from previously validated tools (Aula Blasco, 2016; Farahian, 2017; Kanlapan & Velasco, 2009; Magno, 2009). Additional expert review by two senior specialists in language education confirmed that each instrument appropriately captured the constructs under investigation.

Construct validity was reinforced through methodological triangulation across five independent data sources: (a) the metacognitive knowledge elicitation task, (b) standardized essay assessments, (c) structured classroom observations, (d) student-produced artefacts, and (e) reflective journals. Converging patterns between qualitative and quantitative evidence were used to substantiate interpretations of students' metacognitive development and self-regulatory behaviors.

Reliability procedures were applied to both quantitative and qualitative data. For the essay assessments, two external raters—experienced Panhellenic Examination scorers—evaluated all scripts using the standardized national rubric. The high level of agreement between raters confirmed the consistency and reliability of the scoring process.

For the coding of open-ended responses and interviews, reliability was supported through a structured calibration and verification process. Two language teachers with experience in teaching writing independently coded 30% of the dataset after reviewing the coding guidelines and reaching a shared understanding of the coding criteria. Their classifications demonstrated a high degree of convergence, and any minor discrepancies were resolved through negotiated consensus. A subset of the coded qualitative data was additionally reviewed by two senior experts in language education, who confirmed the consistency and appropriateness of the coding decisions.

The structured observation checklist was pilot-tested in three non-participating classrooms to confirm clarity, feasibility, and observer consistency. Taken together, these procedures ensured that the study met international standards of methodological rigour and that all reported findings were grounded in valid, reliable, and systematically verified evidence.

4.6 Results

I. Open-Ended Metacognitive Knowledge Elicitation Task

Tables 3 and 4 present the means and standard deviations of student responses to the Metacognitive Knowledge Question for the Experimental (Table 3) and Control Group (Table 4), pre- and

post-intervention, along with statistical significance tests of mean score differences. Normality of the continuous variables was assessed prior to inferential testing (Shapiro-Wilk test). Where the normality assumption was violated, within-group pre-/post-changes were tested using the Wilcoxon signed-rank test; paired-sample t-tests were used when normality held. All reported effect sizes are Cohen's d and are interpreted according to conventional thresholds (small ≈ 0.20, medium ≈ 0.50, large ≥ 0.80).

Table 3. Means (M) and Standard Deviations (SD) of Experimental Group Students' Responses to the Metacognitive Knowledge Question, by Parameter, Pre- and Post-intervention

	PRE-TEST	POST-TEST		WILCOXON		EFFECT SIZE	
METACOGNITIVE KNOWLEDGE ELICITATION TASK EXPERIMENTAL GROUP	MEAN (Std Dev.)	MEAN (Std Dev.)	N	TEST STATISTIC	ASYMPTOTIC Sig (2-sided)	COHEN'S D	EFFECT SIZE
Content Instructions	0.97 (0.972)	4.34 (0.708)	38	741.0	<0.001	3.47	Large
Structure Instructions	0.68 (0.525)	2.89 (0.559)	38	741.0	<0.001	3.831	Large
Language Instructions	0.58 (0.758)	2.24 (1.283)	38	558.0	<0.001	1.109	Large
Revision/Improvement Instructions	0.08 (0.273)	1.89 (0.453)	38	666.0	<0.001	3.54	Large

** 0-5 scale: 0 = no instruction; 1 = general instruction without an implementation method; 2 = one clear instruction supported by an implementation method; 3 = two clear instructions with corresponding implementation methods; 4 = three clear instructions with corresponding implementation methods; 5 = four or more clear instructions with corresponding implementation methods.*

Table 4. Means (M) and Standard Deviations (SD) of Control Group Students' Responses to the Metacognitive Knowledge Question, by Parameter, Pre- and Post-traditional Writing Instruction

	PRE-TEST	POST-TEST		WILCOXON		EFFECT SIZE	
METACOGNITIVE KNOWLEDGE ELICITATION TASK	MEAN (Std Dev.)	MEAN (Std Dev.)	N	TEST STATISTIC	ASYMPTOTIC Sig	COHEN'S D	EFFECT SIZE

CONTROL GROUP					(2-sided)		
Content Instructions	0.57 (0.811)	0.86 (0.655)	21	44.5	0.293	0.259	Small
Structure Instructions	0.29 (0.463)	0.81 (0.512)	21	55.0	0.002	0.870	Large
Language Instructions	0.67 (0.658)	0.71 (0.644)	21	9.0	0.655	0.096	Small
Revision/Improvement Instructions	0.0 (0.0)	0.0 (0.0)	21	-	-	-	-

The Experimental Group demonstrated significant improvement across all categories. Content instructions increased from a pre-test mean of 0.97 to a post-test mean of 4.34 ($z = 741.0$, $p < 0.001$), indicating that while initial responses were mostly minimal or general, post-test responses included at least three clear instructions accompanied by specific implementation methods. Structure instructions improved from $M = 0.68$ to $M = 2.89$ ($z = 741.0$, $p < 0.001$). Language instructions increased from $M = 0.58$ to $M = 2.24$ ($z = 558.0$, $p < 0.001$), and revision/improvement instructions rose from $M = 0.08$ to $M = 1.89$ ($z = 666.0$, $p < 0.001$). Cohen's d values indicated large effects across all categories, highlighting the substantial impact of the intervention.

In contrast, the Control Group showed minimal improvement (Table 4). Content instructions increased slightly from $M = 0.57$ to $M = 0.86$ ($z = 44.5$, $p = 0.293$), and language instructions changed marginally from $M = 0.67$ to $M = 0.71$ ($z = 9.0$, $p = 0.655$). Revision/improvement instructions remained unchanged ($M = 0.00$), precluding further analysis. Only structure instructions showed a significant gain, rising from $M = 0.29$ to $M = 0.81$ ($z = 55.0$, $p = 0.002$). Cohen's d values suggested low effects for content and language, a large effect for structure, and no effect for revision/improvement, emphasizing the limited impact of the instructional procedures adopted in the Control Group.

II. Assessment of Students' Written Texts

Table 5. Means (M) and Standard Deviations (SD) of Pre-test and Post-test Writing Scores for the Experimental and Control Group

	PRE-TEST	POST-TEST		t-test		EFFECT SIZE	
ESSAY SCORES	MEAN (Std Dev.)	MEAN (Std Dev.)	N	t value	Sig(2-tailed)	COHEN'S D	EFFECT SIZE
Experimental Group	17.145 (3.9998)	22.474 (3.2631)	38	-9.933	<0.001	1.611	Large

Control Group	17.571 (2.9803)	16.286 (3.2694)	21	2.249	0.036	0.490	Small

** Assessment scale: 0-30 (official Greek senior high school and Panhellenic Examination scale)*

Table 5 shows that pre-test performance was nearly identical between groups, with the Control Group scoring slightly higher (Experimental M = 17.15; Control M = 17.57). At post-test, the Experimental Group improved significantly (M = 22.47, $p < 0.001$), whereas the Control Group's performance declined (M = 16.29, $p = 0.036$). Cohen's d indicated a strong effect of the intervention for the Experimental Group.

Tables 6 and 7 present Means (M), Standard Deviations (SD), and significance tests for Content, Structure, and Language in pre- and post-test essays. Depending on the distribution of the data, either the Wilcoxon signed-rank test or a t-test was applied.

Table 6. Means (M) and Standard Deviations (SD) of Experimental Group Students' Scores in Content Structure and Language Expression Pre- and Post-intervention

	PRE-TEST	POST-TEST		WILCOXON		EFFECT SIZE	
ESSAY SCORES EXPERIMENTAL GROUP	MEAN (Std Dev.)	MEAN (Std Dev.)	N	TEST STATISTIC	ASYMPTOTIC Sig (2-sided	COHEN'S D	EFFECT SIZE
Content	7.224 (1.9232)	9.776 (1.4128)	38	741.0	<0.001	1.656	Large
Structure	5.184 (1.2271)	6.776 (1.2231)	38	595.0	<0.001	1.615	Large
Language Expression	4.737 (1.1073)	5.921 (1.0169)	38	561.0	<0.001	1.083	Large

** Assessment scale: Content = 0-12. Structure = 0-10. Language Expression = 0-8.*

Table 7. Means (M) and Standard Deviations (SD) of Control Group Students' Scores in Content Structure and Language Expression Pre- and Post-traditional Writing Instruction

	PRE-TEST	POST-TEST		WILCOXON or t-test		EFFECT SIZE	
ESSAY SCORES CONTROL GROUP	MEAN (Std Dev.)	MEAN (Std Dev.)	N	TEST STATISTIC Or t value	ASYMPTOTIC Sig(2-sided) Or Sig (2-tailed)	COHEN'S D	EFFECT SIZE
Content	7.381	6.643	21	t : 2.091	Sig (2-tailed):	0.456	Small

	(1.6195)	(1.6966)			0.049		
Structure	5.357	4.952	21	20.0	0.038	0.478	Small
	(0.7769)	(1.0477)					
Language	4.833	4.690	21	19.5	0.403	0.218	Small
Expression	(0.8851)	(0.9148)					

III. Semi-structured Interviews

α) Pre-Intervention Interviews.

Pre-intervention interviews were conducted with all students in the Experimental Group to explore their initial writing habits, strategic approaches, and perceptions of their own writing processes. Thematic analysis focused on three key areas: (a) division of the writing process into stages, (b) revision practices, and (c) self-assessment of writing.

Division of Writing Stages. All students in the Experimental Group participated in interviews before the instructional intervention. When asked whether they divided the writing process into three stages—planning, textualization, and revision—the majority reported minimal engagement with planning. Specifically, 20 of the 38 students indicated that they wrote the assigned task immediately without any plan, 16 relied on a mental plan, 1 prepared a written plan only if time permitted, and 1 created a detailed written plan before starting to write. The interview data further illuminate these tendencies. Several students indicated that planning was perceived as unnecessary or time-consuming:

St. 1: *"I knew what I wanted to write, but I did not create an outline because I considered it a waste of time. I would form a rough plan mentally, not detailed, but sufficient for knowing approximately what I would write".*

St. 2: *"I looked at the essay topic but did not prepare an outline because it would take too much time".*

St. 3: *"I wrote in a continuous flow. I never prepared an outline. I would think of ideas in my head and then write them down directly without organizing them in any particular order".*

St. 4: *"I generally began writing without any prior thought. I simply started, and the text emerged automatically".*

St. 5: *"I thought of all the ideas beforehand, with very little organization, and then moved directly to writing".*

Revision Practices. Most students engaged only in superficial revision. 30 students reported rereading their work to correct minor errors such as spelling or punctuation, 3 did not reread their text at all, 3 reread solely to count words, 1 reread to ensure thematic relevance, and only 1 student performed extensive revision, making multiple changes to improve overall quality. The interview data further illustrate the limited depth of revision practices. Several students described their approach as intuitive, time-dependent, and focused primarily on surface-level corrections:

St. 1: *"Assessment is the teacher's responsibility. I have a general sense of whether I have performed well, but I do not have clear criteria to evaluate my work".*

St. 2: *"I reread my text. I do not assign a grade, and I identify what I have done wrong based on my own criteria. If, in the end, I realize that I have made a significant mistake—for example, in the structure—I am not sure what I would do to address it".*

St. 3: *"I do not know how to grade my writing. I reread it more than once and correct small mistakes. If I notice a structural problem after I have finished, I usually do not have time to rewrite it".*

Self-Assessment of Writing. Prior to the intervention, all students indicated that they were unaware of grading criteria or how to evaluate their work.

b) Post-Intervention Interviews.

Post-intervention interviews were conducted to examine how students' writing processes, strategic behaviors, and self-regulatory practices had evolved following the instructional intervention. Thematic analysis focused on four areas: (a) division of writing stages, (b) adopted writing strategies, (c) self-assessment practices, and (d) management of writing difficulties.

Division of Writing Stages After the Intervention. Following the instructional intervention, 37 of the 38 students reported that they now divided the writing process into distinct stages—planning, textualization, and revision—while only 1 continued to write directly without planning or revision. Among those who adopted the staged approach, 13 attributed the change to the perceived usefulness of the planning and revision strategies, 12 stated that these strategies helped them organize their texts more effectively, and 4 indicated that applying the strategies improved the overall quality of their essays. Interview excerpts further illustrate students' perceived benefits from the new approach:

St. 1: *"Planning helps me organize my ideas, while revision allows me to refine what I have written and improve it further".*

St. 2: *"It has helped me considerably, as I have noticed substantial improvement compared to my earlier essays. It enables me to put my ideas in order—both mentally and in terms of what I will write".*

St. 3: *"Planning helped me organize my work and determine the order in which I would approach each task. I applied it in other subjects, e.g., the Mathematics exam".*

Adopted Writing Strategies. All students (38) reported using the text identification strategy; 36 applied idea-generation strategies; 33 employed idea-organization strategies; 36 implemented strategies for structuring and developing arguments; and 30 used revision sheets to review and improve their texts. Additionally, 13 students reported using techniques to enrich vocabulary and enhance text cohesion.

Self-Assessment of Writing. Post-intervention, 23 students reported being able to assess their writing independently, 5 demonstrated moderate self-assessment ability, and 10 indicated that they could not evaluate their texts. Regarding alignment with the teacher's grading, 27 students reported no discrepancy, 8 indicated that the teacher's grade was higher than their own assessment, and 3 noted that it was lower than their expected evaluation.

Managing Writing Blocks. When encountering difficulties during writing, 20 students reported experimenting with different techniques to overcome obstacles, 16 relied on independent reflection, and only 2 sought teacher assistance immediately. Overall, 18 students viewed teacher support as a secondary strategy, resorted to only when self-directed efforts proved insufficient. Interview excerpts illustrate students' self-regulatory and adaptive responses:

St. 1: *"I use different techniques when the one I am applying does not yield the desired result".*

St. 2: *"If I encounter difficulty, I change technique or modify my strategy".*

St. 3: *"I seek help only when I cannot overcome the block on my own".*

St. 4: *"I look at the outline again to approach the topic from a different angle, and I reread the paragraph from the beginning to generate new ideas, adjusting my techniques along the way".*

St. 5: *"I try to clear my mind, put my thoughts in order, and review the material I have available to determine how I can move forward and what I can add. I ask for help if needed".*

4.7 Discussion

The first research question examined whether CA, as a teaching model, effectively enhanced students' metacognitive knowledge of written discourse. The findings clearly demonstrate substantial improvement in students' declarative, procedural, and conditional metacognitive knowledge (Table 3). This outcome aligns with the design of the intervention: throughout the instructional period, students were systematically guided through all stages of the CA model and received explicit instruction in strategies connected to the prewriting, textualization, and revising phases. The cumulative effect of this exposure enriched their metacognitive repertoire, enabling them to articulate more clearly what constitutes effective writing, how writing strategies operate, and why they should be employed. The increased sophistication evident in their responses on the Metacognitive Knowledge task reflects this development.

The lack of progress in the control group's metacognitive knowledge (Table 4) likely stems from structural limitations inherent in traditional writing instruction. Although the national curriculum nominally includes metacognitive development as a learning objective, it provides no operational guidance for its implementation, resulting in incidental rather than explicit strategy instruction. This is inconsistent with research showing that metacognitive growth requires direct, systematic, and clearly scaffolded strategy instruction (Paris & Winograd, 1990; Zohar & Dori, 2012). In conventional classrooms, teaching practices tend to prioritize the written product over the recursive processes of planning, monitoring, and revising, whereas writing research highlights the importance of explicitly teaching these processes to support strategic and self-regulated writing (Graham & Harris, 2005). Furthermore, feedback typically centers on surface-level correctness rather than strategy use or self-regulation, despite evidence that process and self-regulation-oriented feedback is essential for activating metacognitive awareness (Hattie & Timperley, 2007). Collectively, these discrepancies between what the literature identifies as necessary for metacognitive development and what conventional

instruction provides help explain the absence of measurable gains in the control group.

The second research question explored whether students developed metacognitive skills in argumentative writing. Qualitative data drawn from student interviews, classroom observations, reflective journals, preparatory notes, and written work produced throughout the year revealed consistent and meaningful progression across all stages of the writing process.

Prewriting phase. Before the intervention, most students approached writing as a linear activity, with little or no deliberate planning. Reflective journals, interviews, and classroom observations indicated that planning was frequently perceived as unnecessary or overly time-consuming, and many students relied on a brief mental overview rather than structured preparation. After the intervention, students reported that planning strategies helped them organize ideas more coherently and improved the overall structure of their texts. Reflective journal entries further revealed that many students intended to continue using planning procedures independently, demonstrating internalization of the value of prewriting.

Writing phase. Initial drafts produced before instruction revealed common difficulties in constructing arguments, including incomplete reasoning and weak justification. Many students acknowledged in their journals and interviews that they lacked knowledge of how to build an argument and relied on spontaneous or intuitive reasoning. Following explicit instruction in argument-structuring strategies, students described these techniques as particularly beneficial for helping them organize ideas and develop coherent, substantiated reasoning. Their later texts reflected these gains, exhibiting improved logical development and stronger organizational control.

Revision phase. Revision emerged as the most challenging stage at the outset. Students often struggled to identify weaknesses in their own work, a difficulty consistent with limitations noted in the literature (Mason et al., 2009; Tulis et al., 2015, 2016). Early revisions were typically superficial, focusing on surface-level corrections. After instruction and the use of the Guided Revision Sheet, students adopted a more strategic and goal-directed approach. Reflective journal entries, interviews, and classroom observations recorded increased attention to refining argument structure, clarifying meaning, enriching vocabulary, and eliminating redundancies. This shift demonstrates growth in metacognitive control over the revision process and a deeper understanding of revision as a purposeful, structured activity rather than a superficial check.

A further indication of metacognitive development appeared when students were asked how they would respond to writing difficulties. Reflective journals and interviews documented a tendency to adapt or modify strategies rather than immediately seek external assistance. This marks the stage of knowledge integration and individualization described by Zimmerman (2002), Pintrich (2000), and Schunk and DiBenedetto (2020), where learners move from strategy acquisition to self-regulated application and strategic adjustment based on individual needs.

The third research question addressed whether students' overall performance in argumentative writing improved. The Experimental Group demonstrated substantial gains in argumentative writing quality

(Table 5), an outcome fully consistent with previous findings showing that targeted metacognitive and strategy-based instruction leads to significant improvement in students' written performance (Santelmann et al., 2018; Brunstein & Glaser, 2011; Riwayatiningsih, 2021). Students produced more coherent texts, an outcome that is in line with the observations of Briesmaster and Etchegaray (2017), demonstrating clearer argumentative development, enhanced organizational structure, greater cohesion, and more precise linguistic expression (Table 6).

In contrast, the control group did not exhibit comparable growth, despite similar curricular exposure (Tables 5 and 7). This divergence may be linked to the increasing cognitive demands of the annual Language curriculum, which requires sustained engagement with multiple thematic units and progressively more complex concepts. Students who had not developed metacognitive monitoring and control mechanisms appeared less able to manage this cognitive load effectively. As Spantidakis (2010) argues, the interaction between monitoring and control is fundamental for managing cognitive demands and achieving high-quality writing performance.

4.8 Research Limitations

As with all empirical studies, this research has certain limitations. The relatively small sample size restricts the generalizability of the findings. Additionally, because the researcher also served as the instructor for the two experimental classes, this dual role—while facilitating implementation and close observation—may have introduced elements of subjectivity or observer bias, potentially intensifying the Hawthorne effect (Cook, 1967; Blease, 1983). Although systematic observation protocols were applied to preserve objectivity, such influence cannot be entirely excluded.

4.9 Conclusion

Although the study was conducted in a Greek high school context, its implications extend beyond the local educational setting. Metacognition, self-regulation, and argumentative writing are central not only to students' long-term academic development but also to their immediate progress within the senior high school curriculum. The Cognitive Apprenticeship (CA) model—widely implemented across different educational systems—supports both dimensions of achievement.

The intervention draws on the seven stages of the CA model (Development of Prior Knowledge, Modeling, Coaching, Scaffolding, Articulation, Reflection, and Exploration), which together form a structured developmental sequence adaptable to various curricular frameworks. By explicitly operationalizing these stages, the study demonstrates how metacognitive knowledge can be transformed into metacognitive skills. Development of Prior Knowledge enhances intrinsic motivation and prepares students for strategic engagement. Through Modeling, Coaching, and Scaffolding, strategic thinking becomes visible, accessible, and gradually internalized. Articulation and Reflection prompt students to externalize, examine, and evaluate their reasoning processes, while Exploration shifts responsibility to the learner, fostering independence and self-regulation. This progression encourages students to think critically and deepen their understanding both collaboratively and individually, an essential process for

cultivating cognitive maturity and autonomy in writing.

Such developmental gains are particularly valuable in the high school context, where students encounter increasingly complex writing demands and must acquire the ability to plan, monitor and evaluate their learning autonomously. At the same time, the CA model equips them with strategic tools that support their broader academic growth across disciplines. While specific implementation will naturally vary across contexts, the findings highlight core instructional elements that can inform the design of metacognitive and self-regulatory support in writing instruction within secondary education.

References

Akhavan, N., & Walsh, N. (2020). Cognitive apprenticeship learning approach in K-8 writing instruction: A case study. *Journal of Education and Learning*, *9*(3), 123-142. https://doi.org/10.5539/jel.v9n3p123

Alfaifi, M. J. (2022). A suggested model for metacognitive strategy instruction in EFL writing classrooms. *Reading & Writing Quarterly*, *38*(4), 323-339. https://doi.org/10.1080/10573569.2021.1954569

Aula Blasco, J. (2016). The relationship between writing anxiety, writing self-efficacy, and Spanish EFL students' use of metacognitive writing strategies: A case study. *Journal of English Studies, 14*, 7-45. https://doi.org/10.18172/jes.3069

Bal, M., Uyumaz, G., & Maden, B. (2025). Examining the mediating role of metacognitive writing strategies in the relationship between self-regulated writing skills and writing anxiety among middle school students. *British Educational Research Journal*, *51*(2), 345-361. https://doi.org/10.1002/berj.4212

Blake, M. F., Cottle, K., Gallagher, C., & MacArthur, C. A. (2024). Supporting metacognition in writing strategy instruction: Effective learning strategies for the first-year student and beyond. *Journal of the National Organization for Student Success*, *1*(2), 43-59. https://doi.org/10.61617/jnoss.30

Blease, D. (1983). Observer effects on teachers and pupils in classroom research. *Educational Review*, *35*(3), 213-217. https://doi.org/10.1080/0013191830350302

Boling, E. C., & Beatty, J. (2010). Cognitive apprenticeship in computer-mediated feedback: Creating a classroom environment to increase feedback and learning. *Journal of Educational Computing Research*, *43*(1), 47-65.

Briesmaster, M., & Etchegaray, P. (2017). Coherence and cohesion in EFL students' writing production: The impact of a metacognition-based intervention. *Íkala: Revista de Lenguaje y Cultura*, *22*(2), 183-202. https://doi.org/10.17533/udea.ikala.v22n02a02

Brunstein, J. C., & Glaser, C. (2011). Testing a path-analytic mediation model of how self-regulated writing strategies improve fourth graders' composition skills: A randomized controlled trial. *Journal of Educational Psychology*, *103*(4), 922-938. https://doi.org/10.1037/a0024622

Bruner, J. S. (1960). *The process of education*. Harvard University Press.

Camacho, A., Alves, R. A., Silva, M., Ferreira, P., Correia, N., & Daniel, J. R. (2023). The impact of combining SRSD instruction with a brief growth mindset intervention on sixth graders' writing motivation and performance. *Contemporary Educational Psychology*, *72*, Article 102127. https://doi.org/10.1016/j.cedpsych.2022.102127

Collins, A., Brown, J. S., & Holum, A. (1991). Cognitive apprenticeship: Making thinking visible. *American Educator*, *15*(3), 6-11, 38-46.

Collins, A., Brown, J. S., & Newman, S. E. (1989). Cognitive apprenticeship: Teaching the craft of reading, writing, and mathematics. In L. B. Resnick (Ed.), *Knowing, learning, and instruction: Essays in honor of Robert Glaser* (pp. 453-494). Erlbaum.

Cook, D. L. (1967). *The impact of the Hawthorne effect in experimental designs in educational research* (Final Report No. P-1757). U.S. Department of Health, Education, and Welfare, Office of Education.

Creswell, J. W. (2007). *Qualitative inquiry and research design: Choosing among five approaches*. SAGE Publications.

Cuenca-Carlino, Y., Gozur, M., Jozwik, S., & Krissinger, E. (2018). The impact of self-regulated strategy development on the writing performance of English learners. *Reading & Writing Quarterly*, *34*(3), 248-262. https://doi.org/10.1080/10573569.2017.1407977

De La Paz, S., Butler, C., Levin, D. M., & Felton, M. K. (2024). Effects of a cognitive apprenticeship on transfer of argumentative writing in middle school science. *Learning Disability Quarterly*, *47*(2), 70-83. https://doi.org/10.1177/07319487221119365

De La Paz, S., Monte-Sano, C., Felton, M., Croninger, R., Jackson, C., & Worland, K. (2017). A historical writing apprenticeship for adolescents: Integrating disciplinary learning with cognitive strategies. *Reading Research Quarterly*, *52*(1), 31-52. https://doi.org/10.1002/rrq.147

Delanoy, N., & Mosher, R. (2021). *Cognitive apprenticeship in online teaching and learning with education students*. University of Calgary.

Dennen, V. P. (2004). Cognitive apprenticeship in educational practice: Research on scaffolding, modeling, mentoring, and coaching as instructional strategies. In D. H. Jonassen (Ed.), *Handbook of research on educational communications and technology* (pp. 813-828). Lawrence Erlbaum Associates.

Dennen, V. P., & Burner, K. J. (2007). The cognitive apprenticeship model in educational practice. In J. M. Spector, M. D. Merrill, J. van Merriënboer, & M. P. Driscoll (Eds.), *Handbook of research on educational communications and technology* (pp. 425-439). Taylor & Francis.

Denzin, N. K., & Lincoln, Y. S. (2018). *The SAGE handbook of qualitative research* (5th ed.). SAGE Publications.

Dewey, J. (1938). *Experience and education*. Collier Macmillan.

Ding, H. (2008). The use of cognitive and social apprenticeship to teach a disciplinary genre: Initiation of graduate students into NIH grant writing. *Written Communication*, *25*(3), 3-52.

Efklides, A. (2006). Metacognition and affect: What can metacognitive experiences tell us about the learning process? *Educational Research Review*, *1*(1), 3-14.

Escott, S., & McCrudden, M. T. (2022). Investigating self-regulated strategy development for persuasive writing with elementary school students in Aotearoa/New Zealand. *Journal of Research in Childhood Education*, *36*(3), 392-405. https://doi.org/10.1080/02568543.2021.1990168

Farahian, M. (2017). Developing and validating a metacognitive writing questionnaire for EFL learners. *Issues in Educational Research*, *27*(4), 736-750.

Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive-developmental inquiry. *American Psychologist*, *34*(10), 906-911. https://doi.org/10.1037/0003-066X.34.10.906

Flavell, J. H. (1985). *Cognitive development*. Prentice Hall.

Flavell, J. H. (1987). Speculations about the nature and development of metacognition. In F. Weinert & R. Kluwe (Eds.), *Metacognition, motivation, and understanding* (pp. 21-29). Lawrence Erlbaum Associates.

Graham, S., & Harris, K. R. (2005). Improving the writing performance of young struggling writers: Theoretical and programmatic research from the Center on Accelerating Student Learning. *The Journal of Special Education*, *39*(1), 19-33. https://doi.org/10.1177/00224669050390010301

Harris, K. R., & Graham, S. (1996). *Making the writing process work: Strategies for composition and self-regulation*. Brookline Books.

Hassan, N. M. H. (2024). Using an online collaborative learning program based on the cognitive apprenticeship model for developing student teachers' EFL argumentative writing and critical thinking skills. *Sohag University International Journal of Educational Research*, *10*(10), 147-184. https://doi.org/10.21608/suijer.2024.369245

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research*, *77*(1), 81-112. https://doi.org/10.3102/003465430298487

Hayes, J. R. (1996). A new framework for understanding cognition and affect in writing. In C. M. Levy & S. Ransdell (Eds.), *The science of writing: Theories, methods, individual differences and applications* (pp. 1-27). Lawrence Erlbaum Associates.

Juhaňák, L., Juřík, V., Dostálová, N., & Juříková, Z. (2025). Exploring the effects of metacognitive prompts on learning outcomes: An experimental study in higher education. *Australasian Journal of Educational Technology*, *41*(1), 42-59. https://doi.org/10.14742/ajet.9486

Kanlapan, M. T. C. E., & Velasco, J. C. (2009). Constructing a self-regulation scale contextualized in writing. *TESOL Journal*, *1*, 79-94.

Karatsareas, P. (2022). Semi-structured interviews. In R. Kircher & L. Zipp (Eds.), *Research methods in language attitudes* (pp. 99-113). Cambridge University Press. https://doi.org/10.1017/9781108867788.010

Kellogg, R. T. (2008). Training writing skills: A cognitive developmental perspective. *Journal of Writing Research, 1*(1), 1-26. https://doi.org/10.17239/jowr-2008.01.01.1

Kirschner, P. A., & Hendrick, C. (2020). Cognitive apprenticeship revisited: Shining a light on the processes of thinking to understand learning. *American Educator*, *44*(3), 37-40, 50. https://eric.ed.gov/?id=EJ1272730

Kolikant, Y. B., Gatchell, D. W., Hirsch, P. L., & Linsenmeier, R. A. (2006). A cognitive apprenticeship-inspired approach for teaching scientific reading and writing. *Journal of College Science Teaching*, *36*(3), 20-25.

Koriat, A. (2002). Metacognition research: An interim report. In T. J. Perfect & B. L. Schwartz (Eds.), *Applied metacognition* (pp. 261-286). Cambridge University Press. https://doi.org/10.1017/CBO9780511489976.012

Magno, C. (2009). Self-regulation and approaches to learning in English composition writing. *TESOL Journal*, *1*, 1-16.

Mason, A. J., Cohen, E., Singh, C., & Yerushalmi, E. (2009). Self-diagnosis, scaffolding and transfer: A tale of two problems. Paper presented at the Physics Education Research Conference, Ann Arbor, MI. *AIP Conference Proceedings*, *1179*, 27-30. https://doi.org/10.1063/1.3266736

Matsagouras, I. (2006). *Θεωρία της διδασκαλίας: Η προσωπική θεωρία ως πλαίσιο στοχαστικοκριτικής ανάλυσης [Teaching theory: The personal theory as a framework for reflective-critical analysis]*. Gutenberg.

Matsagouras, I. (2014). *Κειμενοκεντρική προσέγγιση του γραπτού λόγου ή αφού σκέφτονται γιατί δεν γράφουν; [Text-centered approach to written discourse, or "If they think, why don't they write?"].* Εκδόσεις Γρηγόρη.

NASEM The National Academies of Sciences, Engineering, and Medicine. (2018). *How people learn II*. National Academies Press.

Paris, S. G., & Winograd, P. (1990). How metacognition can promote academic learning and instruction. In B. F. Jones & L. Idol (Eds.), *Dimensions of thinking and cognitive instruction* (pp. 15-51). Lawrence Erlbaum Associates.

Piaget, J. (1952). *The origins of intelligence in children* (M. Cook, Trans.). International Universities Press.

Pintrich, P. R. (2000). The role of goal orientation in self-regulated learning. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 451-502). Academic Press. https://doi.org/10.1016/B978-012109890-2/50043-3

Riwayatiningsih, R. (2021). Metacognitive strategy in teaching writing: What teachers should be aware of. In *UNNES-TEFLIN National Seminar Proceedings*, *4*(1), 300-312.

Santelmann, L. M., Stevens, D. D., & Martin, S. B. (2018). Fostering master's students' metacognition and self-regulation practices for research writing. *College Teaching*, *66*(3), 111-113. https://doi.org/10.1080/87567555.2018.1446898

Scardamalia, M., & Bereiter, C. (1987). Knowledge telling and knowledge transforming in written composition. In S. Rosenberg (Ed.), *Advances in applied psycholinguistics*. *Vol. 2: Reading, writing, and language learning* (pp. 142-175). Cambridge University Press.

Schraw, G. (1998). Promoting general metacognitive awareness. *Instructional Science*, *26*(1-2), 113-125. https://doi.org/10.1023/A:1003044231033

Schraw, G. (2001). Promoting general metacognitive awareness. In Metacognition in learning and instruction: *Theory, research and practice* (pp. 3-16). Springer. https://doi.org/10.1007/978-94-017-2243-8

Schraw, G., & Dennison, R. S. (1994). Assessing metacognitive awareness. *Contemporary Educational Psychology*, *19*(4), 460-475. https://doi.org/10.1006/ceps.1994.1033

Schraw, G., & Moshman, D. (1995). Metacognitive theories. *Educational Psychology Review*, *7*(4), 351-371. https://doi.org/10.1007/BF02212307

Schwartz, B. L., & Perfect, T. (2004). Introduction: Toward an applied metacognition. In T. Perfect & B. L. Schwartz (Eds.), *Applied metacognition* (pp. 1-11). Cambridge University Press.

Shah, A., & Soosai Raj, A. G. (2024). A review of cognitive apprenticeship methods in computing education research. In *Proceedings of the 55th ACM Technical Symposium on Computer Science Education* (pp. 1202-1208). ACM. https://doi.org/10.1145/3626252.3630769

Shen, X., Ismail, L., Jeyaraj, J. J., & Teng, M. F. (2024). Metacognitive strategies, writing self-efficacy, and writing anxiety in different learning modes: A two-wave longitudinal model. *System*, *126*, Article 103485. https://doi.org/10.1016/j.system.2024.103485

Schunk, D. H., & DiBenedetto, M. K. (2020). Motivation and social cognitive theory. *Contemporary Educational Psychology*, *60*, 101832. https://doi.org/10.1016/j.cedpsych.2019.101832

Spantidakis, I. (2010). *Κοινωνιο-γνωσιακά πολυμεσικά περιβάλλοντα μάθησης παραγωγής γραπτού λόγου* [Socio-cognitive multimedia learning environments for written discourse production]. Gutenberg.

Spantidakis, I., & Vamvoukas, M. (2007). Γραπτός λόγος, γνωσιακό φορτίο και σχεδιασμός μαθησιακών περιβαλλόντων [Written discourse, cognitive load, and the design of learning environments]. In G. Kapsalis & N. Katsikis (Eds.), *Η πρωτοβάθμια εκπαίδευση και οι προκλήσεις της εποχής μας: Πρακτικά Συνεδρίου [Primary education and the challenges of our time: Conference proceedings]* (pp. 563-571). University of Ioannina.

Spantidakis, G., & Vassarmidou, D. (2015). *Διαδικτυακά περιβάλλοντα μάθησης του γραπτού λόγου στην ελληνική Διασπορά [Online learning environments for written discourse in the Greek diaspora]*. Gutenberg.

Stefaniak, J. E. (2013). *The use of cognitive apprenticeships to teach learner-centered instructional strategies in an undergraduate learning environment* (Publication No. 798) [Doctoral dissertation, Wayne State University]. Wayne State University Dissertations. https://digitalcommons.wayne.edu/oa_dissertations/798

Tahmasbi, S., Karimnia, S., & Rahimi, A. (2022). A combination of action research and reflective journal writing in an English as a foreign language class: Learners' psychological points of view and grammar use in writing. *Frontiers in Psychology*, *13*, Article 810775. https://doi.org/10.3389/fpsyg.2022.810775

Teng, F. (2016). Immediate and delayed effects of embedded metacognitive instruction on Chinese EFL students' English writing and regulation of cognition. *Thinking Skills and Creativity*, *22*, 289-302. https://doi.org/10.1016/j.tsc.2016.06.005

Teng, F. (2020). The role of metacognitive knowledge and regulation in mediating university EFL learners' writing performance. *Innovation in Language Learning and Teaching*, *14*(5), 436-450. https://doi.org/10.1080/17501229.2019.1615493

Teng, F., & Huang, J. (2019). Predictive effects of writing strategies for self-regulated learning on secondary school learners' EFL writing proficiency. *TESOL Quarterly*, *53*, 232-247. https://doi.org/10.1002/tesq.462

Tomal, D. R. (2003). *Action research for educators*. Scarecrow Education.

Tulis, M., Steuer, G., & Dresel, M. (2015). Learning from errors: Process and contextual conditions toward a model of individual processes within contexts. In M. Gartmeier, H. Gruber, T. Hascher, & H. Heid (Eds.), *Fehler und ihre Funktionen im Kontext individueller und gesellschaftlicher Entwicklung* (pp. 53-70). Waxmann.

Tulis, M., Steuer, G., & Dresel, M. (2016). Learning from errors: A model of individual processes. *Frontline Learning Research*, *4*(2), 12-26. https://doi.org/10.14786/flr.v4i2.168

Türkben, T. (2021). The effect of self-regulated strategy education on the writing skills of middle school students. *International Journal of Education and Literacy Studies*, *9*(2), 52-65. https://doi.org/10.7575/aiac.ijels.v9n2p52

Vassarmidou, D., & Spantidakis, I. (2015). *Διδασκαλία και μάθηση του γραπτού λόγου [Teaching and learning of written discourse]*. Gutenberg.

Wilby, J. (2022). Motivation, self-regulation, and writing achievement on a university foundation programme: A programme evaluation study. *Language Teaching Research*, *26*(5), 1010-1033. https://doi.org/10.1177/1362168820917323

Winne, P. H., & Hadwin, A. F. (1998). Studying as self-regulated learning. In D. J. Hacker, J. Dunlosky, & A. C. Graesser (Eds.), *Metacognition in educational theory and practice* (pp. 277-304). Lawrence Erlbaum Associates.

Wu, Y.-T., Shen, P.-D., & Lin, C.-H. (2022). The effects of cognitive apprenticeship and co-regulated learning on improving student computer problem-solving skills and learning motivation. International *Journal of Educational Research* Open, *3*, Article 100182. https://doi.org/10.1016/j.ijedro.2021.100182

Yu, C.-C., & Wu, L. Y. (2024). Instructing with Cognitive Apprenticeship Programming Learning System (CAPLS) for novice computer science college freshmen: An exploration study. *Educational Technology & Society*, *27*(2), 183-196. https://doi.org/10.30191/ETS.202404_27(2).RP07

Zimmerman, B. J. (1989). A social cognitive view of self-regulated academic learning. *Journal of Educational Psychology*, *81*(3), 329-339. https://doi.org/10.1037/0022-0663.81.3.329

Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 13-39). Academic Press.

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory Into Practice*, *41*(2), 64-70. https://doi.org/10.1207/s15430421tip4102_2

Zimmerman, B. J., & Risemberg, R. (1997). Becoming a self-regulated writer: A social cognitive perspective. *Contemporary Educational Psychology*, *22*(1), 73-101. https://doi.org/10.1006/ceps.1997.0919

Zimmerman, B. J., & Schunk, D. H. (2011). Self-regulated learning: An introduction and an overview. In B. J. Zimmerman & D. H. Schunk (Eds.), *Handbook of self-regulated learning and performance* (pp. 1-12). Routledge.

Zohar, A., & Dori, Y. J. (2012). Metacognition in science education: Trends in current research. In A. Zohar & Y. J. Dori (Eds.), *Metacognition in science education: Trends in current research* (pp. 1-20). Springer. https://doi.org/10.1007/978-94-007-2132-6_1