

LEARNERS' WRITING SKILL AND SELF-REGULATION OF LEARNING AWARENESS USING COMPUTER-ASSISTED ARGUMENT MAPPING (CAAM)

by **Roderick Julian Robillos**

Faculty of Education, Khon Kaen University, Khon Kaen, Thailand

rodero @ kku.ac.th

Abstract

Software and digital visual mapping tools have recently been implemented by educators and academics for several educational and related purposes. The current study was set out to explore the effect of using CAAM on Thai EFL learners' argumentative writing performance and their self-regulation of learning awareness. A total of 28 freshman students were purposively selected as the subjects of the study. The researcher used a mixed-mode method type of research involving a pre- and post-test design. Data was collected from a single group of participants who participated in eight sessions based on the use of CAAM in their writing processes. A Self-Regulation of Learning Scale (SRS) was utilized to identify the students' awareness of their self-regulation of learning. The results reveal that the CAAM method used by the respondents made noteworthy gains on their argumentative writing performance across task achievement, coherence-cohesion, lexical resource and grammatical range and accuracy, as indicated by a significant difference between their pre- and post- test results. Furthermore, four out of six components of SRS reveal a significant relationship with their writing performance indicative that the respondents have become more cognizant of their self-regulation in terms of planning, self-monitoring, effort and self-efficacy. Finally, qualitative findings reveal that the respondents had positive feelings about using CAAM in their writing processes as well as enhanced their awareness on their self-regulation of learning.

Keywords: Computer-Assisted Argument Mapping; argumentative writing; self-regulation of learning awareness

1. Introduction

One necessary requirement for learners in their undergraduate studies is writing; however, developing an effective writing competency is a tough undertaking for them (Malmir & Khosravi, 2018; Robillos & Phantharakphong, 2020). One of the main problems among students is that many of them cannot develop their writing skills, mostly the ones who are making compositions in a foreign language. Knowledge of the task and content, lexical complexity, coherence and cohesion apart from the fluency of ideas are just some of the

difficulties relating to the development of an effective writing ability (Malmir & Khosravi, 2018). These difficulties and challenges get even more complex when different genres of writing are taught (Hyland, 2013). Writing genres (e.g. argumentative), according to Weigle (2013; Harrel & Wetzel, 2013), add to the inherent complexity involved in second language writing because of their special lexical and syntactical grammar apart from its structural organizations. These difficulties are overloading the learners' cognitive load and need to be reduced in order to acquire new information. In order to facilitate the acquisition of new schemas which are representations of either concepts or problem-solution procedures, Sweller (1994) recommends reducing the extraneous mental load during the learning process. One common method of reducing unimportant cognitive load is by using graphic organizers such as maps and diagrams to help supplement regular reading and instruction (Harrel & Wetzel, 2013). Mapping assists learners to gain more engagement in their process of writing. Humans are highly visual and mapping may provide students with a basic set of schemas with which to understand argument structures. The current study is aimed at investigating the effectiveness of an alternative teaching method that incorporates mapping to improve argumentative abilities in writing essay.

On the other hand, Self-Regulation of Learning (SRL) has emerged as an important new construct in the field of education (Soureshjani, 2013) as evidenced by a variety of studies that have been conducted in recent years (Pintrich, 2000; Pintrich & Schunk, 2002; Cleary & Zimmerman, 2004; Boekaerts & Cascallar, 2006; Zimmerman, 2008; Taghizadeh, 2016). Self-regulated learning is an active process whereby learners set goals for their learning and then monitor, regulate and control their cognition, motivation, and behaviour guided and constrained by their goals and contextual features of the environment (Pintrich, 2000). Zimmerman (1986) described that self-regulated learners systematically use metacognitive, motivational and behavioral strategies and proactively participate in their own learning processes. Those learners who self-regulate establish goals for their learning supervise, assess, and self-reflect upon their learning (Robillos, 2020). The use of CAAM stimulates students to have self-reflection on a particular task and help design a continuous monitoring and evaluating learning after an activity is completed. Susilowati (2015) notes that monitoring is a stage that helps trigger students to make self-reflection because they have already known their position in the task. It is notable that CAAM guides students to engage in critical thinking (Harrell and Wetzel, 2013) since the processes involved in CAAM are controlled by proper planning and monitoring during the process that raises students' self-reflection. With their critical thinking, reflection can optimize learners' self-regulated learning abilities. Learners who are self-regulated in their

learning are likely to become more capable of interpreting the signs of changes continuously. Self-regulatory capacity interacts with cognitive factors, and they separately and jointly affect writing processes, which include the planning, formulation, transcribing, and editing of writing (Pahlavani & Maftoon, 2015).

In the Thai EFL context, no studies to date have investigated the use of argument maps for improving EFL learners' argumentative writing performance and for promoting their self-regulation of learning. Therefore, the current study is aimed at investigating this research gap in EFL writing literature to further determine the role of CAAM on EFL learners' argumentative writing performance across writing components such as task achievement, coherence-cohesion, lexical resource and grammatical range and accuracy as well as their self-regulation of learning awareness.

2. Conceptualization of the study

Argument mapping (AM) is, roughly, making a picture of reasoning. AM, which is also known as argument diagramming or argument visualization, is a visual diagram that organizes a text-based argument into a hierarchical representation, with propositions arranged in a coloured boxes and connected by arrows that highlight the relations (i.e. *because, but, however*) between propositions (Dwyer et al., 2012; van Gelder, 2007). Argument mappings are designed in such a way that if one proposition is evidence for another, the two will be juxtaposed (van Gelder, 2007). As Dwyer (2011) and Dwyer et al. (2012) describe, these organizational features have been hypothesized in past research to facilitate metacognitive processes both by making the structure of the argument open to deliberation and assessment, and by revealing the strengths and weaknesses of the arguments in an argument structure.

AM has been used for language teaching in general (e.g. Davies, 2009) and in L2/EFL writing in particular (Harrell and Wetzel, 2013; Malmir & Khosravi, 2018). This method has been carried with the use of manual and computer-based argument mapping strategies for enhancing L2/EFL learners' critical thinking which is considered as the foundation of many language skills and sub-skills (Chamot, 1995; Eftekhari et al., 2016). Some investigations have supported the efficacy of using argument mapping method for EFL text comprehension (Harrell & Wetzel, 2013). For example, Dwyer et al. (2010) examined the effect of prose-text versus argument maps on reading comprehension and memory ability. The findings of their study contrasted other studies; they found that learners who used argument maps as pre- and post-reading tools perform better than others who practiced residing through prose-text explanation

on tests of memory but the reading comprehension of both study groups did not differ significantly.

Argument maps have also been used for teaching L2 writing, indicating their effective use. Harrell and Wetzel (2013) claimed that using well-designed argument diagrams (AD) can both improve L2 learners' critical thinking and writing performance among first year language learners, stressing that argument maps ignite learners' schemas which are necessary in argumentative writing. Also, Davies (2010) compared the effect of argument, concept, and mind maps on ESL learners' writing enhancement, claiming that argument maps were more effective than the other two kinds of maps for teaching second language writing. Argument mapping method assists EFL learners to produce more developed and coherent written outputs (Dwyer et al., 2010). Gray (2012) backed up Dwyer et al.'s (2010) view and stated that argument maps can trigger L2/ EFL learners' critical thinking and problem-solving abilities and therefore optimize their writing performance. Added to this is the study conducted by Pinkwart et al. (2009), who reported that the use of argument maps enhances second language learners' writing specifically the argumentative type of writing.

The development of software programs has facilitated the process of constructing maps for the users. Further, it was the marriage of the mapping and the Internet that launched a completely new world of applications and uses for mapping as exemplified by the CmapTools software (Canas et al., 2004). CAAM as one of the computer-based instructional software programs is aimed at enhancing students' critical thinking since it provides an easy way to conduct diagram reasoning on any given topic (Davies, 2009). It also helps ones' own thinking and reasoning (van Gelder, 2007).

In CAAM, when writers draw reasoning through the process of mapping, they will have a fully refined conception of the reasoning in their mind. Thus, they will be better capable of distinguishing gaps and ambiguities. As a result, the reformation of mistakes would be possible. According to Davies (2009), in CAAM, arguments are considered as philosopher's sense of statements (premises) which are joined together to result in claims (conclusions) in a top-down arrangement. Arguments are followed by supporting claims with linkers in the map with different colours. The end of the argument tree is composed by basic boxes which provide defence for the main claims. These boxes also need support claims such as statistics, expert opinions, quotations and the like which can be accessed in CAAM. Figure 1 shows an example of an argument map produced with Rationale Software (van Gelder, 2007)

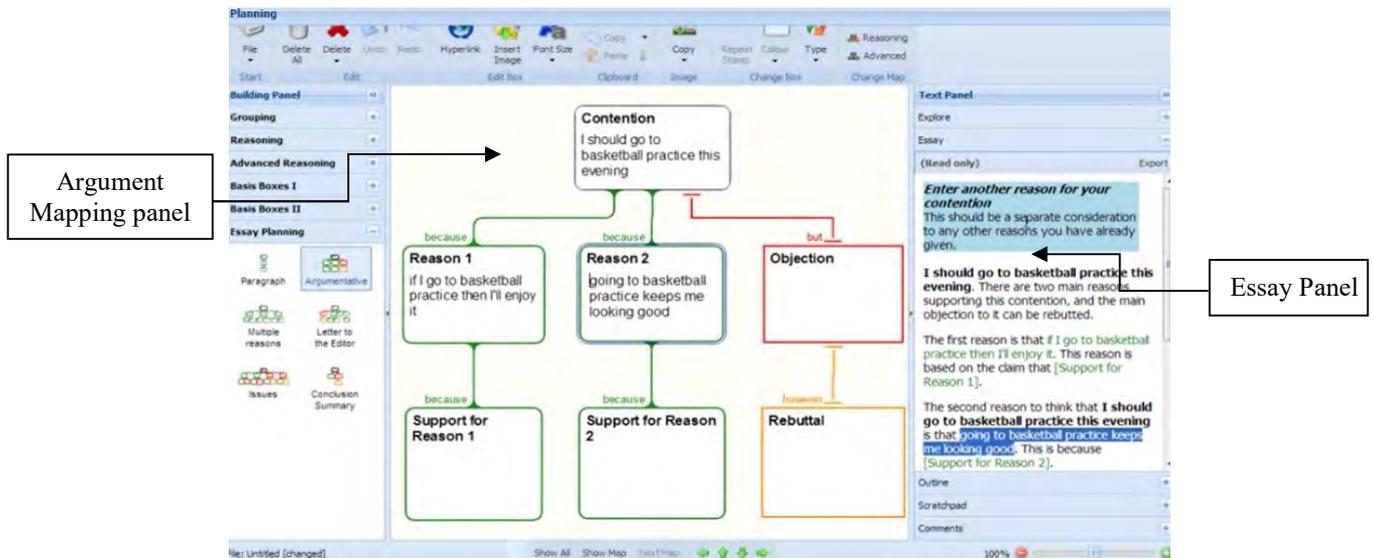


Figure 1. A sample of an argument map produced using Rationale Software (van Gelder, 2007)

A student using CAAM in accomplishing his/her argument map in the panel provided for him/her can possibly check his/her essay in another panel simultaneously getting support to be conscious of coherence and cohesion during the mapping process.

Recent research reported that individual differences such as personality traits, learning styles and strategies, motivation, beliefs and self-regulation, could predict success in language learning (Dornyei, 2005; Wang, Kim, Bong, & Ahn, 2013). Researchers are increasingly directing their research efforts towards the important role of learners' thoughts, beliefs, and cognitive/metacognitive behaviors to learn different second language skills successfully and writing skill is no exception to this. It has been suggested that individuals who self-regulate well must: (1) plan how to approach a task in advance of their actions, (2) self-monitor their improvement during task performance, (3) evaluate both process and outcome after the execution of their plan, (4) during cycles of planning, self-monitoring, and evaluation, reflect upon the learning process, meaning that they put their knowledge into action and increase the number of strategies they can use, which gives them more possibilities to approach and perform future tasks (Ertmer & Newby, 1996). It has been assumed that, besides knowing what aspects to improve and how to improve them, self-regulated learners must be motivated to improve (Zimmerman, 2006). Self-regulated learning research among students revealed that motivational outcome variables (e.g., effort) and motivational beliefs (e.g., self-efficacy) were positively linked to cognitive and metacognitive strategy use (e.g., Pintrich & Schunk, 2002; Schunk, 2001). Ericsson et al. (1993) stated that individuals must be willing to invest maximal efforts to improve and sustain these efforts over years in order to reach optimal levels of performance. For EFL learners, writing seems very difficult to accomplish because the

difficulty is not only within generating and organizing ideas, but is also about translating these ideas into readable texts. It also involves highly complex skills such as planning, monitoring, evaluating, skills apart from spelling, word choice and the like. Learners' awareness on their self-regulation of learning enables them to succeed in their learning endeavors (Robillos, 2019). In previous studies, the effectiveness of self-regulated strategies on L2 / EFL writing has been investigated (Graham & Harris, 2005; Harris et al., 2008; Robillos, 2020). Furthermore, computers and technological devices have been at the service of EFL writing learning and teaching as they enhance learners' motivation, interest, and beliefs.

Corollary to the above, the current study aimed to investigate the impact of using CAAM on learners' writing skill as well as on their self-regulation of learning awareness.

3. Methodology

3.1. Research design and samples

The researcher employed an exploratory case study – specifically a mixed-mode method design – to explore the effect of using computer-aided argument mapping on the students' argumentative writing performance across task achievement, coherence-cohesion, lexical resource and grammatical range and accuracy. A time series design was utilized to monitor students' progress in writing performance and awareness on their self-regulation of learning. This includes monitoring the students' progress during 10-sessions which constituted eight sessions for the implementation of the CAAM as the intervention: one session each for the pre-test and post-test. A single group of 28 first year university students majoring in the TESOL program at the study-university was purposively selected as participants. The participants consist of 9 males and 19 females with ages ranging from 18 to 19 years old. The rationale of targeting this group is because they have been exposed to different strategies in writing during their previous semesters, the researcher would like them to continuously practice and be able to use CAAM as another helpful method to improve their writing compositions in their succeeding semesters where they will still take two more writing courses that would cover various writing genres including expository and argumentative types. Employment of CAAM in their writing course has not been in practice for the learners in their regular classroom.

3.2 Research instruments and data collection

Four methods of data collection were employed to capture quality evidence that leads to the formulation of credible data to achieve the aims that have been posed above. The four methods of data collection are as follows:

First, a writing pre-test was used to measure the relationship between the use of CAAM as an intervention and the respondents' argumentative writing performance. During this phase, the respondents would elaborate upon a topic entitled *Living in the City is better than in the Countryside*. The title is in line with the topics they are studying in Academic Reading and Writing Task 2 in their regular classroom. They were given at least 60 minutes to finish their composition using at least 250 words. Before they were supposed to start writing, there were activities to be done such as activating their prior knowledge towards the topic and a reading text to comprehend to further develop their schemas towards the topic they are going to develop which took at least 1 hour. Moreover, the writing compositions of the respondents were corrected by two inter-raters (both English / TESOL Lecturers in the study university) based from the guidelines used in IELTS writing Task 2 scoring rubric provided by Cambridge IELTS (Hashemi & Thomas, 2011). This writing rubric had 4 components: task achievement, coherence-cohesion, lexical resource, grammatical range and accuracy. The highest mark was 9 and the lowest mark was 1. For the purpose of inter-rater reliability, all written compositions were read by two raters, and the correlation among scores marked by each rater was calculated. The inter-rater reliability of the first and second raters were .551 and .519 respectively, indicating a strong agreement to each other.

Secondly, the Self-Regulation of Learning Scale (SRS) was administered to the participants before and after the strategy intervention. This questionnaire was first formulated by Toering (2011) and is composed of 46 items divided into six components: planning, self-monitoring, evaluation, reflection, effort and self-efficacy. The Self-Regulation of Learning Scale (SRS) is intended to measure self-regulation as a relatively stable attribute in multiple learning domains. Originally, the subscales of planning (9 items), self-monitoring (8 items), effort (10 items), and self-efficacy (10 items) were scored on a 4-point Likert rating scale: (1) never to (4) always. However, in the present study, the scale was revised into a 5-point Likert scale with reliability values of 0.78, 0.73, 0.78, and 0.69 respectively to conform with the subscales of evaluation (8 items) and reflection (5 items) which were scored on a 5-point Likert rating scale. In accordance with the original scales, evaluation ranged from (1) never to (5) always, and reflection ranged from (1) strongly agree to (5) strongly disagree. Before data analysis, reflection scores were reversed to make them correspond to the scores on the other

five subscales. To ensure the reliability of the questionnaire, a pilot study was conducted on 26 third year college students who were not included in the target group. The reported reliability value was 0.79.

The third instrument was the writing posttest, which consisted of the argumentative writing test. The writing topic was selected from among the topics that normally appear in the IELTS writing task 2, which are also in relation with the topics they are studying in the classroom and were checked for their sociocultural and cognitive appropriateness by three experts before they were administered to the respondents. They were given at least 60 minutes to finish their composition using at least 250 words.

Finally, interviews were conducted after a week of intervention. This is to gather more details about how often and when the respondents would use the CAAM after the intervention as well as how the CAAM would assist them to further understand writing processes and be aware of their self-regulation of learning process.

3.3. Procedure

Table 1 presents the plan of activities (the intervention programme) with its corresponding number of sessions, with all the stages and activities detailed below.

Table 1. The intervention program

Session	Stages	Activities
1 st Session	Introductory Part	<ul style="list-style-type: none"> - demystification of argumentative type of writing - discussion of different concepts of argument mapping such as conclusion, premises, counter-arguments, markers of coherence and the like
	Advance Organization / schema building	<ul style="list-style-type: none"> - Students brainstorm the topic to set the scene before attending to the writing topic. - A short text that is related to the writing topic would be provided and students are given time to read and comprehend the short text and make some notes what they expect to write. This is to further build their schemas towards the writing topic. - Learners share their ideas (from the short text) for several minutes to gain more ideas from their peers.
2 nd session to 8 th session	Writing Part	<ul style="list-style-type: none"> - introduce to students the writing topic to be developed asking them to brainstorm by writing all the ideas and thoughts as they could. They may write whatever comes in their mind which they think have something to do with the topic. - Students are asked to share their ideas in pairs or in groups in several minutes. The listeners may add some ideas for its development.
	The Map creation via CAAM	<ul style="list-style-type: none"> - Students create their argument maps through CAAM - Students share their argument maps to their peers/ groupmates to further help shape their essay and to further solve issues regarding mismatched premises, incorrect counter-arguments and logical connections as well as improper use of markers of coherence. - Teacher may provide advice to those students who had encountered problems in

their work.

Writing and Submission parts	- Students would create their draft after their peers' suggestion and comments to shape their work and send their essay to the teacher through CAAM. - Teacher can do indirect corrective feedback and had the chance to monitor and evaluate their writing process via CAAM editor page.
Discovery/ Reflection parts	-After the teacher sends back the students' essays, learners evaluate their performance and discuss to their peers how successful their writing process is and share possible insights (e.g. strategies) that they can try in the future to help them deal with problems they may encounter.

Data from interview questions were subjected to frequency counts and were analyzed using the process of thematic coding (Cresswell, 2008). Table 2 presents the themes that emerged from the participants' responses after the semi-structured interviews.

Table 2. Emerged themes from the participants' responses after the semi-structured interviews

<i>Theme 1</i>	
The Use and Challenges of CAAM Method in EFL Argumentative Writing	<ul style="list-style-type: none"> • Helpful in dealing with arguments • Logical and coherent connections • Time-consuming (lack of knowledge)
<i>Theme 2</i>	
Quality Practice	<ul style="list-style-type: none"> • Provides scaffolding • Complexity is gradual • Guides learners what to do next
<i>Theme 3</i>	
Awareness of their Self-Regulation of Learning	<ul style="list-style-type: none"> • Planning • Self-Monitoring • Self-Evaluation and reflection

4. Results

4.1. Quantitative analysis

4.1.1. Test of difference on participants' argumentative writing performance

Table 3 presents the test of difference between the participants' argumentative writing performance in terms of task achievement, coherence-cohesion, lexical resource and grammatical range and accuracy before and after CAAM was employed on them. As revealed in the table, the component on "task achievement" was the most improved component in the

argumentative writing performance of the participants as it yielded Mean and SD scores of $x=1.68$; $SD=0.55$ before the intervention and $x=3.61$; $SD=0.74$ after the intervention. On the other hand, “grammatical range and accuracy” constituted the least improved component. As regards the overall mean scores before the intervention (5.21) and after the intervention (11.39), when compared statistically, the differences between the two results were significant with a t -computed value of -21.56 compared to the p -value of 0.000. Therefore, the research hypothesis that claimed the use of CAAM had no significant difference on the respondents’ writing performance before and after the strategy intervention, was rejected indicative that CAAM helps facilitate students’ argumentative writing process successfully.

Table 3. Test of difference on the participants’ argumentative writing performance before and after CAAM was employed on them

Writing Components	Before the Intervention		After the intervention		t -computed value	p -value
	Mean	SD	Mean	SD		
Task Achievement	1.68	0.55	3.61	0.74	-4.84	0.000
Coherence-Cohesion	1.39	0.50	3.29	0.71	-14.62	0.000
Lexical Resource	1.61	0.50	3.50	0.96	-10.48	0.000
Grammatical Range and Accuracy	0.54	0.51	1.00	0.00	-18.92	0.000
Overall	5.21	1.32	11.39	1.83	-21.56	0.000

4.1.2. Test of relationship between participants’ argumentative writing performance and self-regulation of learning awareness after the implementation of CAAM

As revealed in Table 4, there were four out of six components that showed significant relationships with the aforesaid variables. The components of planning, self-monitoring, effort, and self-efficacy yielded t -computed values of 2.27, 2.19, 5.09 and 2.07 respectively and were higher than the t -critical value of 2.05. This means that there was a significant relationship between the respondents’ argumentative writing performance and the aforesaid SRS components. However, two other components (evaluation and reflection) that yielded t -computed values of 1.29 and 1.72 respectively were found lower than the t -critical value of 2.05 indicating that there was no significant relationship between the respondents’ argumentative writing performance and the aforementioned components. The CAAM, in overall, used as an intervention to enhance to improve respondents’ argumentative writing performance showed a significant relationship to that of their self-regulation of learning since the t -computed value of 2.09 is higher than the t -critical value of 2.05. This might be attributed to CAAM helping to improve students’ argumentative writing abilities and making them more

conscious and active in dealing with their writing difficulties rather than simply accepting their writing problems.

Table 4. Test of relationship between the participants' argumentative writing performance and self-regulation of learning awareness after CAAM is provided

Components of Self-Regulation of Learning	Pearson r-value	t-computed value	t-critical value
Planning	0.40	2.27	2.05
Self-Monitoring	0.27	2.19	2.05
Evaluation	0.23	1.29	2.05
Reflection	0.28	1.72	2.05
Effort	0.70	5.09	2.05
Self-Efficacy	0.37	2.07	2.05
Overall	0.32	2.09	2.05

4.2. Qualitative analysis

4.2.1. The impact and challenges of using CAAM in EFL writing

There were 21 out of 28 respondents from the initial stage involved in the structured interviews. The interview results revealed the importance of using CAAM to help respondents gain a visual representation of the argument which helps them to understand it. When respondents were asked to express their comments on the impact and challenges of the method, one student contributed her opinion regarding it.

The use of CAAM in argumentative writing is helpful to me. It helps me create a visual representation that aid me break down complex arguments into simple manageable components. And consequently, assisted me to write an essay. (R8)

Moreover, Respondents 1 and 2 maximized the effectiveness of CAAM in argumentative writing for it helped them to regulate their writing performances. They stated that because of the editor page in CAAM, they were able to come up with a complete grasp of their theses, reasons and contentions and achieve a coherent writing product.

The steps in CAAM that I learnt helped me in dealing with arguments and make me perform better in displaying my arguments. With the CAAM editor page, it makes me my writing more coherent and more meaningful. (R1)

With the help of those coherent markers such as “because, although, however, moreover”, which are available in the CAAM editor page, it helps assist my ideas flow smoothly from the beginning to the finished product. (R2)

However, there were also respondents who felt that there was not enough time to complete the AM assessment task due to lack of knowledge of argument mapping. Respondent 3 expressed her opinion regarding unsuccessful writing performance due to insufficient knowledge in CAAM.

The steps in CAAM that I learnt in the class somehow helped me to write, unfortunately, I was not able to use them very efficiently because of lack of knowledge following its steps. Maybe I am just not exposed to this kind of software in writing. I felt that I wasted my time. Or maybe, I am a bit ignorant in using technology like CAAM in writing. (R3)

4.2.2. Quality practice

Since CAAM requires practice (hands-on tutorials), an overwhelming majority (19, 91%) of the participants enjoyed the activities and exercises. One participant (R18) felt motivated while doing those various activities since she was guided in using CAAM to map her arguments and successfully wrote down her arguments into paper.

It is true that there were plenty of practices to accomplish, but by CAAM assistance, it is not a problem because it provides scaffolding steps. Actually, in CAAM, everything is in there, it helps us to improve our skill because we practice deliberately. We even tag our work to our peers and teacher if we would like to seek comments for improvement. It also guides us what to do next and the scaffolding step is directing us what to do and what activity to prevent. Finally, what I like the most in CAAM is, the complexity of the tasks is flowing gradually apart from telling whether a particular activity was successful or appropriate. (R18)

4.2.3. Self-Regulated Learning Awareness

Regarding autonomous and self-regulated learning, it is noticeable that all of the respondents (21 or 100%) utilized CAAM in argument mapping and thus were assisted in achieving a successful argumentative writing composition. Verbatim transcript from R12 and R15 were found to be consistent. R15 stated her insight regarding self-monitoring while using CAAM in her writing processes:

To check if I understood the thesis, arguments and contention towards the text before writing, I try to check everything together and I try to understand one thing which I believe will lead to understanding another. Actually, CAAM has been assisting and guiding me to do these activities (R12)

R15 also maximized the effective use of CAAM by trying to self-monitor her arguments by going back twice or thrice around.

Since using CAAM allows us to go back even how many times we wanted to carefully check our arguments, I am still trying my best to double check if my thesis, contention and conclusions are right and free from mismatches and errors. CAAM aids me to edit throughout my writing process (R15)

With regard to self-evaluation and self-reflection, R13 expressed her feeling regarding the effective use of CAAM in her argumentative writing process. She said that evaluating one's writing performance whether the correct arguments and evidences, or not, makes her more driven to continue writing and do her best to get correct answers. It also helps her to trace her performance.

As I map my arguments, I see to it that I am right there. I am following my performance, whether I did get the right arguments and evidences or not. I always say, I am close! This attitude helps me become more optimistic. Actually, I can go back and change my arguments, premises, and evidences, that easy. Moreover, after seeking suggestions from my peers regarding my work, I am trying to self-evaluate and reflect by weighing the arguments they suggested to my paper. (R13)

The above qualitative results from the interviews indicated the significant impacts of the use of CAAM on learners' argumentative writing as well as their self-regulation of learning awareness.

5. Discussion

The findings of the present study revealed that Thai EFL learners' use of argument mapping method made significant gains on their writing performance in terms of task achievement, coherence-cohesion, lexical resource and grammatical range and accuracy. The effectiveness of employing argument mapping method on respondents' writing process can be attributed to the helpful features of argument mapping such as stating thesis and premises, developing schemas, planning the essay structures, locating links and relationships, developing subclasses, sorting information and giving supports to the reasons, which are considered important factors of a successful argumentative writing. The aforementioned factors are essentially vital as necessary steps in the process of writing as advocated by many researchers of L2/ EFL writing (Hyland, 2003, 2015; Flowerdew, 2017). Furthermore, Harrell and Wetzel (2013) claim that the use of well-designed argument maps or argument diagrams (ADs) can improve second language learners' writing performance and further highlighted that ADs help ignite learners' schemas which are vital in argumentative writing. Additionally, learners experiencing argument mapping develop better writing in terms of complexity and content (Gray, 2012). AM improves

writing process which assists learners at the start of the process, during the process down to the final product, an enjoyable and productive experience by lightening the intimidating atmosphere of traditional writing classes (Dwyer et al., 2010). This simply means that argument maps do not only trigger thinking for writing, but they also act as reliable guides and scaffolds during the writing and even for revisions after such drafts are developed. Further, visual maps and/or visual organizers facilitate learners' production of coherent paragraph texts (Chang, Chang, & Hsu, 2019). This view is echoed by Nurhajati (2016), who claims that visual maps / visual organizers serve as scaffolding tools to assist students write in English.

The study findings also showed a significant relationship between the learners' argumentative writing performance across task achievement, coherence-cohesion, lexical resource and grammatical range and accuracy and the use of argument mapping method as evidenced by a significant improvement towards their writing output after the intervention was employed. The findings revealed that there was a significant improvement on respondents' argumentative writing product in terms of the development of writing content since they were able to distinguish their argument conclusion and provide a number of different premises to support the thesis. They were also able to offer evidence and counter-arguments supporting the premise/s and thesis. The findings also showed a positive change on students' writing coherence. They were able to provide discussion on their reasons by logically linking their premises to the conclusion and between premises as well as the use of their "linguistic signposts" as noticed in their written output reflected from their writing post-test. The efficacy of CAAM assists to promote EFL learners' literacy skills which help them to produce more coherent and cohesive essays (Davies, et. al., 2010). This is in line with Pinkwart et al. (2009), who claim that the use of AMs fosters EFL learners' argumentative writing. Congruent to this view are the study findings conducted by Malmir & Khosravi (2018), proving the efficacy of using AMs on both descriptive and expository tasks in the Iranian EFL context and stating that AM could improve these two tasks in terms of grammar, coherence, cohesion and task achievement but not in improving vocabulary of participant's writing. However, the present study concentrated on how the students develop the content of their argumentative writing with emphasis on task achievement, (where students develop the content of their writing with emphasis on the statement of conclusion and how it is being supported by evidence as well as counter-arguments) cohesion-coherence, lexical resource and grammatical range and accuracy (where students focused on how they use markers of coherence to determine if they can be able to logically connect their premises to the conclusion and between premises).

The results of the present study showed that the students became more cognizant of their self-regulation of learning. Motivation and attitude can have a key impact on students' academic outcomes (Zimmerman, 2008). The findings of this study showed that CAAM within the aforementioned approach enabled the learners to enhance their interests in accomplishing writing tasks, managing their own learning, and involving themselves to active and constructive procedures. It was revealed further that those who worked in groups during the strategy intervention had their writing performance affected significantly, as manifested in the interviews conducted. This is in line with previous studies which found the positive impact of collaborative learning in the classroom (Bayat, 2014; Onozawa, 2010).

However, two out of six components of self-regulation awareness did not show a significant relationship with the participants' argumentative written composition performance. These components are "evaluation" and "reflection". In the traditional EFL classroom, the students are not given the chance or allotted time to evaluate the strategies and methods they used to improve their written works and to self-reflect the mistakes they had in their drafts. They were not also given the opportunity to share their difficulties and accomplishments to their peers and friends which is a potential activity to enhance improvement on their written drafts. Zimmerman (2000) and Zimmerman and Kitsantas (2002) highlighted that self-reflection as one of the phases of self-regulation which consisted of monitoring the adequacy of the content, organization, and form of one's written product, were not only cognitive but often affective processes whereby writers make different self-evaluative judgments about the text they produce.

6. Summary and conclusion

The present study investigated the effect of using CAAM on Thai EFL learners' writing performance and their self-regulation of learning awareness. Using CAAM method could enhance Thai EFL learners' writing skill across the 4 writing components such as task achievement, coherence-cohesion, lexical resource, grammatical range and accuracy. Secondly, CAAM made the respondents more aware of their self-regulation of learning as they manifested inclination on their planning, self-monitoring, self-evaluation, reflection, effort, and self-efficacy. Results also provided further empirical evidence that respondents' self-regulation of learning awareness remarkably improved after the employment of CAAM. Furthermore, as learners' personality traits could be considered as essential predictors in their success in language processing, identifying these traits and providing facilities to enhance them would be a great accomplishment in EFL teaching and learning. CAAM provides this opportunity for the

teachers and learners to improve some of these personality traits such as self-regulation of learning. Finally, the design of effective training procedures and the aiming of specific learning outcomes of training towards writing and other EFL macro-skills for the different groups of learners are further suggested for future research.

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