THINKING SKILLS AND CREATIVITY

Immediate and delayed effects of embedded metacognitive instruction on Chinese EFL students' English writing and regulation of cognition

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A B S T R A C T

Writing can be viewed as a recursive process that involves both cognitive and metacognitive processes. Recent research has highlighted the importance of metacognition in the improvement of English writing. Metacognition is found to be facilitated through collaborative activities. The purpose of this study was to examine the effectiveness of cooperative training strategies in enhancing students' metacognitive skills and therefore their English writing. Towards this, two distinct settings for cooperative training, different in terms of embedded metacognitive instructions, were explored. The embedded metacognitive instructions were developed in line with the IMPROVE method. A total of 120 Chinese university students taking a writing course participated in this study. They were divided equally into three groups that were learning writing under distinct circumstances—a cooperative learning condition with embedded metacognitive instructions (COOP + META), a cooperative learning condition (COOP), and a non-treatment control group. Results indicated that the COOP + META condition yielded the highest mean scores in writing and regulation of cognition, followed by the COOP condition and the control group. In addition, IMPROVE students exhibited different kinds of cognitive regulation processes. However, no significant improvement was noticed in the knowledge about cognition. Interviews conducted at the end of the intervention further corroborated these findings. In last, the theoretical and educational implications of this study are discussed.

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1. Introduction

Research shows that metacognition plays an important role in English learning (e.g., Goh & Taib, 2006; Larkin, 2009; Zhang, Aryadoust, & Zhang, 2014). The consensus in these studies is that metacognition plays the role of a fixer or a problem solver, and learners use a toolbox of strategies to repair the failure in listening or reading comprehension, or to maximize writing performance. These few examples present only a brief snapshot of the vast amount of research in the field of applying metacognition in the teaching of English.

Many studies on metacognition have been conducted in the area of reading (e.g., Baker & Brown, 1984; Carrell, 1989; Carretti, Caldarola, Tencati, & Cornoldi, 2014). However, studies on metacognition in the area of writing are relatively limited (Griffith & Ruan, 2005). Early models of writing highlight the metacognitive elements of writing and acknowledge the positive

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role of a cognitive monitor to oversee the writing process (Conner, 2007). Following these precedents, more attention has been given to the fundamental nature of writing and the role of metacognition in the acquisition of writing skills.

Writing is regarded as a socially, historically, and culturally integrated activity (Larkin, 2009). In classrooms, this activity has been moved to collaborative and group work for writing tasks (Yarrow & Topping, 2001) and self-regulatory features of writers (Perry, 1998). A parallel movement was also witnessed in the area of metacognition research. Metacognition was developed from cognitive psychological traditions with a previous focus mainly on either identifying elements of metacognition or on the ways in which learners self-regulate and monitor cognition (Flavell, 1979). Recent studies have highlighted the role of social interactions in facilitating the development of higher order thinking, which sheds light on how learners develop metacognitive skills through interactions inherent in collaborative learning situations (Post, Boyer, & Brett, 2006).

Based on a social constructivist view of learning, this study seeks to explore the relationship between the cooperative-metacognitive setting and writing. While available research on cooperative learning in a classroom provides ample evidence of its positive influence on learning per se, little empirical research has been undertaken to explore how cooperative learning influences writing (Kirschner, Paas, & Kirschner, 2009). Students involved in writing tasks need to engage in various sub-processes, such as information search, argumentation, reasoning, problem solving, evaluation, and verification. This involves the ability to collate various perspectives and to integrate these into the advancement of unified solution strategies. Hence, the implementation of appropriate strategies for learning that facilitate students to peer interact, to argue, to reason, and to negotiate to synthesize the arguments and ideas of others is crucial.

Furthermore, embedded metacognitive guidance or self-regulated scaffolds have been acknowledged empathetically as effective means of improving English writing (Conner, 2007; Negretti, 2012, 2015). Most often, the studies on metacognition in the context of writing are focused on young children (Larkin, 2010; Perry, 1998; Whitebread, Bingham, Grau, Pasternak, & Sangster, 2007). To date, only few studies have focused on the role of metacognition in the acquisition of writing skills of tertiary-level EFL students, with one or two notable exceptions (Kasper, 1997; Ong & Zhang, 2013). This study aimed to improve the English writing of university EFL learners in a cooperative-metacognitive setting. The reciprocal teaching method is one among the most prominent approaches that use cooperative-metacognitive settings and aim to improve reading literacy (Palinscar & Brown, 1984), other cooperative-metacognitive settings include the reflective judgment model (King & Kitchener, 1994) and guided peer questioning (King, 1999). To enhance the role of metacognition in terms of learning and solving problems, Mevarech and Kramarski (1997) designed a multi-dimensional method termed as IMPROVE, which is an acronym for Introducing new concepts, Metacognitive questioning, Practicing, Reviewing and Reducing difficulties, Obtaining mastery, Verification, and Enrichment. The application of this method in science classes enables students to attain a higher level of creative thinking and problem-solving skills (Mevarech, & Fridkin, 2006). However, there is a lack of studies investigating the effects of such method on the writing skills of students. The present study is an attempt to explore this with a focus on the embedded cooperative-metacognitive trainings using the IMPROVE method to examine the writing performance of university students.

1.1. Metacognition

Metacognition generally involves language learners' knowledge and awareness of their own cognitive processes and outcomes (Flavell, 1979). It is considered to have four dimensions: (a) metacognitive knowledge, (b) metacognitive experiences, (c) goals, and (d) actions. Metacognitive knowledge refers to a learner's knowledge about his own self. Metacognitive experiences can be defined as thoughts and feelings that correspond to cognitive tasks. Metacognitive goals are the global and specific objectives of cognitive tasks. And, metacognitive actions refer to as the strategies utilized to achieve those specified goals. A number of researchers have subsumed metacognitive experiences, goals, and actions under the component of regulation of cognition (Baker & Brown, 1984; Schraw, 2009).

Most of the discourses on metacognition differentiate metacognitive knowledge from the metacognitive control process. The metacognitive knowledge refers to what a learner knows about cognition, whereas the metacognitive control process describes how a learner uses that knowledge to regulate cognition. Brown (1987), for example, made a distinction between the two basic components of metacognition—the knowledge of cognition and the regulation of cognition. The knowledge of cognition refers to the knowledge about a learner's own cognition or cognition in general. It has three facets: declarative knowledge, procedural knowledge, and conditional knowledge. Declarative knowledge concerns with the factual knowledge of a person's own capabilities and the factors that influence his performance. In contrast, procedural knowledge refers to the knowledge of executing procedural skills. The conditional knowledge is about discerning the logic to apply various cognitive actions. The regulation of cognition refers to a set of activities that enable learners to attain control on their thinking and learning. Although a number of regulatory skills have been described in the literature, planning, monitoring, and evaluation are the essential elements included in all accounts. Planning deals with thinking and organizing appropriate strategies and allocating resources that affect the performance. Monitoring means to be aware of and observe the task and performance targets. Evaluating refers to appraising the regulatory process and efficiency of a learner's learning ability.

Metacognition is essential for success in learning. An expert learner often possesses three different kinds of metacognitive awareness: declarative, procedural, and conditional knowledge, which help them understand the level of commitment required to apply actions, determination to persevere, interaction with the assigned tasks, and goals achievement (Metcalfe & Shimamura, 1994). In addition, an expert learner utilizes various metacognitive skills to regulate their commitment, disposition, and attention.

Metacognition is supposed to be an innate ability of human beings. Veenman, Van Hout-Wolters and Afferbach (2006) revealed that when students are facilitated to develop awareness of metacognition and use it strategically to influence learning, a considerable variation in their metacognitive adequacy is observed. However, some students improved their metacognitive accuracy when metacognitive exercises were integrated in the class content, but failed to access that knowledge in problem-solving situations (Nietfeld, Li, & Osborne, 2006). On the other hand, some students showed advancement in the regulation of metacognition, but not on the knowledge of cognition (Mevarech & Amrany, 2008). And, some revealed a gap between their domain-specific and general metacognitive knowledge (Mevarech & Fridkin 2006). Yet there might be few students having difficulties in improving their conditional knowledge and skills (Negretti & Kuteeva, 2011). However, metacognitive instruction of self-monitoring and performance feedback can equip students to acquire these skills (Mouzakitis, Codding, & Tryon, 2015).

1.2. Metacognition and writing

Writing is defined as a complex socio-cognitive activity. The complexity lies in the need to have an objective unity of apperception toward a culturally specific sign system and employ the skills to reproduce elements which correspond to this system and also represent ideas and thoughts (Kress, 1982). The Hayes model describes writing as hierarchically and recursively organized processes, where greater cognitive demands on working memory are induced when some processes interrupt other processes (Hayes, 1996). In this cognitive model of writing, text generation is regarded as a problem- solving process provided that writing is goal-oriented, and the writer needs to modify goals as the writing task is in progress. The complexity also lies in the need to transform ideas into written form. For example, the Scardamalia and Bereiter model proposes that writing is developed when knowledge telling is generated and refined to knowledge transformation (Scardamalia & Bereiter, 1986). In other words, writing is a developmental process starting from writing down thoughts retrieved from long-term memory to a much more complex process of transforming this knowledge into a new knowledge structure. In this regard, writers need to employ different cognitive skills, such as planning, evaluation, problem solving, and revision to attain the task goals.

A number of researchers attempted to make improvement in learners' English writing through metacognitive instruction. For example, Larkin (2009) investigated the effects of metacognition on the writing abilities of young children. She recruited 172 sixth-grade students enrolled in five different primary schools in England. The analysis of data from 25 h of video-based observation, teacher reflections, and notes showed that metacognitive instruction enabled learners to make intentional use of metacognitive skills for constructing texts. Independently, Nguyen and Gu (2013) explored nine sessions of metacognitive strategy training for improvement in writing performance. The sessions included 130 participants, who were third-year English-major students, in a Vietnamese EFL context. The participants significantly improved their ability to plan, monitor, and evaluate a writing task much better than their counterparts in the two control groups. These studies support the claim that metacognitive instruction is effective in enhancing metacognitive skills and writing performance of students in different settings.

Previous studies provide evidence to support metacognitive instruction, and the extent of transferability of learning obtained from metacognitive instruction to new situations (e.g., Mevarech & Amrany, 2008; Mevarech & Kramarski, 2003). This raises the question of the extent to which metacognitive knowledge and skills can be transformed to writing tasks other than the tasks in which students were trained to use these processes. It is unknown at present whether learners with metacognitive instruction would see the relevance of these cognitive processes and apply them in a delayed writing task imposing higher cognitive load. As the knowledge transformation becomes more challenging in situations involving a high cognitive load (Hertzog & Dunlosky, 2012), further research focusing on the application of acquired skills to writing tasks that are demanding, stressful, and time-consuming in nature is needed.

1.3. Cooperative learning and writing

Being a communicative act, writing is also considered social. For example, the Flower model describes writing as a process learned and developed within a social and cultural context (Flower, 1994). In this regard, cooperative learning may help learners build the knowledge of relevant strategies for writing that emerges from reflection based on experiences and knowledge garnered within a social world.

Cooperative learning is an essential element of educational research and practice and has often been euphorically advocated as the optimal learning strategy. Previous studies investigated the effects of cooperative learning on students' learning achievement and showed that increased interactivity between students facilitates complex problem solving, development of valid argument, deep processing, and insightful discussions (Gillies, 2004; Kirschner et al., 2009). Thus, cooperative learning may improve their higher-order thinking skills and construct profound knowledge of relevant strategies for writing. However, empirical research also highlights the notion that cooperative learning is not, in essence, more beneficial than other learning settings. According to Slavin (2015), merely assigning students into small groups will not lead to interactive group work and meaningful learning. In this regard, cooperative learning settings need to account for positive interdependence and individual accountability, increase interactivity, and foster interpersonal and social skills to be successful (Slavin & Karweit, 2015). To be able to monitor and reflect upon their learning processes is one crucial factor for a successful collaboration of the cooperative groups (Zion, Michalsky, & Mevarech, 2005). As a consequence, future research is needed to provide sup-

port measures in the form of metacognitive guidance promoting students' elaboration and learning processes while they cooperate for their studies.

1.4. Relevance to the current study

This study is underpinned by two constructs: IMPROVE and cooperative learning. As noted above, the IMPROVE method has previously been used in science education to help students in problem solving. In the cognitive models of writing, text generation is regarded as a problem-solving process provided that writing is goal-oriented, and the writer needs to modify goals as the writing task is in progress (ibid.). Thus, similar to the existing research that highlights the importance of metacognitive guidance to writing, we assume that IMPROVE is an effective method to improve English writing performance. Introducing new concepts (represented as I) is to facilitate learners to identify and assess the characteristics of writing tasks. This can help them formulate their plans and achieve their pre-established goals (Hacker, Keener, & Kircher, 2009). Four types of metacognitive questions (M) were included: comprehension, connection, strategic, and reflection. Comprehension questions address the main idea of the writing task. Connection questions prompt students in analyzing similarities and differences between the current task and the previously completed tasks. Strategic questions guide students to reflect on the specific strategy that might be appropriate for writing. The use of strategy is effective in improving writing (Sitko, 1998). Reflection questions were designed to motivate students to reflect on their learning process during or at the end of the task because the monitoring process is not static but changes as the task develops or alters (Hacker et al., 2009). Practicing (P) helps learners self-regulate their performance in the writing tasks. Reviewing and reducing difficulties (R) involve a set of basic supportive aids in writing, such as guiding students to organize the content for writing, having an overview of the writing goal (Scardamalia & Bereiter, 1986). Obtaining mastery (O) is about orienting learners to attain mastery on different cognitive skills to meet the task goals. Verifications (V) are strategies learners apply to assess tasks and their own personal cognitive abilities (Becker, 2006). Enrichment (E) refines learners' understanding of the tasks they work on. In sum, the IMPROVE method presented substantiate learners' metacognitive awareness in writing test performance. For example, Mevarech and Amrany (2008) conducted a study on 61 Israeli high school students, dividing them into two groups. Approximately half of the students (N = 31) received metacognitive instruction, called IMPROVE, and the others (N = 30) attended regular lessons without explicit metacognitive guidance (control group). The findings revealed that students in the IMPROVE program significantly outperformed their counterparts in the non-treatment control group on problem solving and regulation of metacognition. Thus, we posited that these facets of IMPROVE method would correlate significantly, function in synergy, and collectively explain a significant portion of variance in writing performance.

It is also assumed that cooperative learning is an effective method of improvement in English writing performance. Vygotsky (1978) theorized that learners develop the capacity for self-regulation through social interaction with others who are more knowledgeable. These learners initially assume responsibility for setting goals, planning activities, monitoring progress, allocating attention, and so on. Handling over the responsibility of these executive processes to the learners makes them increasingly capable of regulating their cognitive activities. This transition from other-regulation to self-regulation is regarded as a hallmark of metacognitive development. This was also articulated by Baker (2008), who proposed that peers challenge each other's thoughts and thus advance their cognitive development. Palincsar and Brown (1984) also argued that peer discussion and collaboration help students to monitor their own understanding and build new strategic capabilities. These studies provide the foundation for classroom interventions that involve cooperative learning, which is assumed to affect writing of a high task complexity and cognitive load.

1.5. Research questions

The present study aimed at measuring the extent to which metacognitive-cooperative learning settings impact learners' writing achievement and metacognitive awareness. To this end, three groups were involved: a cooperative learning condition with embedded metacognitive instructions (COOP + META), a cooperative learning condition (COOP), and a non-treatment control group. This study attempted to address three Research Questions (RQ):

RQ 1: Which group does perform the best in English writing?
RQ 2: Which group does maintain the best results in a delayed writing test?
RQ3: Which group does demonstrate the biggest enhancements on the metacognition scale?

2. The study

2.1. Participants

Data were collected from approximately 120 first-year interior design-major students (age 18–20 years), who were enrolled an English writing course at a university in mainland China. The participants were first-year undergraduate students from four classes. They were pursuing to become an interior decoration designer and were learning English as a Foreign Language (EFL). The original number of the participants was 140. The other students were not involved in this research partly due to teacher allocation and partly due to the fear of introducing an intervening variable. The final number of male and female participants was 42 and 78, respectively. Since the students were in the second semester at the time of study, they

had received approximately 36 periods (40 min each) of English writing lessons. The 120 participants were equally divided into three groups: two experimental groups (EG) and one control group (CG). An equal gender mix was included in each group. In this regard, each group included 14 males and 26 females.

The participants in EG1 received cooperative learning plus embedded metacognitive guidance (COOP + META), whereas participants in EG 2 received only cooperative learning (COOP). The CG was a non-treatment group with traditional instruction. Since the present study focuses on English writing learning, the selection of the participants for the three groups was based on their latest writing examination results. The CG had a mean score of 6 out of 15 points, whereas both the experimental groups had a mean score of 6.1 on the same test. The results depict that the differences in writing proficiency among the three groups were not significant ($p = 0.68$, n.s.).

2.2. Training conditions

All the students were allowed to study the English writing course for the same duration, using the same textbook, and completing the same tasks. The reasons why this course was selected are as follows: first, it is a compulsory course in teaching English. Second, for a large extent, it is based on authentic writing tasks. Third, the course is provided for a semester (totally 36 periods, with two periods of 40-min each per week), which is suitable for incorporating metacognitive instructions. Finally, this is the only English course in this semester, and students do not practice English writing directly or indirectly while they study other courses.

COOP + META accounts for 12 periods and COOP accounts for six periods and were incorporated into the 36-period writing course. Also, the CG was a 36-period writing course. The author observed four writing lessons in each of the three groups at the beginning, middle, and end of the writing course. This ensured the fidelity to the intervention and teaching. The delivery of the three groups was vested in the hands of three experienced English teachers. They all were holding Master's degree in English education and had a 10-year experience in teaching English at university level. In both experimental groups, the teachers received training on cooperative learning methods and exemplary cooperative activities prior to the experiment. The teacher responsible for the COOP + META group also received a prefatory training on the IMPROVE method. The teacher in the control group did not receive any specific training on the cooperative learning method or the IMPROVE method. To ensure the consensus on the writing tasks and the curriculum, a joint session of the three teachers was held before the research was conducted.

The two training criteria of COOP + META and COOP were identical in applying cooperative learning. Lesson activities for cooperative learning were developed focusing on three essential components, namely, presentation, process, and reflection. Presentation was about practicing text construction in talk before writing (Teng & Wong, 2015). Process was focused on generating content for writing, which can be described as getting ideas. Reflection was targeted at developing reflection on writing, which can be depicted as thinking about writing. Table 1 presents related examples of cooperative activities.

The only difference between the two experimental groups is the presence or absence of metacognitive instructions. In a simple term, the learners in the COOP + META condition spent six periods on the metacognitive instructions, whereas those in the COOP condition did not receive any metacognitive instructions. Metacognitive instructions for the COOP + META condition were developed using the IMPROVE method (Mevarech & Fridkin, 2006). Metacognitive training consisted of the following two components: the knowledge of metacognition and regulation of metacognition. The metacognitive instruction was based on the principles proposed in a previous study (Veenman et al., 2006) and is listed Table 2.

The main principles for this method are as follows: first, embedding the meta-cognitive self-addressed questions in all students' writing tasks. Second, instructing the learners about the efficacy of the metacognitive activities to make them exert the initial extra effort. Third, intensive practicing of the meta-cognitive activities by training students to apply the meta-cognitive self-addressed questioning in all their attempts to write. Finally, the meta-cognitive self-addressed questions were printed on the students' learning sheets, where they had to contemplate on them in writing.

As indicated, the traditional teaching was similar to the experimental groups, except that learners were not explicitly exposed to metacognitive training and cooperative learning. Thus, the control group studied the usual writing course, which is heavily dependent on the textbook and the teacher. Writing tasks were consistent in all three groups.

2.3. Measures

2.3.1. The pre- and post-writing tests

A comparison and contrast essay written before and after the experiment served as pre- and post-essay tests, which were used for the evaluation of the writing development of the participants. The marking scheme for the two tests was based on the following five components: task response, coherence and cohesion, lexical resource, punctuation, and grammatical range and accuracy. Following the Chinese tradition, the maximum possible score for an essay was 15 points, with 3 points for each component. The tests were evaluated by two experienced writing teachers who did not participate in this research. They were not informed whether the essays being marked were pre- or post-tests. Details of inter-rater agreement are shown in Appendix A. In case when discrepancies arise between the first two raters, a third experienced rater was called upon, and the final score was decided by the majority opinion.

Table 1
Examples of cooperative learning method.

	Activities	Procedures
Presentation	Circle chat	Divide the total number of students into inner cycle and outer cycle The students in the inner circle turn around and face their new partner in the outer circle. The students talk to their partners about how to compose a text according to the task requirements posed by the teacher. Continue this process—practicing text construction in talk each time new pairs are formed—until the students have worked their way around the circle.
Process	Think-pair-share/Write-pair-share	The teacher asks to write an essay that demands analysis, evaluation, or synthesis. Students take a few minutes to think and then turn to a partner and share their responses. Student responses are shared within larger teams or with the entire class during a follow-up discussion.
	Fishbowl debate	Ask students to sit in groups of three. Assign roles. The first student prepares a writing topic for debate, the second student reads and provide ideas, and the third student takes notes and provides his or her own argument.
Reflection	Group problem solving	Present students with a written essay with grammatical mistakes, inappropriate word choices or sentence structures. Reach a final outcome or solution after group discussion.

Table 2
Metacognitive instructions.

Metacognition	Meta-cognitive self-addressed questions in writing
Knowledge of cognition	(i) What is writing all about? Take some notes. (ii) What factors will influence our performance in writing? (iii) What strategies can be accessed efficiently for developing a good writing sample? Explain your reasoning. (iv) How should we proceed to develop a solution and in which way can we apply the strategies from previous learning experiences? Quote some. (v) When and why can we use knowledge or strategies to improve our writing?
Regulation of cognition	(i) What background knowledge do you have about planning, monitoring, and evaluating English writing task? (ii) Do I set reasonable goals for this writing? (iii) How should we plan the content of the essay before writing? Quote some, for example, what to write about, what views on the topic were, how to support their views, and how to present information. (iv)What strategies should we use to plan the language content of the essays (v) How should we organize the content for writing? Quote some, for example, how to organize ideas, language use, etc. (vi) How should we monitor a writing task? For example, what are the similarities and differences between the task at hand and tasks that we have solved in the past? (vii) How should we evaluate a writing task? For example, does the writing make sense? Can I write differently? Did I consider all the relevant information?

2.3.2. The delayed writing test

The delayed writing test, administered one month after the experiment, was the end-of-term examination for all students. The test was designed, supervised, and administered by the teaching faculty of the Department of Teaching English for Non-English Majors. Unlike the comparison and contrast essay in previous tests, this test required the students to compose an argumentative essay. An informal interview with the students of the same background revealed that it is more difficult and

time-consuming to write an argumentative essay than a comparison and contrast essay. As official permission was obtained for the study, the marking criteria for the test were the same as that of the pre- and post-tests.

2.3.3. Metacognition scale

A self-reporting Metacognitive Awareness Instrument (MAI), designed by Schraw and Dennison (1994), was adopted to assess general development of metacognition. This instrument was based on eight attributes, namely, declarative knowledge, procedural knowledge, conditional knowledge, planning, monitoring, evaluating, information management, and debugging strategies. The first three attributes were subsumed into the knowledge of cognition and the last five attributes were categorized under the regulation of cognition.

This instrument consisted of 52 items and mainly comprised statements that were measured on a 5-point Likert scale (1 = never; 5 = always). Potential changes in metacognition were elicited by administering the same set of MAI at the beginning and the end of the program. Cronbach's alpha was found to be $\alpha = 0.75$ for the pre-test and $\alpha = 0.78$ for the post-test.

2.3.4. Interview

The interviews were conducted in a quiet classroom. Students were shown a recently completed contrast and comparison writing task from the course. Few examples of questions are presented in Appendix B.

The average time for each interview was 3 min, with a total of 90 min for 30 participants. The three teachers transcribed and analyzed the interviews, in one accord.

2.4. Procedures

All students were administered the writing pre-test and the metacognitive awareness questionnaire prior to the study. Then, students were equally assigned into one of three groups. One group studied the course by using IMPROVE and COOP. The second group studied the course by using COOP. The third group was exposed to the traditional teaching. At the end of the 18-week study, all students were administered the post-test and the meta-cognitive awareness questionnaire. On the completion of the questionnaire, a total of 30 students, with 10 students randomly selected from each group, were interviewed. Finally, one month after the experiment, all students took the delayed test.

2.5. Use of triangulation

The researcher selected triangulation for the research methodology and this involved a questionnaire to be analyzed quantitatively and an interview to be analyzed qualitatively. Structured questionnaires and semi-structured interviews are often used in mixed method studies to generate confirmatory results. While questionnaires can provide evidence of patterns among large populations, qualitative interview data serve as useful means to gather a more in-depth insight on participant attitudes, thoughts, and actions (Brown, 2001). Furthermore, questionnaire employed in this research yielded the greatest amount of data and previous research on strategies used for writing by Petric and Czarl (2003) has highlighted the importance of using triangulation with such data.

Data collected from writing tests were analyzed using one-way ANOVA to compare the mean scores of three groups. Repeated-measure ANOVA was used to measure the same subjects at different points in time after the intervention to measure the improvement. The post-hoc test was used to find out where these differences lie across three groups.

3. Results

3.1. Enhanced writing performance

The ANOVA results revealed insignificant differences in the pre-intervention writing scores (F (2, 85) = 2.121, $p > 0.05$, n.s.). This scenario allowed repeated-measures ANOVA, with 'writing scores' as the dependent variable. Table 3 presents descriptive statistics and ANOVA results comparing the mean scores of the three groups for pre-, post-, and delayed writing tests.

As is described in Table 3, improvements were seen in writing scores of all the three groups, immediately after intervention. The EG1 (COOP + META) achieved the greatest mean score of 10.784, indicating an increase of 4.553 marks compared to the mean score of the pre-test. Also, the mean score of EG2 (COOP) was 8.692, indicating an increase of 2.56 marks compared to the pre-test. However, the mean score of CG was 6.645, resulting in a marginal increase of 0.473 marks. The ANOVA results (F (2, 80) = 8.652, $p < 0.001$) indicated significant differences for the post-test mean scores of the three groups. Post-hoc comparisons of scores are presented in Table 4.

Table 4 illustrates that both experimental groups significantly outperformed the control group ($p < 0.001$). Also, the results revealed that there was a significant difference between the two experimental groups ($p < 0.001$), which indicates that the COOP + META group was benefited by the metacognitive guidance.

Mean scores of the delayed writing test dropped across the three groups (Table 3). However, EG1, with a mean score of 9.191, managed to maintain the highest score. The mean score of EG2 was 7.135. Also, the mean score of CG was only 5.892, which was lower in comparison to the mean score in the pre-test. The data revealed statistically significant differences in

Table 3
Pre-, post-, and delayed tests across three groups.

	Group	Mean	S.D.	N	F	Significance
Pre-test	EG1	6.231	1.435	40	2.121	0.205
	EG2	6.132	1.345	40		
	CG	6.172	1.306	40		
	Total	6.178	1.362	120		
Post-test	EG1	10.784	1.321	40	8.652	0.000
	EG2	8.692	1.331	40		
	CG	6.645	1.335	40		
	Total	8.707	1.329	120		
Delayed test	EG1	9.191	1.387	40	7.952	0.000
	EG2	7.135	1.332	40		
	CG	5.892	1.291	40		
	Total	7.406	1.336	120		

Table 4
Post-hoc comparisons of writing scores across three groups.

Tests	(I)Group	(J)Group	Mean difference (I-J)	Standard error	Significance
Pre-test	EG1	CG	0.509	0.374	0.181
		EG2	0.272	0.368	0.211
	EG2	EG1	− 0.272	0.368	0.211
		CG	−0.636	0.354	0.128
	CG	EG1	−0.509	0.374	0.181
		EG2	0.636	0.354	0.128
Post-test	EG1	EG2	1.599**	0.457	0.000
		CG	1.881**	0.462	0.000
	EG2	EG1	−1.599**	0.457	**0.000**
		CG	−1.672**	0.472	**0.000**
	CG	EG1	−1.881**	0.462	**0.000**
		EG2	1.672**	0.472	**0.000**
Delayed test	EG1	EG2	1.636**	0.415	**0.000**
		CG	1.378**	0.412	**0.000**
	EG2	EG1	−1.636**	0.415	**0.000**
		CG	−1.392*	0.420	**0.001**
	CG	EG1	−1.378**	0.412	**0.000**
		EG2	1.392*	0.420	**0.001**

Note: $^*P < 0.05$ $^{**}P < 0.001$.

Table 5
Within-participants effects for three tests across three groups.

Source	Sum of squares	df	Mean square	F	Significance
Tests	39.841	2	60.924	27.622	0.000
Tests*Group	15.773	4	6.393	3.881	0.001
Error(Tests)	125.621	160	1.542		

Table 6
Between-participants effects for three tests across three groups.

Source	Sum of squares	df	Mean square	F	Significance
Intercept	8631.461	1	8431.562	1453.672	0.000
Group	65.804	2	34.765	6.621	0.000

the delayed test among the three groups ($F(2, 80) = 7.952$, $p < 0.001$). Post-hoc comparisons shown in Table 4 revealed that the two experimental groups performed significantly better than the control group ($p < 0.001$), and EG1 outperformed EG2 ($p < 0.001$).

Moreover, the scores of the three tests, presented in Tables 5 and 6, reveal significant differences among the three groups.

In addition, Tables 5 and 6 show that the EG1 group outperformed the other two groups, indicating significant improvements in writing abilities during the interventions and the delayed writing test conducted one month post-intervention. This finding provided evidence for answering the first two questions: which group did produce and maintain the best learning outcomes in written English? These results also suggest that metacognitive guidance integrated with cooperative learning methods could be considered as an effective and pragmatic approach to teach second language writing.

As mentioned above, the delayed test required students to compose an argumentative essay, and this task did not bear any resemblance to the comparison and contrast essay writing task that were used to evaluate students in the pre- and post-tests. The results of the delayed test indicate that the learners in the EG1 were able to maintain an edge over the other two

Table 7
Mean scores and standard deviations on knowledge of metacognition by time and treatment.

	COOP + META	COOP	Control
Pretest			
M	3.641	3.612	3.614
SD	0.71	0.81	0.67
Posttest			
M	3.692	3.684	3.679
SD	0.69	0.65	0.61

Table 8
Mean scores and standards deviations on regulation of metacognition by time and treatment.

	COOP + META	COOP	Control
Pretest			
M	3.664	3.678	3.689
SD	0.65	0.64	0.71
Posttest			
M	4.221	3.987	3.709
SD	0.78	0.64	0.61

Table 9
Percentage of interviewees' responses on each category.

	COOP + META	COOP	Control
Reflective thinking before writing event	80	40	10
Content planning	70	50	20
Better content organization	70	40	10
Monitoring written progress	80	40	0
Implementing appropriate strategies	90	50	0
Evaluating written matter	80	60	10
Constructing connections	80	50	0

groups by extending the use of metacognitive skills beyond the comparison and contrast essay. The EG2 also outperformed the CG in the post-test and the delayed test. This shows the positive impact of COOP condition on learners.

3.2. Metacognitive awareness

With regard to the knowledge of cognition, a one-way ANOVA was conducted to investigate possible differences among the three groups during the pre-test. There were no significant differences among the three groups at pre-intervention (F (2, 125) = 3.021, $p > 0.05$, n.s.), thereby leading to data analysis through the employment of a repeated-measures ANOVA. Table 7 presents the mean scores and standard deviations of knowledge about cognition by time and treatment.

Repeated-measures ANOVA revealed no significant main effect of time ($F (2, 85) = 3.052$, $p > 0.05$, n.s.), or for the treatment ($F (2, 85) = 3.661$, $p > 0.05$, n.s.). An insignificant interaction effect between treatment and time ($F (2, 85) = 4.551$, $p > 0.05$, n.s.) was also observed.

With respect to the regulation of cognition, a one-way ANOVA was also conducted to examine possible differences among groups at the pre-test. The results did not reveal significant differences before the experiment ($F (2, 85) = 3.875$, $p > 0.05$, n.s.). Table 8 presents the mean scores and the standard deviations of regulation of cognition by time and treatment.

The post-intervention data were also analyzed with repeated-measures ANOVA. The results indicated a significant main effect of time ($F (2352) = 87.06$, $p < 0.05$), as well as of the treatment ($F (2352) = 122.06$, $p < 0.001$). The interaction effect between treatment and time was also significant ($F (2352) = 65.12$, $p < 0.05$). A post hoc Tukey's test revealed that participants in the COOP + META condition outperformed their counterparts in the COOP condition ($p < 0.05$). Similarly, participants in the COOP condition also outperformed their counterparts in the control group ($p < 0.05$).

These inferences answered the third research question: which group did demonstrate the highest improvement at the metacognition scale? Results indicated that students in the COOP + META condition outperformed their counterparts on regulation of cognition, but not on knowledge about cognition.

3.3. Analysis of interviews

Based on the interviews, the interviewees' responses were classified into seven categories. For example, when asked, "*Did you do a lot of thinking before writing?*" A student answered, '*Now I do a lot thinking before I begin to write an essay*.' This response was included in the first category (reflective thinking before writing event).

Table 9 presents the percentage of interviewees' responses on each of the seven categories.

3.3.1. Reflective thinking before writing event

Eight students in the COOP + META condition (80%) contemplated before a writing task. For example, a student said, "*The way I approach a writing task has changed after receiving instructions given by teachers. Now I do a lot thinking before I begin to write an essay.*" Four students in the COOP condition (40%) stated that their capacity to reflect before attempting a writing task has increased significantly. In contrast, only one student (10%) in the control group conducted contemplation before writing. A significant percentage of students stated, "*I simply read the information and started to write.*"

3.3.2. Content planning

Seven interviewees in the COOP + META condition (70%) said that they tried to plan the content before writing. For example, a student said, "*Now I realize how important it is to plan the content before writing an essay. Planning the content in advance reduces my writing time.*" Five students in the COOP condition (50%) agreed to this assertion. However, the students in the control group responded differently. The data show that only two students (20%) planned the content well before writing.

3.3.3. Better content organization

Approximately 70% of the interviewees in the COOP + META condition reported that they focused on organizing their essays. For example, a student said, "*Now I know how to choose important ideas and organize them in my writing. I used to write as much as I could in my essay*." Four students in the COOP condition (40%) reported that they would henceforth organize their essays. Whereas only one control student (10%) said that he organized the ideas well before writing, others in the group stated that they did not consider organizing content as an important activity in view of limited time available for completing a task.

3.3.4. Monitoring written progress

Eight interviewees in the COOP + META condition (80%) reported that they tried to monitor their writing, despite the perceived lack of time. One student said, "*Now I will simply move on when I get stuck with one idea during a writing activity. I will come back and contemplate on the idea after finishing the rest of the essay. I used to pause and ponder over the idea, which left me with little time to finish the essay. It is just a waste of time.*" Four students in the COOP condition (40%) agreed on the importance of monitoring. However, students in the control group did not respond to the category, which might imply that students in the CG never attempted to monitor their writing.

3.3.5. Implementing appropriate strategies

Approximately 90% of the COOP + META interviewees reported that they attempted to search for an appropriate strategy for improving writing skills. For example, a student said, "*I searched for strategies that could improve writing skills. One of the strategies enabled me to improve paragraph coherence in my writing.*" Another student added, "*Now I will try to find a consistent writing process across all different types of writing assignments. Initially, different requirements of different writing assignments caused confusion*." Five students in the COOP condition (50%) also attempted to search for a writing strategy. One student said, "*The cooperative group work requires me to create a strong and focused introduction that can make an impact on my partner.*" However, students in the control group never reported about exploring a strategy. The CG students confessed that they simply followed the teacher's instructions and started their writing assignments.

3.3.6. Evaluating written matter

With an exception of two participants, all other COOP + META interviewees described the manner in which they evaluated their writing. One student said, "*I rechecked spelling and grammatical mistakes after finishing my writing.*" Another student added, "*I checked content, clarity, form, and style for my completed essay. I also checked if I have provided enough evidence to develop my ideas.*" Six students in the COOP condition (60%) also agreed on the importance of evaluating. Nine students in the control group said that they did not check their writings because of time constraints, and some students expressed the lack of knowledge on methods for evaluating own writings.

3.3.7. Constructing connections

Approximately 80% of IMPROVE interviewees said that they attempted to construct connections between the task on the exam and the tasks that they had solved in the course. For example, a student commented, "*It reminded me the tasks I solved in class*" or "*It reminded me the connecting points between the tasks being examined and other tasks that I completed. I do not think that I could get to the function by myself.*" About half of the COOP interviews expressed similar comments. The control students, however, responded differently. They commented, "*I did not check for myself to see if the task is familiar.*"

3.3.8. Unexpected interview data

As noted above, 90% of COOP + META interviewees reported that they attempted to search for an appropriate strategy for improvement in English writing skills. However, none of them presented evidence to the questions, such as "What strategies did you use in writing? 'When and why did you use the strategies?' Conditional knowledge about cognition seemed not to be improved. Learners did not tend to have more knowledge about their own cognition and were not able to describe that knowledge. This incapability of knowledge about cognition is also revealed by the following question: "What factors have

influenced your writing?" None of the students in the three groups clearly stated related factors that influenced writing. Even COOP + META students experienced great difficulty in providing explicit descriptions of their own cognition. Some students seemed to be less able to provide answer in this regard. The main reason for not locating any of the contradictory data when it comes to corroborating the quantitative data with the interview data (qualitative data) is that some students were less able to verbalize.

As described above, a few students who received the traditional teaching also showed improvement in regulation of cognition (e.g., planning and evaluating). This can be explained as that an ability to plan and evaluate about this process also develops throughout this traditional teaching for this course, although not dramatically.

4. Discussion and conclusions

The present study addressed (a) whether students attain a higher level of English writing achievement and metacognition as a result of being exposed to metacognitive instruction; and (b) the extent to which students who were exposed to metacognitive instruction were able to implement meta-cognitive processes in a delayed, stressful situation, in our case, being examined by writing an argumentative essay. Three groups were involved: COOP + META (EG1), COOP (EG2) and a control group.

Results revealed that both training groups outperformed the control group in terms of writing performance. Combined with previous research findings (Kirschner et al., 2009; Slavin, 1996), the structured cooperative learning setting is beneficial for students' writing performance. Additionally, the EG1 outperformed the EG2. One possible explanation might be that metacognition training facilitated natural cooperation among the students. This might equip students to employ higher-order thinking skills and harness creativity to enhance writing. Writing accomplishments for EG1 are in line with previous studies on metacognition training (Conner, 2007; Larkin, 2009; Nelsi & Susana, 2008). The only difference found in the present study was that students extended their metacognition skills to other forms of writing. This may be explained as learners grow while writing for different purposes and in different contexts. They build a repertoire of strategies which can be drawn upon for a new writing task. Combined with previous findings (Nguyen & Gu, 2013), it is suggested that metacognition training contributes toward enhancing the writing performance of learners in different age groups and in a variety of contexts.

Although there are evidences that highlight the impact of metacognition training on the construction of written texts, not all metacognitive experiences influence production of written communication. For example, the mean score of EG1 is 10.784 out of 15 in the present study, which reveals that a few students might not have benefited from the training. This shows a complex interaction between metacognition and writing. As writing is a highly genre-based activity, it might be beneficial for training students' metacognitive knowledge of genre-relevant aspects. This instruction may help students adapt their writing strategies to changing social dynamics and develop a conscious understanding of target genres (Negretti, 2009; Negretti & Kuteeva, 2011).

Based on the post-intervention measure for metacognition, results indicate that all groups, including the control one, improved on the regulation of metacognition. It was also observed that students in the COOP + META condition developed better self-regulation than their counterparts in the COOP condition and CG. As in previous studies (Mevarech & Amrany, 2008; Veenman et al., 2006), students in COOP and CG group could not perform at par with COOP + META condition. Additionally, the differences among groups were statistically significant. Given this, one might argue that students, who attended the COOP + META condition, benefited from the metacognitive instructions. This suggests that self-regulating behaviors can be taught in class time and students seem to be able to quickly learn to apply these behaviors without prompting. Once the behaviors are internalized, students continue to use them but focus their attention on the content they are learning, which may improve their writing performance.

However, results also showed that the metacognitive instruction did not exert positive effects on learners' knowledge of cognition. Several explanations for no positive effects are possible. First, knowledge about cognition does not guarantee a high degree of regulation. It is possible that students who acquired knowledge of cognition, not necessarily regulated their cognition, as was also found in previous studies (e.g., Veenman et al., 2006). Second, the metacognitive instruction that was employed in the present study emphasized more on the regulation of cognition, rather than knowledge about cognition. This may explain the significant differences between the groups regarding the regulation of cognition, and the insignificant differences on knowledge about cognition.

Data collected from the interviews corroborated the research findings. However, the data of the interviews should be considered with caution. First, some students were less able to verbalize and thus sufficient data related to the knowledge of cognition were not gathered even though the statistical findings showed no differences across the three groups. Second, although teacher in the COOP + META condition explained the metacognitive questions and their function, students may not have acknowledged their usefulness, which may be the reason that they did not invest the extra effort that is needed for successful metacognitive instruction. Third, the knowledge of certain behavior or strategies is used to support other behavior or strategies so learners are less consciously aware of them. This may be due to the paucity of choices on the MAI. Finally, some of these processes have developed without any conscious reflection and therefore are difficult to report to others.

Therefore, the findings with respect to learners' metacognitive awareness need further analysis and examination. There are two other reasons to be cautious about when interpreting these results. First, the number of participants is limited, and although the results may show statistical significance, it might be better to consider these findings as tentative. Second,

metacognition itself was seen as a complex process (Flavell, 1979), and although many studies on metacognition training have been conducted, the relationship between writing and metacognition has not been clearly delineated (Zinchuk, 2015). However, judging from the present study, it appears that the findings are intriguing enough to warrant further research. Further research must be conducted using a bigger sample, and equal emphasis must be placed on the amount of training to be provided for knowledge about cognition and regulation of cognition.

Findings concluded from the present study have theoretical and practical implications. First, learners can transfer their regulatory skills of metacognition to other types of writing, which is regarded as the transfer of knowledge. This transfer of learning is described as a process that measures the effective extent to which past experiences (the transfer source) can be applied in a new situation to improve learning and performance (Pugh & Bergin, 2006). This is an important goal in an educational setting, as it is essential for learners to develop the skill of applying acquired knowledge inside and outside the classroom, specifically in new cases. This resonates with the Gestalt theory of learning (Ikehara, 1999). With respect to teaching how to write effectively, students should be encouraged to discover the underlying nature and overall structure of a writing task.

Second, learners may possess a certain level of metacognitive knowledge. However, further achievements on the knowledge of cognition were found to be difficult. This suggests that systematic and explicit metacognitive training might be needed to equip students to use this knowledge in an effective manner. One reasonable conclusion is that students have to be trained to regulate their learning, as shown in the present study, and in other studies (e.g., Schraw, 2009). In this regard, teacher needs to instruct students on how to set goals, plan to meet them, and practice self-monitoring and adapting.

Third, the positive effects of the COOP + META condition on both writing achievement and regulation of cognition seemed to be linked with the gradual transfer of responsibility from the teacher to the students. The teacher gives theoretical background for a task and gradually guides the learners to develop creative thinking skills. Students accept responsibility for their own learning and direct this learning through the cognitive processes to the academic spectrum, and finally implement it in their workplaces without the necessary guidance of the teachers (Fisher & Frey, 2008). As shown in other studies (Jason, 2009; Nguyen & Gu, 2013), it is essential to facilitate the gradual transfer of responsibility from the teacher to learners, thereby promoting learners' writing performance.

Fourth, cooperative work also seemed to be a factor that has contributed toward achievement in writing and regulation of cognition. In this regard, learners were given opportunities for peer-correction. This motivated the students to practice writing through regulatory skills of metacognition. There is ample evidence for supporting peer-correction in writing (Suzuki, 2008; Yang, 2011). In this regard, students should be provided opportunities to correct and evaluate others and themselves.

The present study had certain limitations. Firstly, different kinds of metacognitive instructional methods were not analyzed, such as the Strategy Evaluation Matrix (SEM), which might favor the development of the knowledge of cognition (Schraw, 2009). Secondly, this exploratory study was limited only to 120 tertiary level students from the same ethnic group at a university. Moreover, performance due to gender difference was not analyzed. Female learners may outperform male learners in the use and choice of strategies and skills (Conger & Long, 2010). Thirdly, the interval between the writing task and interview is also a limitation because there might be a memory loss. Finally, future studies should also focus on whether metacognition is reliant on co-operative learning. In this regard, future research can be conducted by having a fourth group of metacognition only.

Appendix A. Details of inter-rater agreement on writing tests

A Calculation of Inter-rater Agreement on Writing Performance (pre-test)

Marking scheme	Rater A Number of ratings	Rater B Number of ratings	Number of ratings that agree	Total number of ratings
1. Task response	120	120	110	120
2. Coherence and cohesion	120	120	115	120
3. Lexical resource	120	120	115	120
4. Punctuation	120	120	115	120
5. Grammatical range and accuracy	120	120	115	120
		Sum	570	600
		Percent	95%	

A Calculation of Inter-rater Agreement on Writing Performance (post-test)

Marking scheme	Rater A Number of ratings	Rater B Number of ratings	Number of ratings that agree	Total number of ratings
1. Task response	120	120	115	120
2. Coherencee and cohesion	120	120	116	120
3. Lexical resource	120	120	115	120
4. Punctuation	120	120	115	120
5. Grammatical range and accuracy	120	120	115	120
		Sum	576	600
		Percent	96%	

Appendix B. Questions for interview

Did you do a lot of thinking before writing?
What factors have influenced your writing?
Did you plan the content for your writing?
Did you organize the content for your writing?
Did you monitor your writing?
What strategies did you use in writing?
When and why did you use the strategies?
Did you try to check your writing?
Did you find the task being examined have something connecting with the tasks completed in class?

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