

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

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DOI: 10.5281/zenodo.6552989

Abstract

Software and digital mapping tools have recently been used by educators and academics for several education and related purposes. The current study was set out to investigate 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 subject of the study. The researcher employed an exploratory case study specifically a mixed-mode method type of research involving a single group of pre- and post-test design. Data was collected while the respondents participated in the 8 sessions of instructing them on how to use 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. However, 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. On the other hand, qualitative findings reveal that respondents have positive responses in using CAAM on their writing processes as well as enhance their awareness on their self-regulation of learning.

Keywords: Computer-Assisted Argument Mapping, EFL argumentative writing, Self-Regulation of Learning Awareness

Introduction

One necessary requirement for learners in their undergraduate studies is writing; however, developing an effective writing competency is a tough undertaking for them (Robillos & Phantharakphong, 2020). One of the main problems among students is the fact that many of them cannot develop their writing skills, mostly the ones who are making compositions in foreign language (Batalla & De Vera, 2019). Difficulties that include 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) 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 needs 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 have 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 interested in the effectiveness of alternative teaching method that incorporate 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 behavior guided and constrained by their goals and contextual features of the environment (Pintrich, 2000). As described by Zimmerman (1986; 2008) "...self-regulated learners systematically used metacognitive, motivational and behavioral strategies and proactively participate in their own learning processes". Learners, who self-regulate establish goals for their learning, supervise, assess and self-reflect 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 have critical thinking (Harrell and Wetzel, 2013) since the processes involved in CAAM are designed by well-planning and well-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 of and able to interpret the signs of changes continuously. Self-regulatory capacity interact 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 Thai EFL context, no studies to date have been investigated on the use of argument maps for improving EFL learners' argumentative writing performance and for promoting their self-regulation of learning; therefore, the researcher would like to investigate this untouched knowledge 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.

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 highlights the relations (i.e. *because*, *but*, *however*) between propositions (Dwyer, *et.al.* 2012; van Gelder, 2007). According to van Gelder (2007), ‘...argument mappings are designed in such a way that if one proposition is evidence for another, the two will be juxtaposed.’ Dwyer (2011) and Dwyer, *et. al.* (2012) describe that these organizational features have been hypothesized in past researches 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 method 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 on 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. 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 other two kinds of maps for teaching second language writing. Argument mapping method assists EFL learners 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), they 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 to enhance students' critical thinking since it provides an easy way to diagram reasoning on any given topic (Davies, 2009). It also helps ones' own thinking and reasoning (van Gelder, 2007). In CAAM, when a writer draws reasoning through the process of mapping, he will have a fully refined conception of the reasoning in his mind. So, he will be better capable to distinguish 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 colors. The end of the argument tree is composed by basic boxes which provide defense 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 a sample of CAAM editor page provided by *Rationale* (2012):

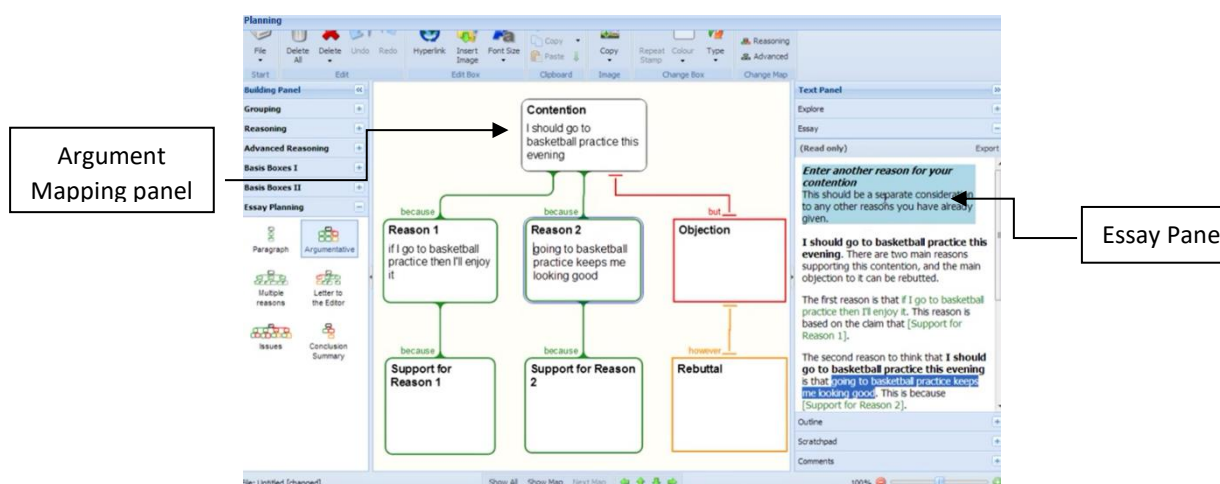


Figure 1. The editor page in CAAM in *Rationale* (2012)

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

Recent researches on the other hand, 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 the 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 these aspects, self-regulated learners must be motivated to improve (Zimmerman, 1989, 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 does not only to generate and organize ideas, but also to translate 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; Magno, 2009). Furthermore, computer and its technological devices have been at the service of EFL writing learning and teaching as they enhance learners' motivation, interest, and beliefs.

Method

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 development of writing content and writing coherence. The researcher utilized a time series design 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 with 28 first year university students of academic year 2018-2019 majoring in the TESOL program at the Faculty of Education in Khon Kaen University (KKU) was purposively selected as respondents. The respondents 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.

Research instruments and data collection

The researcher employed four methods of data collection 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:

Firstly, Writing Pretest 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 be developing 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 write, there were activities to be done first 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 British Council and IDP IELTS Australia. This writing rubric constituted of 4 components namely: task achievement, coherence-cohesion, lexical resource, as well as grammatical range and accuracy. The highest mark is 9 and the lowest mark is 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 are .551 and .519 respectively indicating a strong agreement to each other.

Secondly, the Self-Regulation of Learning Scale (SRS) which was administered to the participants before and after the strategy intervention was also used. This questionnaire was first formulated by Toering (2011) and composed of 46 items divided into six components namely: planning, self-monitoring, evaluation, reflection, effort and self-efficacy. The Self-Regulation of Learning Scale or 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-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.

Third is the writing posttest. This 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; however, 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.

Treatment

Table 1 presents the plan of activities with its corresponding number of sessions and main parts:

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
2 nd session to 8 th sessions	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.
	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	<p>-students create their argument maps through CAAM</p> <p>-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.</p> <p>-teacher may provide advice to those students who had encountered problems in their work.</p>
	Writing and Submission parts	<p>-students would create their draft after their peers suggestion and comments to shape their work and send their essay to the teacher through CAAM.</p> <p>-teacher can do indirect corrective feedback and had the chance to monitor and evaluate their writing process via CAAM editor page.</p>
	Discovery/ Reflection part	<p>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.</p>

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

Table 2 *Emerg ed themes from 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

Results

Quantitative Part

Test of difference on respondents' argumentative writing performance

The results from the t-test analysis showed that there was a significant difference on the respondents' argumentative writing performance across task achievement, coherence-cohesion, lexical resource and grammatical range and accuracy before and after the implementation of CAAM. As shown from table 3, the overall mean scores before the intervention (7.93) and after the intervention (13.93) show that when compared statistically, the differences between the two results were significant with a t-computed value of -17.0 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 writing process successfully.

Table 3 *Test of difference on the respondents' argumentative writing performance*

Variables	Mean	SD	t-computed value	p-value
Before the Intervention	7.93	1.75	-17.0	0.000
After the Intervention	13.93			

Test of relationship between respondents' argumentative writing performance and self-regulation of learning awareness after the implementation of CAAM

As revealed from Table 4, there were four out of six components that showed significant relationships with the aforesaid variables. The components on planning, self-monitoring, effort, and self-efficacy which yielded t-computed values of 2.27, 2.19, 5.09 and 2.07 respectively and are 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 components such as evaluation and reflection yielding t-computed values of 1.29 and 1.72 respectively 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 which help improve students in their argumentative writing abilities and make 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 respondents' argumentative writing performance and self-regulation of learning awareness after the implementation of CAAM*

Components of SRS	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

Qualitative Part

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 that the importance of using CAAM is able to help respondents to have a visual representation of the argument which helps them to understand the argument. 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”

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)

Quality Practice

Since CAAM requires practice (hands-on tutorials), majority or 19 (91%) of the participants enjoyed the activities and exercises. Since the goal is both to provide plenty of practice and plenty of feedback. One participant (R18) felt motivated in 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)

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 assist them to achieve 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 stated 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.

Discussion

The findings of the present study revealed that Thai EFL learners' use of argument mapping method made significant gains on their writing performance across development of writing content and writing coherence. The effectiveness of employing argument mapping method on respondents' writing process can be attributed to the helpful features of argument mapping such as stating of 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 which are 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 a 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 start 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 in the production of coherent paragraph texts (Chang, Chang, & Hsu, 2019). This view is echoed by Nurhajati (2016) claiming that visual maps / visual organizers serve as scaffolding tool 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 (basing from the study findings) they were able to distinguish their argument conclusion and able to provide a number of different premises to support the thesis; They were also able to offer evidence/s 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 AM assists to promote EFL learners' literacy skills which help them to produce more coherent and cohesive essays (Davies, et. al., 2010). This is backed up by Pinkwart, et. al. (2009), claiming that the use of AMs foster L2 learners' argumentative writing. Congruent to this view is the study findings conducted by Malmir & Khosravi (2018), where they reported the efficacy of using AMs on both descriptive and expository tasks in the Iranian EFL context and found out that AM could improve these two tasks in terms of grammar, coherence, cohesion and task achievement but not beneficial in improving vocabulary of participant's writing. However, the present study concentrated on how the students develop the content of their writing with emphasis on the statement of conclusion and how it is being supported by evidence as well counter-arguments. It also focused on how students use markers of coherence to determine if they can be able to logically connect their premises to the conclusion and between premises.

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. The main conclusions of the study are: firstly, using CAAM method could enhance Thai EFL learners' writing skill across the 4 writing components namely 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 manifest 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 are remarkably improved after the employment of CAAM. Engaging students' interest in the nature of the teaching materials through working on them in some ways like using CAAM, a greater degree of commitment and sense of purposeful activity will be generated (Pahlavani & Maftoon, 2015). 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.

Conflict of Interest

No conflict of interest was declared by the author

References

1. Battala, A.V., & De Vera, P.V. (2019). Integration in English writing skills of sophomore college students. *Asian EFL Journal*, 28 (2), 232-275.
2. Canas, A.J., Hill, G., Carf, R., Suri, N., Lott, J., & Eskridge, T. (2004). A knowledge modelling and sharing environment. In A. J. Canas, J., D. Novak & F.M. Gonzalez (Eds.), *Concept maps: Theory, methodology, technology: Proceedings of the first international conference on concept mapping* (Vol. 1, pp.125-133) Pamplona, Spain: Universidad Publica de Navarra.
3. Castillo, A. C (2012). Promoting argumentative abilities in written composition of psychology senior students: CAAM method. *Procedia-Social and Behavioral Sciences*. 69, 1664-1675.
4. Chamot, A.U. (1995). Creating a community of thinkers in the ESL/EFL classroom: *TESOL Matters*, 5(5),1-16.
5. Davies, WM (2009). Computer-assisted argument mapping. A rational approach. *Higher Education*, 58, 799-820.
6. Davies, W.M. (2010). Concept-mapping, mind-mapping, and argument mapping: What are the differences and do they matter? *Higher Education*, 62(3), 270-301.
7. Davies, W.M. (2011). Mind-mapping, concept mapping and argument mapping: What are the differences and do they matter? *Higher Education*, 58, 799-820.
8. Davies, W.M (2014). Computer-aided argument mapping as a tool for teaching critical thinking. Retrieved June, 2014 from http://www.mitpressjournals.org/doi/pdf/10.1162/IJLM_a_00106.
9. Dornyei, Z. (2005). *The psychology of the language learner: Individual differences in second language acquisition*. Mahwah, NJ: Lawrence Erlbaum.
10. Dwyer, C.P., Hogan, M.J., & Stewart, I. (2010). The evaluation of argument mapping as a learning tool: Comparing the effects of map reading versus text reading on comprehension and recall of arguments. *Thinking Skills and Creativity*, 5(1), 16-22.
11. Dwyer, C.P., Hogan, M.J., & Stewart, I. (2011). The promotion of critical thinking skills through argument mapping. In C.P. Horvart, & J.M. Forte (Eds.), *Critical thinking* (pp.97-122). New York: Nova Science Publishers.
12. Eftekhari, M., Sotoudehnama, E., & Marandi, S.S., (2016). Computer-aided argument mapping in an EFL setting: Does technology precede traditional paper and pencil approach in developing critical thinking? *Educational Technology Research and Development*, 64 (42), 425-445.

13. Ericsson, K. A., Krampe, R. T. & Tesch-Römer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review*, 100, 363-406.
14. Ertmer, P. A. & Newby, T. J. (1996). The expert learner: Strategic, self-regulated, and reflective. *Instructional Science*, 24, 1-24. doi: 10.1007/ BF00156001
15. Graham, S., & Harris, K.R. (2005). *Writing better: Effective strategies for teaching students with learning difficulties*. Baltimore, MD: Paul H. Brookes Publishing Co.
16. Gray, J. W. (2012). *Introduction to argument mapping and critical thinking*. Retrieved from <http://ethicalrealism.files.wordpress.com/introduction-to-argument-mapping>
17. Harrel, M., & Wetzel, D. (2013). Improving first-year writing using argument diagramming. In M. Knauff, M. Pauen, N. Sebanz, and I. Wchsmuth, *Proceedings of the 35th Annual Conference of the Cognitive Science Society* (pp. 2488-2493). Austin, TX: Cognitive Science Society.
18. Harris, K., Graham, S., Mason, L., & Friedlander, B. (2008). *Powerful writing strategies for all students*. Baltimore, MD: Brookes
19. Hyland, K. (2013). Writing in the university: Education, knowledge, and reputation. *Language Teaching*, 46(1), 53-70.
20. Magno, C. (2009). Self-regulation and approaches to learning in English composition writing. *TESOL Journal*, 1, 1-16
21. Malmir, A., & Khosravi, F. (2018). The effect of argument mapping instruction on L2 writing achievement across writing task and writing components: A case study of Iranian EFL Learners. *Applied Research on English Language* 7,(4), 514-538.
22. Pahlavani, P. & Maftoon, P. (2015). The impact of Using computer-aided argument mapping (CAAM) on the improvement of Iranian EFL learners' writing self-regulation. *The Journal of Teaching Language Skills*, Vol. 7,(2), 127-152.
23. Pintrich, P. R., & Schunk, D. H. (2002). *Motivation in education: Theory, research and applications*, (2nd ed.) Englewood Cliffs, NJ: Prentice Hall Merrill.
24. Robillos, R.J. (2019). Crossing metacognitive strategy instruction in an EFL classroom: Its impact on Thai learners' listening comprehension performance and metacognitive awareness. *Asian EFL Journal*, 21(2), 311-336.
25. Robillos, R.J., Phantharakphong, P. (2020). Enhancing EFL learners' argumentative abilities in written composition and critical thinking dispositions through argument mapping within metacognitive approach. *Asian EFL Journal*, 27(3.3), 181-208.
26. Robillos, R.J. (2020). Instruction of metacognitive strategies: Its role on EFL learners' listening achievement and awareness of their metacognitive listening strategies and self-regulation. *Asian EFL Journal*, 27(3.2), 442-452.
27. Schunk, D. H. (2001). Social-cognitive theory and self-regulated learning. In B. Zimmerman & D. H. Schunk (Eds.), *Self-regulated learning and academic achievement: Theoretical perspectives* (pp. 125-151)., 2nd ed. Mahwah, NJ: Lawrence Erlbaum.
28. Soureshjani, K.H. (2013). A study on the effect of self-regulation and the degree of willingness to communicate on oral presentation performance of EFL learners. *International Journal of Language Learning and Applied Linguistics World (IJLLALW)*, Vol 4(4), 166-177.

29. Susilowati, T. (2015). Metacognitive strategies in building autonomous learning on teaching listening to the second semester "TLC class" of STAIN Ponorogo in academic year 2014/2015. *Cendekia, Vol 13*(2). 227-251.
30. Taghizadeh, M. (2016). The effects of metacognitive strategy training on the listening comprehension and self-regulation of EFL learners. *International Journal of Foreign Language Teaching and Research, Vol. 4*(16), 36-54.
31. Toering, T. T. (2011). *Self-regulation of learning and the performance level of youth soccer players*. Groningen: s.n.
32. van Gelder, T. (2007). Rationale: Making people smarter through argument mapping: retrieved November 2013, from http://www.austhink.com/pdf/vangelder_submitted.pdf
33. Wang, C., Kim, D.H., Bong, M., & Ahn, H.S. (2013). Korean college students' self-regulated learning strategies and self-efficacy in learning English as a second language. *Asian EFL Journal, Vol 15* (3). 81-112.
34. Weigle, S.C. (2013). ESL writing and automated essay evaluation. In M. Shermis, & J. Burstein, (Eds.). *Handbook on automated essay evaluation.: Current applications and new directions* (pp. 36-54). New York:Routledge.
35. Zimmerman, B.J (2008). Investigating self-regulation and motivation: historical background, methodological development, and future prospect. *American Educational Research Journal, 45*(3) 166-185, doi: 10.3102/0002831207312909.
36. Zimmerman, B. J. (1989). A social cognitive view of self-regulated academic learning. *Journal of Educational Psychology, 81*, 329-339. doi: 10.1037/0022-0663.81.3.329
37. Zimmerman, B. J. (2006). Development and adaptation of expertise: The role of self-regulatory processes and beliefs. In K. A. Ericsson, N. Charness, P. J. Feltovich & R. R. Hoffman (Eds.), *The Cambridge handbook of expertise and expert performance* (pp. 705-722). New York, NY: Cambridge University Press.