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THE IMPACT OF USING COMPUTER-AIDED ARGUMENT MAPPING (CAAM) ON THE IMPROVEMENT OF IRANIAN EFL LEARNERS' WRITING SELF-REGULATION

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Abstract

The present study was conducted to investigate the impact of using computer-aided argument mapping (CAAM) on the improvement of Iranian learners' writing self-regulation. To this end, 90 participants out of 127 senior university students in English translation were selected after administrating language proficiency test, as well as an essay writing test for the purpose of homogenizing the learners. Then all participants completed the self-regulation questionnaire in writing skill. As the homogeneity of responses was checked, the participants were randomly categorized into three equal groups as control, experimental 1, and experimental 2. During the course, as the participants in the experimental groups accomplished their writing assignments via CAAM software (in person and in pairs), the participants in the control group did their assignments traditionally. At the end of the course, all participants completed the same writing self-regulation questionnaire again. Using SPSS 21, the one-way ANOVA statistical procedure was utilized to determine the effectiveness of CAAM on writing self-regulation. The findings revealed that using CAAM in writing classes improved learners' self-regulation. Moreover, the Post-Hoc statistical procedure between two experimental groups showed that collaborative learning in a computer hands-on learning environment led to higher writing self-regulation.

Keywords: second language writing, self-regulation, computer aided argument mapping (CAAM)

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1. Introduction

Today, advances in technology allow people from nations and cultures throughout the world to interact with each other. So, communication across languages becomes even more essential. Pennington (2003) states computers "contribute to an ongoing expansion of information and communication resources that has put English in the hands of more and more people around the globe" (p.287). In this regard, with the great progress of computer technology, computers have become at the service of second language (L2) students' achievements during the learning process. For example, computer technology provides "the interdisciplinary and multicultural learning opportunities for students to carry out their independent studies" (Lai, 2006, p. 3). Teachers understand that using computer technology and its related language learning programs can be convenient to create independent, as well as collaborative learning environments and provide students with language experiences when they move through the different stages of second language learning (Kung, 2002).

Computer-aided argument mapping (CAAM) as one of these computer-based instructional software programs is aimed to enhance students' critical thinking since it provides an easy way to diagram reasoning on any topic (Davies, 2009). In CAAM, when a person 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 reformulation of mistakes would be possible. Some studies have proved the positive effectiveness of using CAAM to promote the students' critical thinking strategies in different educational fields (Davies, 2009; Davies, 2014), L2 learners' writing achievement (Maftoon, Birjandi, & Pahlavani, 2014), as well as L2 learners' self-efficacy (Maftoon &Pahlavani, 2014).

Recent researches indicate that individual differences could predict success in language learning (Dörnyei, 2005). These individual differences include personality traits, learning styles and strategies, learners' aptitude, motivation, gender, age, self-regulation, and beliefs. In order to understand why some learners learn language more successfully than others, with almost the same aptitude and capabilities, researchers have focused their attention on

the learners' perceptions of the task and the learners' beliefs in their abilities to perform a task (Bandura, 1997). Although learning process is multifaceted and complicated, researchers are increasingly directing their research efforts towards the important role of learners' thoughts, beliefs, and cognitive/metacognitive behaviors to learn different L2 skills successfully, and writing skill is no exception. Writing seems very difficult for L2 learners to master. The difficulty relates not only to generate and organize ideas, but also to translate these ideas into readable texts. Also, writing involves highly complex skills, such as planning and organizing skills, spelling, pronunciation, word choice, and so on. In this regard, the studies on the effect of personality traits on L2 writing could be appreciated. In previous studies, the effectiveness of self-regulated strategies on L2 writing has been investigated (Graham & Harris, 2005; Harris, Graham, Mason, & Friedlander, 2008; Magno, 2009). Moreover, computer and its technological devices have been at the service of L2 writing learning and teaching as they enhance learners' motivation, interest, and beliefs. In this regard, the present study aimed to find out whether using CAMM would improve EFL learners' self-regulation in writing achievement.

2. Theoretical Background

2.1 Computer-aided argument mapping (CAAM)

Ausubel's cognitive psychology (1963) asserts that learning takes place when the learners assimilate new concept and propositions into existing concepts/propositional frameworks in the learners' mind which is known as the individual's cognitive structure. In order to enhance this type of meaningful learning, the idea of mapping was proposed by Novak and Gowin (1984). Maps are representations which depict explicit relationships between concept using links between concepts and arranging the ideas expressed in a hierarchical form. The empirical studies in using different types of mapping in education show the learners can follow the maps easier than verbal and written types of description (Larkin & Simon, 1987; Mayer & Gallini, 1990). Furthermore, mapping requires learners to have more engagement in the process of learning (Twardy, 2004).

Despite the ultimate goals of mapping tools are similar, their applications differ. Davies (2011) mentions that argument mapping lets students show inferential between propositions, as well as evaluate their validity and logic of argument structure and premises. In other words , argument mapping "involves clearly outlining a contention at the top of a map, followed by tiers of reasons and objections" (Davies, 2014, p.86).However, concept mapping provides learners to connect concepts together in a domain they belong and mind mapping allows students to study and analyze the possible associations between concepts (Davies, 2011). Figure 1 illustrate a sample argument mapping

The advent of personal computers and the development of software programs have facilitated the process of constructing maps for the users. However, 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 (Cañas, Hill, Carff, Suri, Lott, andEskridge**,** 2004). Computer-aided argument mapping (CAAM) is an instructional software program which aims to enhance the user's critical thinking by diagramming reasoning on any given topic. Van Gelder (2007) asserts the main function of these CAAM programs, such as ***Rationale*** is to help one's own thinking and reasoning. CAAM provides a platform which the user arrives at such a conception not through an interactive process of drafting and revision, but through drawing and refining reasoning clearly before use. So they could identify the gaps and errors better and they can reformulate their reasoning.

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 under the link word known as ***because***, or objection/rebuttals under the link word ***but*** in the map with different colors. Finally, the end of the argument tree is constructed by basis boxes which provide defense for the terminal claims. These basis boxes also need evidence in place of the provided brackets. Some evidence like ***statistics***, ***expert opinion***, and ***quotation*** are also available in this software. A sample of CAAM editor page provided in ***Rationale*** software (2012) is shown in Figure 1.

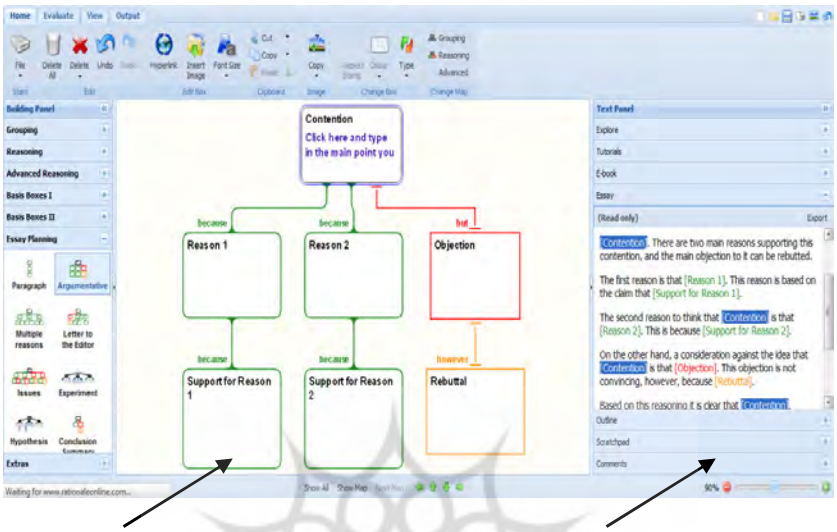

Figure 1. CAAM editor page in Rationale (2012)

As a user tries to complete an argument mapping in the panel provided for him/her, it is possible to check the essay in another panel simultaneously. This feature of CAAM let the user be aware of coherence, as well as the cohesion of what they write in argument mapping. Figure 2 illustrates a sample of argument mapping done in CAAM.

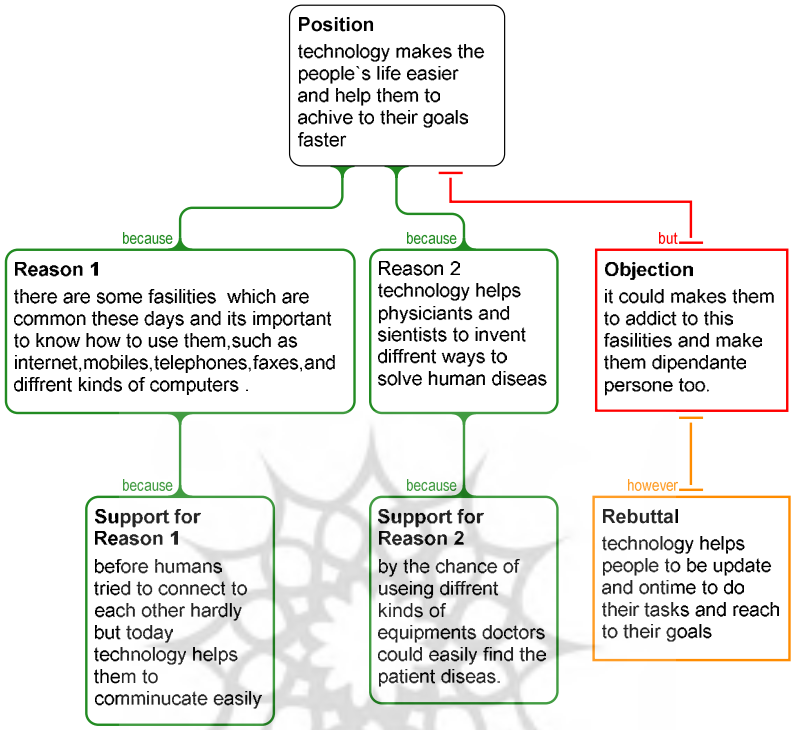

Figure2. A sample of argument mapping in CAAM

2.2 Self-regulation in second language acquisition (SLA)

Self-regulation is defined as "the degree to which individuals become metacognitively, motivationally, and behaviorally active participants in their own learning processes" (Zimmerman, 1986, p. 308). As self-regulation originates from psychology, early self-regulation researchers were focusing on changing people's malfunctional behaviors such as aggression, addiction, and so on. Now, researchers have gradually adapted the concept of self-regulation to student learning or educational practice, which leads to the current concept of self-regulated learning (SRL) in education-related fields of study. These two terms self-regulation and SRL are interchangeable and have the same meaning in educational contexts (Schunk, 2005).

Although, the concept of SRL has been described in different ways, its central idea is about motivation and learning strategies that students utilize to achieve their learning goals. Zimmerman (1989) defines SRL as "the degree

to which students are metacognitively, motivationally, and behaviorally active participants in their own learning" (p. 329). He goes on to assert that the requirement of any learning goal achievement is to combine cognitive, metacognitive, motivational, and behavioral processes

The strategies which learners use to achieve or comprehend new information are referred to cognitive strategies. Metacognitive processes include learners' ability to set the goals, monitor their plans, and evaluate their learning improvement. Motivational processes show that learners are self-motivated and take responsibility for their success or failure willingly. Behavioral processes relates to seeking help from others to progress learning (Zimmerman & Martinez-Pons, 1990). In SRL, there is a reciprocal causation among personal, behavioral, and environmental influence processes (Zimmerman, 1989), but this influence does not imply that these processes have an equal strength (Bandura, 1989). For instance, in some situations like a school with a highly structured curriculum, environmental factors may be stronger than behavioral or personal parameters.

The relationship among these three processes is depicted in Figure 3. Zimmerman (1989) asserts to become self-regulated in learning is the result of developing strategies to control person's behavior.

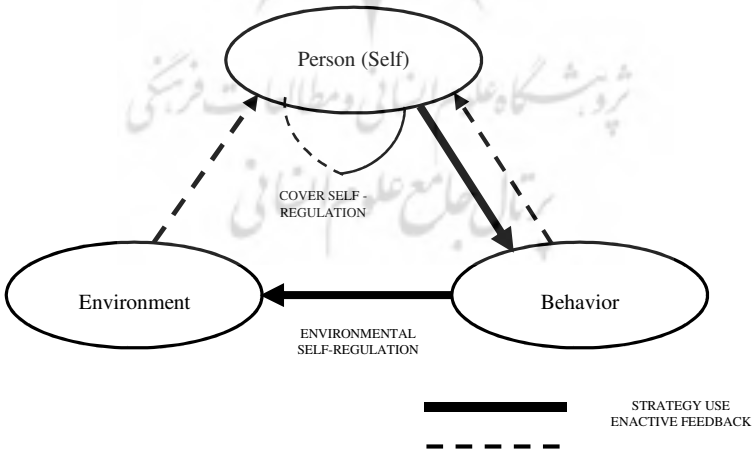

Figure3. A triadic analysis of self-regulated functioning
(Zimmerman, 1989, p. 3)

Pintrich and De Groot (1990) highlight the importance of motivation and presume that merely utilizing cognitive and metacognitive strategies is not sufficient without taking into account individual differences in motivation which is assumed to be relevant to student's cognitive and metacognitive engagement. The authors believe that both motivational and SRL should be considered for successful academic achievement. Learners need to be motivated to employ the strategies, as well as to regulate their efforts.

Zimmerman (2002) explains that SRL is not a simple personal trait that learners either possess or lack, but it consists of the selective use of specific processes personally adapted to each learning task. He adds that self-regulated component skills are as follows:

> (a) setting specific proximal goals for oneself, (b) adopting powerful strategies for attaining the goals, (c) monitoring one's performance selectively for signs of progress, (d) restructuring one's physical and social context to make it compatible with one's goals, (e) managing one's time use efficiently, (f) self-evaluating one's methods, (g) attributing causation to results, and (h) adapting future methods. (p. 66)

SRL has been recognized as one of the influential components of academic achievement in traditional classroom learning (Pintrich & De Groot, 1990). According to McCombs (2001), self-regulated learners are more self-efficacious in learning than those with poor self-regulation skills. Self-regulated learners believe they can exert self-regulatory skills to help them learn efficiently. Successes are attributed to the learners' personal competencies, effort, and failures to the use of ineffective strategies or correctable causes (Schunk, 2005). In contrast, low self-regulatory learners ascribe their failure to limited ability or insufficient effort.

In this regard, Zimmerman (2008) asserts that self-regulation is essential to the learning process. It can help students create better learning habits and strengthen their study skills (Wolters, 2011), apply learning strategies to enhance academic outcomes, and monitor their performance, and also evaluate their academic progress. Teachers thus should be familiar with the factors that influence a learner's ability to self-regulate and the strategies they

can use. Pintrich (2000) summarizes the common underlying elements of self-regulation along four lines:

> Self-regulated learning is pro-active and constructive, that is, the student is active in the learning process; a prerequisite for self-regulated learning is the potential for control. The students are able to monitor the learning process, which is a function of certain individual differences; in self-regulated learning there are goals, criteria and standards that help the learner to modify the process of learning if needed; and mediators have an important role in self-regulated learning in that they are a link between the learner and outer expectations, and between actual and expected activity. (pp. 453-454)

Dornyei (2005) emphasizes that SLA has several dimensions, among which cognitive, metacognitive, motivational, behavioral, and environmental processes could be found. There are three main lines of research that account for these self-regulatory processes: studies emphasizing cognitive and metacognitive components, studies emphasizing motivational and self- and goal-related issues, and studies emphasizing socio-cognitive aspects. It is also important to see how teachers characterize a self-regulated learner and SRL in general. These concepts are typically represented in Mezei (2008) believing that:

> Learning is student-initiated, and the students persistently carry out the task; students are autonomous and use efficient learning strategies; students are able to reflect on their work; and self-regulated learners are typically interested in learning, able to set intrinsic and personal goals, realistic about their own knowledge, and love learning, they are also self-confident, diligent and persistent. (p. 83)

Wolters (1998) adds that self-regulated learners possess a wide range of adaptive motivational beliefs and attitudes, which help them direct and control their learning. Zimmerman (2000) asserts that self-regulation is a human characteristic everyone possesses, but it shows different levels of mastery across individuals. Therefore, self-regulation is an individual difference factor but one that can be improved.

2.3 The relationship between self-regulation and writing skill

Zimmerman and Campillo (2002) formulate a cyclical phase model of SR, which explain learning processes and motivational beliefs in three phases: forethought, performance, and self-reflection. The proposed model is depicted in Figure4.

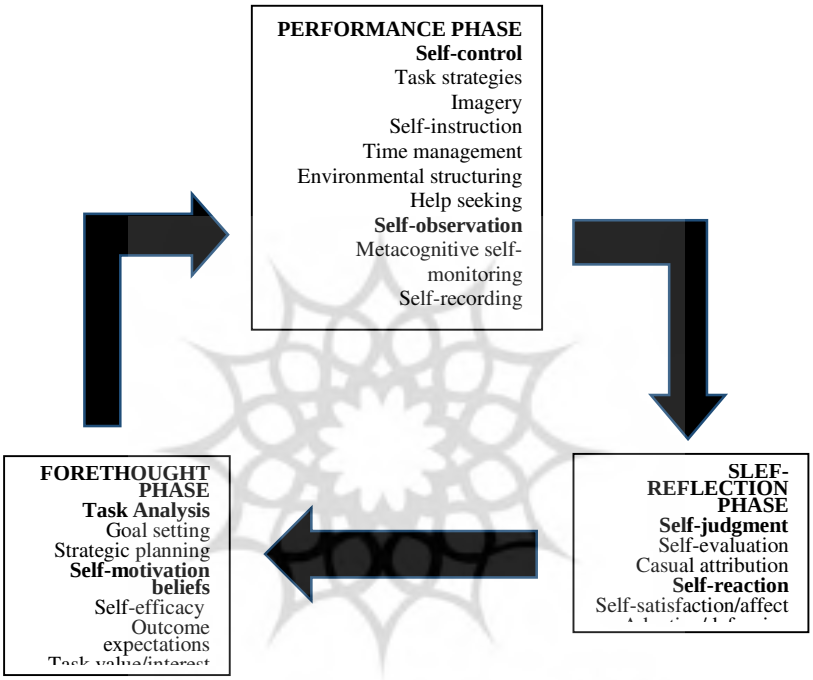

Figure4. A cyclical phase model of SR by Zimmerman and Campillo (2002)

Zimmerman and Kitsantas (2002) model of self-regulation to the study of writing shows that planning phase in writing can be fitted in the ***forethought phase*** of self-regulation. Learners establish goals in the planning phase in order to accomplish the given writing task. Also, they are required to decide upon strategies, employ their schematic knowledge for the writing task, and analyze the requirements for the given task.

The next phase of this model is the *performance phase*. In this stage, students start expressing their viewpoints on a paper or a computer monitor. This stage is relevant to the planning phase, as well. In L2 writing tasks, applying successful self-regulatory strategies, such as controlling attention, potential feelings of anxiety, boredom, and the writing environment is very

vital. Also, the student needs to apply appropriate strategies to overcome problems experienced during writing. Anderson (2005) believes that the attention is not only a cognitive factor, but it is also a motivational process, like interest. Consequently, self-regulatory strategies can have considerable influence on the amount of attention paid to various stages of the writing process and how learners' allocate their attention between various stages of writing.

Self-reflection as the final self-regulatory phase can be paired with the *monitoring stage* of writing, as it involves the self-evaluation of one's writing processes and outcomes (Zimmerman, 2000). Monitoring the adequacy of the content, organization, and form of one's written product and also carrying out necessary revisions are not only a cognitive process but often an affective process, whereby writers make different self-evaluative judgments about the text they produce. Written products might be evaluated positively by learners, which can provide impetus for engaging in further revisions and future writing activities. However, negative self-evaluations might be detrimental for task engagement (Zimmerman & Kitsantas, 2002).

To sum up, self-regulatory capacity interact with cognitive factors, and they separately and jointly affect writing processes, which include the planning, formulation, transcribing, and editing phases of writing.

3. The Present Study

Nowadays, using computers and the Internet in different educational fields of study have an important effect on the writing skill. Students have the opportunity to write the information via their personal computers even interact with each other through network. Writing as a process is nonlinear, dynamic, recursive, and complex. Although, many instructional methods, techniques, and even technological tools have been investigated in writing skill, other factors like individual differences may be influential on the L2 writing achievement in a computer hand-on learning environment. However, the present study sought to shed light on the impact of using computer-aided argument mapping (CAAM) on the improvement of Iranian EFL learners' writing self-regulation. In keeping with the purpose of the study the following research question was raised:

RQ: Does the application of computer-aided argument mapping (CAAM) improve Iranian EFL learners' self-regulation in writing?

To probe the above question, the following null hypothesis was proposed:

H0: The application of computer-aided argument mapping (CAAM) does not improve Iranian EFL learners' self-regulation in writing.

4. Method

4.1 Participants

All participants of this study were male and female senior university students in English translation at Islamic Azad University, Karaj and Qazvin Branches, Iran. At first, all students took one standardized English test (Oxford Placement Test), as well as an essay writing test for the purpose of homogeneity in language proficiency. Then, the self-regulation questionnaire in writing skill was administered for all students and the homogeneity of responses was checked by the researchers. After analyzing the obtained results, 90 out of 127 students with upper-intermediate language proficiency level were selected as eligible participants of this study. Accordingly, the researchers divided the participants into three equal groups randomly: one control group and two experimental groups (in pairs and in person).The schematic representation of the three groups of participants is depicted in Table1.

Table 1. Number of participants

Control Group (CG)	**Experimental Group 1 (EG1) in pairs**	**Experimental Group 2 (EG02) in person**
N=30	N=30	N=30

4.2 Instrument

The following tests, questionnaire, and devices were utilized as the instruments in this present study:

a. A test of English general proficiency was utilized in order to homogenize the students regarding their language proficiency level. Oxford Placement Test (OPT) was chosen among the standardized tests, for measuring language

proficiency from beginning to upper-intermediate. This test comprises 60 items and the average administration time is 70 minutes.

b. An essay writing test consisting of four topics was used. All students were required to select one topic for writing a five paragraph essay serving as a pre-test.

c. A standard self-regulation questionnaire for writing performance developed by Kanlapan, Theresa Carmela, and Velasco (2009), adapted from the Zimmerman's (2002) model was used serving as the pre-test and the post-test (see Appendix). This is a self-report questionnaire comprising 100 items across three areas of personal, behavioral, and environmental effects in seven categories of strategies:

1. Goal setting (15 items);
2. strategies for attaining the goals (15 items);
3. restructuring one's physical and social contexts (15 items);
4. managing one's time efficiency (15 items);
5. evaluating one's method (15 items);
6. attributing causation to results--it refers to beliefs about the cause of one's errors or successes (10 items); and
7. adapting future methods (15 items)

The average administration time is between 30 and 45 minutes. The inventory was based on a five-point Likert scale measuring how frequently students use the related strategies: "Not at all true of myself," "Slightly true of myself," "About half way true of myself (about 50 percent of the time)," "Mostly true of myself", or "True of myself".

d. All participants in the both experimental groups used CAAM software--*Rationale*. They were required to accomplish their homework assignments in the CAAM environment.

e. The TOEFL Writing Scoring Guide (2007) provided by ETS was used to score the writing scripts in the writing pre-test.

4.3 Procedure

To achieve the purpose of the study, i.e., the impact of using CAAM on the EFL learners' self-regulation in writing, the following steps were taken into consideration during the research process:

***Pre-test*:** 127 university students in English Translation major took part in this study. After administrating a homogeneity test (OPT), as well as an essay writing test, all students completed the self-regulation questionnaire in writing under the supervision of the researchers, who read and explained each item in front of the class to help learners fill out the questionnaire ensuring the quality of responses. The provided questionnaire is a five point Likert scale one which the responses could be codified into 1 to 5 according to the equivalent answers:"Not at all true of myself=1" "Slightly true of myself=2," "About half way true of myself (about 50 percent of the time)=3," "Mostly true of myself=4", or "True of myself=5". Accordingly, 90 out of 127 students were selected as the eligible participants for the present study.

***Treatment*:** All participants in three groups were required to accomplish five paragraph writing tasks as homework assignment in argumentation text type during a course of 12 sessions. Each assignment included three phases to be handled to participants in the control group, as well as in both experimental groups: introduction and assignment, problem solving, and collection. In the first phase, the argumentation text type was introduced to learners by the instructor. Next, all participants had some practices on that specific text type in the classroom as the instructor monitored them. The second phase started almost at the end of the session (ten to fifteen minutes) which was devoted to providing help to those students who had problems in accomplishing their assignments. In other words, forethought and performance phase of self-regulation could be accomplished by all three groups either on paper or in CAAM environment. Meanwhile, indirect corrective feedback was provided for all groups received the instructor's corrective feedback and had the chance to monitor their writing process on their assignment paper for the control group and for both experimental groups with available tools in CAAM editor page. In this regard, the third phase of self-regulation, i.e., monitoring stage was performed. In the last phase, the assignments were collected from students in the control group and the hard copies of those of the experimental groups from their CAAM environment (individually or in pairs).

***Post-test*:** At the end of the course, all participants in three groups were assigned to complete the same self-regulation questionnaire they had replied in the pre-test.

4.4 Design

As the nature of the current research was to investigate the impact of using computer-aided argument mapping (CAAM) on the improvement of Iranian EFL learners' writing self-regulation, the selected participants were divided into three equal groups, one control group and two experimental groups exposed to treatment condition doing writing tasks via CAAM software in pairs or individually. As there was not possible to have true randomization of the participants, this research was a quasi-experimental one following a pre-test/post-test design which was dealing with following variables:

1. Independent variable, which was the technique of using CAAM in the English essay writing classes for accomplishing tasks.
2. Dependent variable which was writing self-regulation.

5. Results

In order to select the participants with upper-intermediate language proficiency level, OPT was used in this study. As the obtained distribution of scores did not significantly differ from the normal distribution, those standing between X ± 1 SD were selected. The reliability of the test was calculated, as well. Test-reliability and descriptive statistics of the placement test are illustrated in Table 2 and 3.

Table 2. Reliability statistics of OPT

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.802	.797	54

Cornbach's alpha (.802) indicates a high level of internal consistency of the test items.

Table 3. Descriptive statistics of OPT

	N	Mean	Std. Deviation
OPT	127	44.35	7.48

Therefore, 90 students who scored between 37 and 52 were selected for the study.

In addition to OPT, all participants took a pre-test of essay writing. For the purpose of obtaining inter-rater reliability, all scripts were read by three raters, and the correlation among scores marked by each rater was calculated. Table 4 shows the correlation among three raters who marked writing scripts obtained in the pre-test according to TOEFL scoring guide (2007) for assessing essay writing.

Table 4. Inter-rater correlation matrix

	rater2	rater3
rater1	.539	.768
rater2		.422

Moreover, to find out intra-rater reliability, the researcher chose ten scripts of the participants randomly scored them in other time without writing any score on them. To achieve Intra-rater reliability, the data were analyzed statistically. In this regard, the selected sample was homogenized.

All participants of the study were categorized randomly into three equal groups and they completed the writing self-regulation questionnaire. As the research design followed pre- test/post-test design, to ensure that all participants in three groups enjoy the same self-regulation level, the test of homogeneity of variance was run. The descriptive statistics of writing self-regulation questionnaire as the pre-test is shown in Tables 5.

Table 5. Descriptive statistics of pre self-regulation test

	Mean	Std. Deviation	Minimum	Maximum	N
self-regulation	205.32	19.292	143	249	90

According to Table 6, as the significance value is greater than 0.05, the assumption of homogeneity of variance is not violated. So, three homogenous groups went under the experimental condition.

Table 6. Test of homogeneity of variances in pre self-regulation test

Levene Statistic	df1	df2	Sig.
9.381	2	87	.905

In order to find the answer of the research question and investigate the accuracy of the null hypothesis, the researchers analyzed the data from the post- test. Using the SPSS software version 21, the *one-way ANOVA* statistical procedure was run among the mean scores of writing self-regulation obtained from the control group and the experimental groups on the post-test in order to realize whether using CAAM in essay writing classes promotes Iranian EFL learners' self-regulation.

At first, the descriptive statistics of writing self-regulation scores on the post-test obtained from all three groups are depicted in Table 7.

Table 7. Descriptive statistics of self-regulation post-test

	Mean	Std. Deviation	Std. Error	N
CG	236.70	24.910	4.548	30
EG1	405.47	20.130	3.675	30
EG2	423.57	10.153	1.854	30

Table 8 shows there is a statistically significant difference at the $p<.05$ level in writing self-regulation scores for the three groups: F (2, 87)=846.8, p=0. Accordingly, the positive effect of using CAAM on Iranian EFL learners' writing self-regulation is achieved.

Table 8. On-way ANOVA between and within groups in post-test self-regulation in writing

	Sum of Squares	*df*	Mean Square	*F*	*Sig.*
Between Groups	637289.489	2	318644.744	846.861	.000
Within Groups	32735.133	87	376.266		
Total	670024.622	89			

Furthermore, the researchers used the *Post Hoc tests* in order to find out the possible difference between participants' self-regulation in a computer hands-on writing environment when the participants performed in collaboration or in person. Post-Hoc comparisons using the Tukey HSD test indicated that the mean score for EG1 (M=405.47, SD=20.130) was significantly different from EG 2 (M=423.57, SD=10.153). In other words, in CAAM environment, those participants who did their tasks in pairs had higher

self-regulation than those who did their assignments individually. Table 9 and 10 illustrates the means for groups in homogeneous subsets and multiple comparisons among groups obtained from Tukey HSD, respectively.

Table 9. Means for groups in homogeneous subsets in writing self-regulation post-test

		Subset for alpha= 0.05		
Participants	N	1	2	3
CG	30	236.70		
EG1	30		405.47	
EG2	30			423.57
Sig		1.000	1.000	1.000

Table10. Pairwise comparisons among groups of writing self-regulation post-test

Dependent variable	Paired Tests	Mean Difference	Std. Error	Sig
Writing self-regulation	CG/EG1	-168.767*	5.008	.000
	CG/EG2	-186.867*	5.008	.000
	EG1/EG2	-18.100*	5.008	.001

*. The mean difference is significant at the 0.05 level.

6. Conclusion

The role of self-regulation for better writing performance was studied in earlier researches (Manchón, 2009; Zimmerman, 2000; Zimmerman & Kitsantas, 2002). In the same line with this research, Manchón (2009) reported the educational and language learning value of L2 writing, together with instructional practices, as well as a great influence on writing goals, attitudes, and students' interest. Also, Zimmerman (2000) and Zimmerman and Kitsantas (2002) found 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.

Winne (1989) states that self-regulating strategies can be learned to a varying extent, but students need to be instructed and they need to be provided with plenty of practice and appropriate feedback in class. In addition, self-regulation is usually viewed as a cycle (Zimmerman, 2000), and it can even be imagined as a continuum (Dörnyei, 2005), along which learners can be placed at each moment of learning not for attaining a foreign language but for reaching a sense of being a lifelong English learner. This way of modeling self-regulation provides an explanation for the phenomenon of "the daily ebb and flow of motivation" (Dörnyei, 2001, p. 16), as well as dysfunctions of self-regulation (Zimmerman, 2000).

The role of self-regulatory learning in an intelligent tutoring and computer hands-on learning environment was studied in earlier researches (Conati, Hefferman, & Motivic, 2015; Giuliana, 2010). Also, Boykin (2015) reported the positive effect of computer-based graphic organizers on self-regulatory learning in L2 writing. In the same line with these researches, the findings of the present study revealed the impact of computer- aided argument mapping on Iranian EFL learners' self-regulation in writing skill. Furthermore, in line with previous research findings (Stahl et. al, 2006; Marjanovic, 1999; Wegerif, 1996), the results of the present study showed the positive effect of computer-based writing classroom on the learners' self-regulation.

In addition to self-regulation, motivation and attitude can have pivotal impacts on students' academic outcomes (Zimmerman, 2008). The findings of this study showed that using computer helped the learners enhance their interests for accomplishing writing tasks, see themselves as agents of their own learning, and be involved in a dynamic and constructive process. Also, it was revealed that those who worked in pairs in CAAM environment outperformed those who worked individually. This finding was in line with previous studies which found the positive effect of collaborative learning in the computerized environment (Kessler, Bikowsi, and Boggs, 2012; Yarling, 2011), and also its effect on the self-regulatory strategies of L2 learners in computerized learning environment (Chao, 2011; Giuliana, 2005; Lonchamp,2010). Kessler et al. (2012) reported about the evolving nature of Web-based collaborative writing and associated pedagogical practices

including considerations about student autonomy. Also, Yarling (2011) found the positive effect of cooperative learning in computerized environments.

It should be noted that self-regulation does not occur automatically, and the factor of age does not develop self-regulated ability, as well (Lapan, 2010; Orhan, 2007). However, self-regulated learning could be taught and can lead to increase in students' achievement (Orhan, 2007; Tseng, Dörnyei, & Schmitt, 2006). Therefore, learners should be given choices to practice self-regulation in writing classes through carrying out the related tasks/activities. In this regard, self-regulated learners evaluate failure as constructive, realizing the fact that failure is not important but how to respond to it really matters (Paris & Winograd, 2010).

The findings of this research have implications for L2 materials development, teaching/learning, and testing. In materials development, this study contributes to better understanding of students' self-regulation in the process of learning L2 writing in a way to help educators develop innovative teaching materials and upgrade the pedagogical practices, as well as empower learners to go through in a positive and lifelong learning experience. In this regard, it can be stated that materials developers can include CAAM in the academic writing classrooms via the textbook, section devoted to performing the computer-based activities, tasks, and projects. By engaging the 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.

Besides, CAAM has some pedagogical implications, as well. As L2 learner's personality traits could be considered as important predictors in their success in language processing, identifying these traits and providing facilities to enhance them would be a great accomplishment in L2 teaching and learning. CAAM would provide this opportunity for the teachers and learners to improve some of these personality traits, such as critical thinking, motivation, interest, self-efficacy, and self-regulation.

For testing implication, as CAAM provides a platform to accomplish L2 writing in a procedural manner, it could be easy to monitor and assess the learners' self-regulation in any stage of writing process. This assessment

could be done not only by the instructor, but also by the individual leaner as self/peer assessment.

To conclude, it is hoped that the experience shared in this study will inspire further research studies and lead to closer partnership between teachers and students so that students are given more choices to practice the writing skill in the process of L2 learning and teachers have better opportunities to enhance L2 achievement by recognizing and considering the learners' personality traits.

References

Anderson, A. (2005). Affective influences on the attentional dynamics supporting awareness. *Journal of Experimental Psychology General, 134,* 258–281.

Ausubel, D. (1963). *The psychology of meaningful verbal learning.* New York: Grune & Stratton.

Bandura, A. (1989). Perceived self-efficacy in the exercise of personal agency. *The Psychologist: Bulletin of the British Psychological Society, 2*, 411-424.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: W. H. Freeman and Company.

Boykin, A. (2015). The impact of computer-based graphic organizers with embedded self-regulated learning strategies on the content area argumentative writing of typical and struggling Writers. Retrieved September, 2015 from http://digilib.gmu.edu/dspace/handle/1920/2811/browse?value=Graphic+organizer&type=subject

Cañas, A. J., Hill, G., Carff, R., Suri, N., Lott, J., Eskridge, T. (2004). CmapTools: A knowledge modeling and sharing environment.In A. J. Cañas, J. D. Novak & F. M. González (Eds.), Concept maps: Theory, methodology, technology. *Proceedings*

of the first international conference on concept mapping (Vol. I, pp. 125-133). Pamplona, Spain: Universidad Pública de Navarra.

Chao, Y. (2011). Students' perceptions of Wiki-based collaborative writing for learners of English as a foreign language. *Interactive Learning Environments, 19 (4),* 395-411.

Conati, C., Heffernan, N., Mitrovic, A., & Verdejo, M. (2015). *Proceedings of the 17th international conference on artificial intelligence in education.* Springer-Verlag: Berlin Heidelberg.

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

Davies, W. M. (2011). Mind mapping, concept mapping, and argument mapping: What are the differences and do they matter?*Higher Education, 62*(3), 279-301.

Davies, W.M. (2009). Computer-assisted argument mapping: A rational approach. *High Education, 58*, 799-820.

Dörnyei, Z. (2001). *Motivational strategies in the language classroom.* Cambridge: Cambridge University Press.

Dörnyei, Z. (2005). *The psychology of the language learner: Individual differences in second language acquisition*. Mahwah, NJ: Lawrence Erlbaum.

Giuliana, D. (2010). *Fostering self-regulated learning through ICT.* NY: Information Science Reference.

Giuliana, D. (2005). CMC environments supporting self-regulated learning. Retrieved September, 2014 fromhttp://www.researchgate.net/publication/32231405_CMC_environments_supporting_self-regulated_learning

Graham, S., & Harris, K. R. (2005). *Writing better: Effective strategies for teaching students with learning difficulties*. Baltimore, MD: Paul H. Brookes Publishing Co.

Harris, K., Graham, S., Mason, L., & Friedlander, B. (2008). *Powerful writing strategies for all students*. Baltimore, MD: Brookes.

Kanlapan, M., Theresa Carmela, E., & Velasco, J. C. (2009). Constructing a *self-regulationscale contextualized in writing*. Retrieved October 2012, from www.tesol-journal.com/PDF/A6V1_TESOL%5B1%5D.pdf

Kessler, G., Bikowski, D., & Boggs, J. (2012). Collaborative writing among second language learners in academic web-based projects. ***Language Learning and Technology, 16*** (1), 91-109.

Kung, S. C. (2002). A framework for successful key-pal programs in language learning. CALL-EJ Online, *3*(2). Retrieved December 2013, from http://www.clec.ritsumei.ac.jp/english/callejonline/6-2/SCKung.html

Lai, (2006). The advantages and disadvantages of computer technology in second language acquisition. National Journal for Publishing and Mentoring Doctoral Student Research, 3(1), Retrieved December 2013, from http://files.eric.ed.gov/fulltext/ED492159.pdf

Lapan, R. T. (2010). Empowering students to become self-regulated learners. Retrieved March, 2014, from http://www.sfu.ca/~sbratt/ SRL/Empowering%20students%20to%20become%20self%20regulated%20learners.pdf

Larkin, J.H. , & Simon, H. (1987). Why a diagram is (sometimes) worth ten thousand word. *Cognitive Science, 11*(1), 65-100.

Lonchamp, J. (2010). Customizable Computer-based Interaction Analysis for Coaching and Self-Regulation in Synchronous CSCL Systems. *Educational Technology & Society, 13* (2), 193–205.

Maftoon,P., Birjandi, P., & Pahlavani, P. (2014). The impact of using computer-aided argument mapping on the improvement of writing achievement of Iranian learners of English. *Theory and Practice in Language Studies, 4*(5), 982-988.

Maftoon,P., & Pahlavani, P. (2014). The impact of using computer-aided argument mappin on Iranian EFL learner' writing self-efficacy. *International Journal of Language Learning and Applied Linguistics World, 7* (3), 1-12.

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

Manchón, R. M., (2009). Individual differences in foreign language learning: The dynamics of beliefs about L2 writing. *RESLA, 22,* 245-268.

Marjanovic, O. (1998). Learning and teaching in a synchronous collaborative environment. *Journal of Computer Assisted Learning, 15*, 129-138.

Mayer, R. E. & *Gallini*, J. K. (1990). When is an illustration worth ten thousand words? *Journal of Educational Psychology, 82*(4), 715-726.

McCombs, B. L. (2001). Self-regulated learning and academic achievement: A phenomenological view. In B. J. Zimmerman & D. H. Schunk (Eds.), *Self-regulated learning and academic achievement: Theoretical perspectives* (2nd Ed.) (pp. 67-123). Mahwah, NJ: Lawrence Erlbaum.

Mezei, G. (2008). Motivation and self-regulated learning: A case study of pre-intermediate and upper-intermediate students. *WoPaLP, 2, 79-104.*

Novak, J. D., & Gowin, D. B. (1984). *Learning how to learn*. Cambridge: CUP.

Orhan, F. (2007). Applying self-regulated learning strategies in a blended learninginstruction. *World Applied Sciences Journal, 2*(4), 390- 398.

Quick Oxford Placement Test (2006). Oxford university press and university of Cambridge local examination syndicate. Retrieved April 2013, from http://www.vhsaschaffenburg.de/documents/5000/Oxford_Test.pdf

Paris, S. G., & Winograd, P. (2010). The role of self-regulated learning in contextual teaching: Principles and practices for teacher preparation. Retrieved December 2013, from http://www.ciera.org/library/archive/ 2001 04/0104parwin.html

Pennington, M. (2003). The impact of the computer in second language writing. In B. Kroll (Ed.), *Exploring the dynamics of second language writing.* (pp. 287-311). Cambridge: Cambridge University Press.

Pintrich, P. R. (2000). The role of goal orientation in self-regulated learning. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 452-502). New York: Academic Press.

Pintrich, P. R., & DeGroot, E. V. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology, 82*(1), 33-40.

Rationale (2012). *Austhink*. Retrieved February 2012, fromhttp://rationale.austhink.com/download.

Schunk, D. H. (2005). Self-regulated learning: The educational legacy of Paul R. Pintrich. *Educational Psychologist, 40*, 85-94.

Stahl, G., Koschmann, T., & Suthers, D. (2006). Computer-supported collaborative learning: An historical perspective. In R. K. Sawyer (Ed.), Cambridge handbook of the learning sciences (pp. 409-426). Cambridge: CUP.

TOEFL Writing Scoring Guide (2007). *Educational testing service*. Retrieved October 30, 2012 from http://www.ets.org/portal/site/ets/menuitem.1488512ecfd5b8849a77b13bc3921509/?vgnextoid=e7d72d3631df4010VgnVCM10000022f95190RCRD&vgnextchannel=db35197a484f4010VgnVCM10000022f95190RCRD

Twardy, C. (2004). Argument maps improve critical thinking. *Teaching Philosophy, 27*(2), 95-116.

Tseng, W., Dörnyei, Z., & Schmitt, N. (2006). A new approach to assessing strategic learning: The case of self-regulation in vocabulary acquisition. *Applied Linguistics, 27*(1). 78-102.

Van Gelder, T. J. (2007). Rationale: Making people smarter through argument mapping. Retrieved November 2013, from http://www.austhink.com/pdf/vangelder_submitted.pdf

Wegerif, R. (1996).Collaborative learning and directive software. *Journal of Computer Assisted Learning, 12,* 1, 22-32,

Winne, P. H. (1989). Internal details in self-regulated learning. *Educational Psychologists, 30*, 173-187.

Wolters, C. (1998). Self-regulated learning and college students' regulation of motivation. *Journal of Educational Psychology, 90*, 224–235.

Wolters, C. (2011). Regulation of motivation: Contextual and social aspects. *Teachers College Record, 113*(2), 265-283.

Yarling, H. (2011). The perceptions of cooperative learning in computer assisted language learning environments. *International Conference on Education and control Engineering (ICECE)*, Retrieved October 2013, from http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=6056758&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxpls%2Ficp.jsp%3Farnumber%3D6056758

Zimmerman, B.J. (1986). Becoming a self-regulated learner: Which are the key subprocesses? *Contemporary Educational Psychology, 11*, 307-313.

Zimmerman, B. J. (1989). A social cognitive view of self-regulated academic learning. *Journal of Educational Psychology*, *82*(3), 1-23.

Zimmerman, B.J. (2000). Self-efficacy: An essential motive to learn. *Contemporary Educational Psychology, 25*(1), 82-91.

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory into Practice, 41*(2), 64-70.

Zimmerman, B.J. (2008). Investigating self-regulation and motivation: Historical background, methodological developments, and future prospects. *American Educational Research Journal, 45*(1), 166-183.

Zimmerman,B. & Campillo, M.(2002). Motivating self-regulated problem solvers, in *The Nature of Problem Solving,* J. E. Davidson and R. J. Sternberg, Eds., New York: Cambridge University Press.

Zimmerman, B. & Kitsantas, A. (2002). Acquiring writing revision and self-regulatory skill through observation and emulation. *Journal of Educational Psychology, 94*(4), 660- 668.

Zimmerman, B. J., & Martinez-Pons, M. (1990). Student differences in self-regulated learning: Relating grade, sex, and giftedness to self-efficacy and strategy use. *Journal of Educational Psychology, 82*, 51-59.

Appendix
Writing Self-Regulation Questionnaire

1.	2.	3.	4.	5.
Not at all true of myself	Slightly true of myself	About halfway true of myself	Mostly true of myself	True of myself

Goal setting

1. Before I write, I set my mind that I would finish my written output.
2. I set standards for my writing.
3. I create certain goals for every writing task I need to accomplish.
4. I plan the contents of the things that I would write.
5. I make my own guidelines for my written output.
6. I take note of my purpose in a specific writing task.
7. I think of my target audience and reason for writing a certain piece.
8. I drive myself to be resourceful in my writing.
9. I set a specific time in which I would write.
10. I always intend to make my written outputs of high quality.
11. I visualize my written output first before engaging in it.
12. I have a certain length in mind for the paper that I will work on.
13. I aim to create a paper with no grammatical errors.
14. I aspire to create a paper that will satisfy the readers.
15. I seek to compose a paper that uses comprehensible vocabulary.

Strategies for attaining the goals

16. I brainstorm for ideas before I write.
17. I use graphic organizers to manage my ideas.
18. I use the free-writing strategy to garner several thoughts.
19. I create an outline before I write.
20. I create a draft before writing the final paper.
21. I modify my paper if I'm not contented with it.
22. I use certain writing strategies such as annotating, outlining, etc. whenever doing a writing task.
23. I proofread my work.

24. I ask my peers to edit my writing.
25. I ask professionals to evaluate my writing and give suggested revision
26. I use word processing software to check errors in my writing.
27. I reread my work several times to find some errors in my writing.
28. I check my work on the general level then to the sentence level.
29. I know and use the writing approach of planning, organizing, writing, editing and revising.
30. I take into consideration the comments of other people about my writing.

Restructuring one's physical and social context

31. I avoid watching television when I am finishing a writing task.
32. I avoid using my cell phone whenever I am writing a composition.
33. I usually finish my writing tasks late at night.
34. I isolate myself in quiet places whenever I do my writing tasks.
35. I can write efficiently when I am working in a clean and quiet environment
36. I am able to finish a writing task when I am listening to music.
37. I like talking with my friends while doing a writing task.
38. I prefer having people or friends around when I write so that I can gather more ideas from them.
39. I don't let others disturb me when I am writing.
40. I like finishing my compositions early in the morning.
41. I accomplish all my writing tasks at my own pace.
42. I see to it that my things are fixed before I begin with writing.
43. I usually do my writing tasks in a quiet place where there isn't much noise.
44. I like to multi-task whenever I write.
45. I don't like writing in a crowded place.

Managing one's time efficiently

46. I create a time table of the writing outputs I need to accomplish.
47. I keep a separate planner for all my writing tasks.
48. I use post-its to keep track of the writing tasks I need to accomplish
49. I immediately accomplish the writing tasks I need to accomplish during my free time.
50. I finish all my compositions weeks before its deadline.
51. I keep a calendar where all the deadlines of my writing outputs are written.
52. I create a checklist of all the writing tasks I need to finish.

53. I see to it that I finish my writing tasks before their deadline.
54. I keep a notebook where I list a schedule of my daily writing activities.
55. I gradually finish my writing tasks whenever I have nothing to do.
56. I immediately start with the writing task as soon as the teacher gives it.
57. I accomplish all my writing tasks before doing unnecessary things.
58. I set an alarm for every writing task I have scheduled.
59. I allot a specific time for every writing task.
60. I use daily logs to track the writing tasks I have already accomplished.

Evaluating one's method

61. If the drafts of my outputs are not getting good marks, I ask an English teacher for help.
62. I make necessary revisions in my compositions whenever the teacher suggests me to.
63. I edit errors in my compositions before I submit them to the teacher.
64. I like proof-reading activities in class.
65. I enjoy writing workshops because I am given ideas for points for improvements.
66. I take down the comments of everyone who reads my writing outputs.
67. I browse through my drafts to check the progress of my writing.
68. I am open to feedbacks which can help improve my compositions.
69. I cross check if my writing output matches the outline I created.
70. I ask others what changes should be done in my composition for further improvements.
71. I evaluate my written outputs after every session.
72. I take note of the improvements in my written outputs.
73. I benefit from peer-editing activities.
74. I create my own rubric to check my own written output.
75. I make a list of the things I need to improve on in my written outputs.

Attributing causation to results- refers to beliefs about the cause of one's errors or successes

76. I believe that my success or failures lie in my lack of effort to do a writing task.
77. I ask myself what went wrong when I receive a low grade in a certain writing task.

78. I raise certain questions which I believe were the sources of my success.
79. My compositions are excellent because I know I can do well.
80. I attribute my success in my writing task due to my fondness of reading.
81. I credit my teacher for teaching my how to write suitably.
82. I attach my failure to my own personal limitation.
83. I blame someone or something if I did not reach the deadline of my writing task.
84. I hold myself accountable for the success of my writing.
85. My success in the writing task is due to the help of my peers.

Adapting future methods

86. When I receive a low mark on a certain writing activity, I will plan my next activity in a more detailed manner.
87. I read more so that I have a wide range of knowledge for the next writing task.
88. I take note of the comments of the writing instructor and make sure that I apply it in the next writing activity.
89. I read my work carefully and seek where I committed an error.
90. I ask my teacher for possible improvements I can make in my written outputs.
91. I compile my work so that I can see the progress and development of my writing.
92. I ask someone to tutor me for the next writing task.
93. I eliminate distractions that might have interfered with my writing.
94. I experiment with writing strategies to see what suits me best.
95. I make sure that my writing appeals to the one who'll read it.
96. I'll extensively familiarize myself with the next topic I will write about.
97. I'll use thesaurus to enrich my writing and vocabulary in the next writing activity.
98. I will ponder intently for my next writing task.
99. I'll read aloud what I have written so that I can check what sounds good and what doesn't.
100. I will ensure that the audience of my next writing task will be interested in my composition.

Kanlapan et al. (2009)