

Concept Mapping and Brainstorming Affecting Writing Anxiety and Accuracy

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Abstract

Argumentative essays show how much a writer can implement his/her power to convince the reader in favor of his desired intention. However, many writers might encounter different types of challenges during the task of writing and wonder how to overcome them. The purpose of this study was to investigate the effect of concept mapping and brainstorming on the lexical and grammatical accuracy and writing anxiety of Iranian EFL learners' argumentative essays. In doing so, 90 male and female students ranging from 17 to 35 in Iran National Language Institution (INLI) in Tehran were selected through cluster sampling based on convenience. An essay writing test and the second language writing anxiety inventory (SLWAI) were used both as pre- and post-test. The students were randomly assigned to three equal groups to experience different treatments in a 15-session semester. One group received instruction through concept mapping, another group through brainstorming, and the third group through conventional instruction. For data analysis, three separate one-way ANCOVA procedures were used. The results showed that both experimental groups did better than the control group. In lexical accuracy, the two experimental groups had almost the same mean scores, but in grammatical accuracy and writing anxiety, the concept mapping group obtained the highest mean followed by the brainstorming group. The findings of the study can have useful implications for teachers, students, material designers, and language assessors.

Keywords: concept mapping, brainstorming, lexical accuracy, grammatical accuracy, writing anxiety

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1. Introduction

Argumentative use of language refers to the spoken or written language in which the speaker/writer manages or fails to support their claim by providing arguments, reasons, evidence or examples in a logical framework to achieve their goal of persuasion (Toulmin, Rieke & Janik, 1984). An argumentative essay usually contains a debatable statement. That is, the reader may disagree with what is presented. Therefore, support must be provided to persuade readers. Ross and Rossen-Knill (2015) hold that written arguments are linguistic and rhetorical devices posited by a writer to communicate with a reader via a text with the goal of finding agreement, verifying or reinforcing the reader's position or initiating a new idea. As Richards and Sandy (2015) suggest, "in persuasive writing, you take a position on an issue and try to convince the reader that your position is correct" (p. 83).

A writing assignment can be demanding. Zhang (2001) and Hilleson (1996) state that when students are involved in a writing activity, they experience a remarkable amount of anxiety. As Thompson (1980) states, writing anxiety is a "fear of the writing process that outweighs the projected gain from the ability to write" (p.121).

To overcome writing anxiety, certain things can be done. One solution is to give learners time to ponder over the topic they are about to write about. If they have time to think about relevant information, they will feel more relaxed and, as a result, they will have more ideas on the topic. Two of the techniques that can be used prior to writing assignment are Concept Mapping (CM) and Brainstorming.

Wesley and Wesley (1990) point out that CM is a beneficial tool for explaining and simplifying the perception of concepts and their inter-relationships. Concept mapping is a strategy to help students learn meaningfully; this strategy was first introduced by Joseph Novak at Cornell University (Osborn, 1953). A concept map can be referred to as a tree-like map to join a family of related ideas which are used to exhibit a limited number of main points and key notions for teachers and students to concentrate on, before starting any specific learning tasks (Novak & Gowin, 1984).

According to Khalaf Ibnian (2011), brainstorming is a group activity in which group members think about one problem and try to come up with creative solutions by negotiating different ideas by the leader of the group. Smith (2000) defines brainstorming as "a process in which two or more heads spin out creativity with more zap than any one mind" (p. 3). Brainstorming can be done individually or in groups. Osborn (1953) claims that group brainstorming is more beneficial than individual brainstorming. However,

there is also research evidence suggesting that individual brainstorming may be more effective than group brainstorming (Bouchard, 1969; Bouchard & Hare, 1970; Campbell, 1968; Dunette, 1964; Dunette, Campbell & Jastad, 1963; Fumbam, 2000; Putman & Paulus, 2009; Rietzschel, Nijstad & Stroebe, 2005). In addition, Camacho and Paulus (1995) believe that many individuals become socially stressed out and cannot utter their ideas in a group and, therefore, must brainstorm their ideas alone.

This study has the aim of investigating the effects of using CM and Brainstorming on the lexical and grammatical accuracy of argumentative essays and writing anxiety. It addresses the following research questions:

1. Are there any significant differences among the effects of CM, brainstorming, and conventional instruction on the lexical accuracy of Iranian EFL learners' argumentative essay writing?
2. Are there any significant differences among the effects of CM, brainstorming, and conventional instruction on the grammatical accuracy of Iranian EFL learners' argumentative essay writing?
3. Are there any significant differences among the effects of CM, brainstorming, and conventional instruction on Iranian EFL learners' writing anxiety?

2. Literature Review

2.1. Argumentative writing

Toulmin, Rieke and Janik (1984) introduce four elements for an argument. In the first phase, the participants of an argument clear the air in terms of their purpose behind their argumentation. Providing related grounds for the made claim is the second phase; this implies gathering and presenting facts to support the claim. In the next phase, warrants must be provided to verify the correctness of these grounds. The last phase is examining these warrants. Backing provides a thorough look at the aimed field to prevent fallacies.

Rex, Thomas and Engel (2010) modified the above-mentioned model to simplify argumentative writing. Their framework is made up of three main critical elements of an argument; an argumentative writing can be started by forming a stance. In order for the information to be convincing and persuasive, reasonable evidence is to be provided. The composed writing must warrant the provided evidence and illuminate the relation of the evidence with the related argument.

An argumentative essay can consist of five parts, the first part being the issue about which the writer is composing the argument. Then an overview of the opponent arguments is needed. The third step is the emergence of rebuttals for the opposing outlook, and the last part must present the writer's arguments. These parts can fit into a five-paragraph essay, a paragraph for introduction, three paragraphs of body and a paragraph for conclusion (Bacha, 2010; Oshima & Hogue, 2014). However, Richards and Sandy (2015) offer another style for the essay, which is composed of introduction of the issue and the thesis statement, then the opposing view is presented and the writer's opinion comes next. The last part is the conclusion.

Helping learners to achieve accuracy in writing, in general, and in argumentative writing in particular, has been a long standing concern of many educational practitioners. Accuracy could have different dimensions. This study focuses on lexical and grammatical accuracy. Agustin Llach (2011) suggests a definition for lexical accuracy by defining lexical error as "a deviation in form and/or meaning of a target-language lexical word. Form deviations include orthographic or phonological deviations within the limits of single words, and also ignorance of syntactical restrictions" (p. 90). As Hartshorn, *et al.* (2010) point out, the most effective and reliable measure of writing accuracy is presented by Wolfe-Quintero *et al.* (1989), which calculates error free T-unit ratio (EFT/T) as the whole number of EFT in an essay or writing divided by total number of T-units. Hunt (1965, p. 49) defined the T-unit as "one main clause plus the subordinate clauses attached to or embedded within it" (Cited in Hartshorn, *et al.*, 2010).

Despite consistent attempts by teachers to improve learners' writing accuracy, argumentative writing still provokes substantial levels of anxiety in learners. Writing anxiety, as a language-skill-based anxiety (Cheng, Horwitz & Challert, 1999; Horwitz, 2001)), can negatively influence the accuracy of a composed message (Fleming, 1985), the competence of a student (Bannister, 1992), and their desire to write or attend writing courses (Daly & Miller, 1975b) as well as their future vocational opportunity (Daly, Vangelisti & Witte, 1988).

Daly (1978) reported that low anxious students were more accurate in their writings than highly anxious ones. Various attempts have been made since to relieve writing anxiety and improve writing accuracy. One way of achieving these objective is by using (and teaching) writing strategies.

Dean (2010) believes that the application of strategies in writing can result in a better piece of composition. Strategies have been categorized into three broad groups: (1) cognitive learning strategies, which stand for the general learning and sometimes assist writing, (2) writing strategies, being completely at the service of writing, (3) self-regulatory strategies, aiding the writer to finish a task and be successful in doing it (Dean, 2010). Other than writing strategies, there are certain teaching techniques that can be used to facilitate argumentative writing and to reduce writing anxiety. From among these techniques, this study focuses on concept mapping and brainstorming, each of which are briefly reviewed below.

2.2. Concept Mapping (CM)

To develop knowledge, students need to connect what they learn to what they have learned. Scholars have suggested a technique to link concepts to form new knowledge structure. This technique is known as *concept mapping*. Concept maps are intended to link concepts to meanings for creating propositions (Novak & Gowin, 1984).

Concept maps are believed to be of numerous merits. Learners benefit from concept maps in understanding and internalizing the subject lesson and in connecting new information to what they already know. Material developers can organize materials according to their importance in a course of study. It is also worth mentioning that cooperative learning among students can be boosted through the use of concept maps in groups. Meaning can also be easily negotiated through concept maps (Novak & Gowin, 1984).

As Ojima (2006) mentions, concept maps serve various purposes in learning, like helping learners to develop ideas and evaluating the extent to which students understand in order to detect misunderstandings. There are other benefits cited for CMs in Novak and Canas (2006) such as being rapidly recognized in terms of visual signs, making scanning effortless for students while searching for a specific piece of information, and gaining a holistic view of the concerned subject area by the learner which words by themselves are unable to offer.

Llewellyn (2007) introduces a procedure for teachers to instruct CM in which there are four stages including 1) the main topic must be located at the top or center of the page students are drawing, 2) the subtopics must be ordered from the most general to the most specific, 3) a verb, statement, phrase, or preposition must be used as a linkage to connect the concepts to

each other, and 4) more concepts can be connected to concepts for showing several relationships among the concepts.

Several Studies have been carried out on Concept Mapping. In one such study, Novak and Canas (2006) reviewed the history of concept mapping and referred to the numerous fields of study in which CMs have been used to indicate its efficiency. It was reported that CM results in meaningful learning and stands by Vygotsky's zone of proximal development (ZPD). Novak and Canas called CM a potent technique to help learners build new knowledge.

With the emergence of mapping tools like concept mapping, mind mapping, and argument mapping, Davies (2011) explored the differences among these three cognitive tools for educational-related goals. The author concluded that the three mapping tools are used to perform different functions based on the task they are chosen for, while they can be seen as complementary elements in non-expert situations.

The usefulness of CM in collaborative learning, initially claimed by Cheng et al. (2003), is strongly supported by Kinchin, De-Leij and Hay (2005). Kinchin et al. investigated the role of concept mapping in enhancing undergraduate students' knowledge amalgamation. The findings revealed that in order for concept mapping to appear practical, teachers need to create a student-oriented milieu, launch collaboration in groups, and allocate a sufficient amount of time for thinking.

In another study, 49 students enrolled in a three-part workshop. The first workshop was about the ways to learn academic writing in argumentative genre using concept maps (Experimental). The second group experienced the instruction of argumentation in writing with no concept mapping (Control 1), and the third group had the teaching of reading for pleasure in order to convince others to read (Control 2). Kozminsky, Nathan, Kozminsky, and Horowitz (2012) used ANCOVA to analyze the results and came up with the conclusion that the CMs in the experimental group helped the students to call for background knowledge in written argument and used better writing structures in comparison to the control groups. In a meta-analysis, Nesbit and Adesope (2006) reviewed 55 experimental and quasi-experimental studies in which the participants learned to construct knowledge by concept maps. The disciplines in the study included science, psychology, statistics, and nursing. Through various conditions and settings, concept

mapping was reported to be much more beneficial for knowledge acquisition, retention, and transfer compared to reading and listening as well as summarization and outlining strategies. Furthermore, Ojima (2006) explored the impacts of pre-task planning using concept mapping on ESL learners' writing performance. Three adult Japanese students enrolled in a writing program in a private ESL school in Canada agreed to partake in this case study. The researcher found that concept mapping can foster students' textual complexity and fluency rather than accuracy.

Papajohn (2002) investigated the ways in which raters rated learners' performance on an oral English test through concept mapping. The results revealed that the rating reasons and concepts differed among raters even though they went through the same training to rate. Moreover, Chang, Sung and Lee (2003) investigated the role of computer-based concept mapping instruction in binding learners together to think and explore. Two studies were conducted to see the effects. In study 1, the topic was not tangible for students and there was little help or instruction related to CM. In study 2, the topic seemed more vital and CM instruction was highlighted. The results indicated that concept mapping can be used as a handy device for collaborative learning for the purpose of representing knowledge.

In another study, Sabbaghan and Ansarian (2013) investigated language learners' attitude towards the use of concept mapping strategy to improve listening comprehension. The results showed that concept mapping raised the awareness of the participants and significantly improved their listening comprehension.

Gardner (2015) studied the effect of concept mapping strategy as a graphic organizer on the content knowledge and engagement with content in elementary students' persuasive writing. There were three groups: a concept mapping group, a four square group, and a control group using no graphic organizer. Results from ANOVA test showed a significant mean difference between the three groups. Concept mapping gained the highest mean score on both variables followed by the four square method and the control group.

Jafari and Zarei (2015) investigated the effect of concept mapping on Iranian EFL student' argumentative essay writing skill. The results of the post-test showed that concept mapping strategy had a significant effect on the students' essay writing skill. Shakoori, Kadivar, and Sarami (2017) examined the effects of concept mapping as a representational knowledge organization

tool on writing achievement of EFL learners. The study showed the efficacy of concept mapping as a useful strategy to enhance the performance of learners in writing courses.

Machida and Dalsky (2014) investigated the effect of concept mapping on enhancing writing achievement of students with trait-level anxiety. To this end, the researchers divided the students into groups of high and low anxiety and three groups of concept mapping, idea listing, and an unrelated task. The findings of the study revealed that students with high levels of trait anxiety did not benefit from concept mapping strategy. However, the low anxiety students found concept mapping beneficial for their writing achievement.

2.3. Brainstorming

Brainstorming is a process in which a person or groups of people try to diminish the amount of barriers ahead of idea generation (Osborn, 1953). As Richards (1999) mentions, brainstorming can be done through different ways including Electronic Brainstorming (EB), Heuristic Brainstorming, Interactive Group Brainstorming (IGB), and Nominal Group Brainstorming (NGB).

Brainstorming is based on two assumptions. The first one requires the practitioner to defer the judgment about ideas so that the participants feel free to propose their ideas. The second principle is about the ideas occurring in a natural way and being related to the topic.

Several researchers have investigated Brainstorming. Putman and Paulus (2009) carried out a study to create additional rules of brainstorming. A hundred and twenty students from a psychology class were asked to do both nominal group and interactive group brainstorming. The participants filled a questionnaire on their attitude towards satisfaction of decision making and the addition of extra rules. The results showed that students did not feel positively about the addition of extra rules and were more anxious than students employing Osborn's rules. The findings confirmed the results of previous studies (Bouchard, 1969; Bouchard & Hare, 1970; Campbell, 1968; Dunette, 1964; Dunette, Campbell & Jastad, 1963; Furnham, 2000; Rietzschel, Nijstad & Stroebe, 2005; Taylor, Berry & Block, 1958) suggesting that conducting nominal group brainstorming leads to a greater proportion of quantity and originality of ideas compared to interactive group

brainstorming. Diehl and Stroebe (1991), Karau and Williams (1993), Sutton and Hargadon (1996), and Paulus, Putman, Dugosh, Dzindolet and Coksun (2002) also report that individual brainstorming is more efficient than group brainstorming.

In another study, Nijstad, Stroebe and Lodewijckx (2002) used stimuli in different modes for idea generation. The participants were brought into contact with a group of semantically unrelated ideas dealing with a wide range of words, a group of cohesive and related ideas with a limited range of words, a group of randomly chosen ideas, and a group of categorized range of ideas as well as a group exposed to no idea. Based on the results, the students exposed to organized and categorized ideas generated more semantically related brainstorms in comparison with the groups exposed to unorganized ideas.

Rietzschel, Nijstad and Stroebe (2005) investigated the effects of idea generation of NGB and IGB on idea selection. One hundred and thirty-eight students took part in the study and were divided into 12 male and 34 female groups of three. The groups were given 30 minutes to do the brainstorming activity and another 30 minutes to do the selection of ideas, nominal groups in rooms and interactive groups in group rooms. The outcome suggested the following ideas: the idea generation encountered the superiority of numbers of ideas in NGBs, the two-task groups were more motivated than the one-task group in performance; the members of interactive groups were afraid of evaluation resulting in less idea generation. The ideas generated in NGBs were more original and in IGBs more feasible.

Heningsen and Heningsen (2013) investigated the effectiveness of nominal group brainstorming in terms of cohesiveness and quantity in an idea generation task. They divided 186 students into 31 nominal groups and 28 brainstorming groups, each including four or five members. Like the other groups, the participants in the nominal groups were seated in a room but not close enough to know what the neighbouring member was doing. Members of the brainstorming groups were instructed to interact while doing the activity.

In a study conducted to investigate the efficiency of brainstorming strategy instruction to foster EFL students' essay writing skills, Rao (2007) used three sophomore classes at university and divided them into two experimental and one control groups. Brainstorming was explicitly instructed

to the two experimental groups. Prior and posterior to the instruction, a pre- and post-tests were administered. The results indicated that instruction of the mentioned strategy upgraded the scores obtained from the post-test.

Manouchehry, Farangi, Fatemi, and Qaviketf (2014) investigated the effects of heuristic and clustering brainstorming activity on EFL learners' writing performance involving 60 students in three groups: experimental one (heuristic), experimental two (clustering), and control group. Two essays written by the participants of the three groups were considered pre- and post-tests. The results showed that the experimental groups were significantly different from the control group. It was concluded that brainstorming had a positive effect on EFL learners' writing achievement.

As the above short review suggests, both concept mapping and brainstorming have been investigated in relation to different areas of language. However, there appears to be a paucity of research on the comparative effectiveness of the two techniques, especially on EFL learners' argumentative writing and writing anxiety. This study is intended to partially fill this gap.

3. Method

3.1. Participants

The participants of the study were selected from four English language institutes located in Tehran, including Iran National Language Institution (INLI), Alipour English College, Checkad Language Institute, and Baran English Academy. The participants included ten classes in the last semester of the book "*Passages 1*" (Richards & Sandy, 2015) who wanted to pass the achievement test of this book to pass to the next book, "*Passages 2*" (Richards & Sandy, 2015). The participants' English language background included 4 to 5 years of experience attending EFL classes, and they were at upper-intermediate proficiency level. The number of the selected students was 110 before running the homogeneity test. After administering the homogeneity test, the number of the participants was reduced to 90 ($m = 45$, $f = 45$). 14 students failed the test and 4 students were absent in the exam session. The participants were aged 17 to 35.

3.2. Instruments

In order to answer the research questions, the following materials and data collection instruments were used:

3.2.1. *Passages Lesson-by-Lesson Achievement Tests*

At the end of each lesson in Passages 1 and 2 (Richards & Sandy, 2014), there is a validated standardized achievement test. These tests were considered as the homogeneity test in the study. According to the scoring system proposed by Richards and Sandy (2015), the cut-off point to pass the exam was 35 out of 50. There were six sections in the quiz labeled as A to F. The first section of the test was aimed at evaluating the listening skill of the participants through six multiple-choice items. In section 2, six fill-in-the-blanks items were used for testing the participants' ability to check the correct use of tenses. The third section evaluated the preposition recognition ability of the students. In the next section, the participants were expected to respond to eight items of sentence completion by choosing the proper word in the box. The fifth section was designed to check the students' ability to complete the given sentences through certain structures. The last section of the test was about answering five true-false questions after reading a text.

3.2.2. *Instruction Materials*

For argumentative essay writing, *Longman Academic Writing Series* (Oshima & Hogue, 2014) was used. The first experimental group was taught *Learning How to Learn* (Novak & Gowin, 1984, pp. 15-54) to experience concept mapping strategy. In the experimental group two, the researcher had a brief presentation on brainstorming by exercising *Applied imagination: Principles and procedures of creative problem solving* (Osborn, 1953) as the prototypical source for this strategy and the website <https://teaching.unsw.edu.au/brainstorming> as a secondary and updated version of brainstorming.

3.2.3. *Scoring Rubric*

For rating pre- and post-tests including argumentative essay writing, an analytic scoring rubric designed and used by Paulus (1999) was utilized. The purpose of this rubric is to gauge the writing in terms of six categorical elements. Organization is the first category referring to the efficiency of the thesis statement and unity of the ideas. Development, as the second item, denotes the usage appropriateness of supporting details and examples. Cohesion, the next item, seeks to search for the relationship of ideas with each other and the use of transitions in sentences. Structure was used by Paulus (1999) to rate syntax complexity and grammatical accuracy.

Vocabulary is the element referring to clarity of meaning and the appropriate use of words and word groups. Mechanics, as the final category, refers to correctness of spelling, punctuation, capitalization, and general formatting. For the purpose of the present study, the three last categories were used; Structure and mechanics were used to measure grammatical accuracy and the category of vocabulary was used as the measure of lexical accuracy. The writing proficiency related to each category was fully described in 0 to 10 points ranging from minimum to native like proficiency for each of the three categories.

3.2.4. Second Language Writing Anxiety Inventory (SLWAI)

Most studies on writing anxiety have employed the writing anxiety test (WAT) developed by Dally and Miller (1975). However, Cheng (2004) gives several reasons for the inefficacy of WAT as a true estimation of writing anxiety due to its poor construct validity, inaccurate sample measurement- measuring writing anxiety in L1 not L2, and low self-confidence being its concern rather than writing anxiety alone. For these reasons, Cheng introduced a multi-dimensional writing anxiety scale. Cheng claims that the proposed scale, namely second language writing anxiety inventory (SLWAI), is devised for the purpose of both meeting multi-dimensional conception of anxiety and measuring L2 writers' anxiety as well as removing the flaws in previous scales. SLWAI, which was used in this study, includes 22 items in a 5-point Likert scale ranging from strongly agree to strongly disagree.

3.3. Procedure

To fulfil the objectives of the study, the following steps were taken. After the participants were selected through cluster sampling, the standardized lesson-by-lesson achievement test of *Passages 1 and 2* was administered, as a result of which 90 students were shown to be qualified to partake in the study. Then, they were put in three groups and each group was randomly assigned to one of the three modes of treatment. The first group consisting of 30 participants was randomly assigned to concept mapping instruction for writing argumentative essays. The second group consisting of 30 participants was randomly assigned to brainstorming instruction. The third group (with 30 participants) was randomly assigned to process writing instruction (the conventional treatment).

Next, all the participants were given a pre-test. They were asked to write a four-paragraph essay in the argumentative genre in 40 minutes. The

essay had to be composed of an introductory paragraph, one paragraph stating the opponent view, one paragraph providing the proponent view, and a final paragraph restating the opponent/proponent view taken by the writer as the conclusion. Prior to the pre-test, the students were supposed to fill out SLWAI. This was done in the first session of the 5-week treatment, prior to the strategy instruction treatment.

The third stage was the treatment. The first experimental group was given instruction in concept mapping strategy. The instructor used *Learning How to Learn* (Novak & Gowin, 1984) to teach the strategy. The treatment was given during 15 sessions over 5 weeks. Each session took one hour and a half. The researchers taught concept mapping strategy in 3 sessions, and the students practiced the strategy for eight sessions. The remaining four sessions were used by students to finalize their grasp of concept mapping by receiving feedback from both the teacher and other students. While teaching, the instructor familiarized the students with the strategy through incomplete concept maps, so that the students could fill the blanks with proper concepts. Then, in the 5th session, the teacher allowed them to draw basic concept maps. When satisfied, the instructor gave the participants certain activities as homework. In the classroom, the students practiced drawing concept maps both individually and in groups.

The second group received instruction in brainstorming strategy. The researcher used *Applied imagination: Principles and procedures of creative problem solving* (Osborn, 1953) as the prototypical source for this strategy and <https://teaching.unsw.edu.au/brainstorming> as a secondary source on brainstorming. During instruction, students were able to do brainstorming as a warm up activity for other skills like speaking. Individual mode of brainstorming was of utmost importance here. The treatment took 5 weeks (15 sessions of 1.5 hour each). The researcher taught brainstorming in 3 sessions as a warm up activity for writing. The students were given 5 minutes to think of related ideas to a certain topic introduced by the teacher and draw a brainstorm of those ideas. The related ideas were attached to the topic by straight lines. Then the students practiced the strategy for eight sessions, both in groups and individually. Four sessions were allocated to feedback from both the teacher and other students.

The third group was the control group and received instruction of process writing in argumentative genre in a conventional way. The researchers used *Longman Academic Writing Series* (Oshima & Hogue,

2014) to go through the argumentative essay writing process. The instructor worked on argumentation and outlining to help students overcome the difficulties of writing arguments. Like the two mentioned groups, a 15-session period was devoted to the treatment, each session lasting for one and a half hours. Two sessions were used to teach argumentation by allowing them to write opponent and proponent views about a topic introduced by the teacher, then nine sessions were considered for in-class and at-home practices, and four sessions were devoted to sharing content-related knowledge among the class members. The last session was allocated for the post-test.

After the treatments, the students in each group were told to complete SLWAI once again to see if there was any significant impact on their level of writing anxiety.

In the post-test session, the two experimental groups were given 5 minutes to do an individual paper-and-pencil concept mapping and brainstorming to help them organize what they wanted to write. Then, they were allowed to write their argumentative essay in 40 minutes in the classroom. The control group had 5 minutes to plan their writing and then started to write the argumentative writing in 40 minutes.

For scoring the essays, the instructor used Paulus's (1999) scoring rubrics to rate the writings of the participants. There were two raters for each writing sample. Then, the average of the two scores were considered as the main score for data analysis.

3.4. Data Analysis

To see whether and to what extent the treatment conditions affected the learners' lexical and grammatical writing accuracy and writing anxiety, one-way ANCOVA procedure was used.

4. Results and Discussion

4.1. Results

4.1.1. The First Research Question

The first research question examined the effects of concept mapping and brainstorming on the lexical accuracy of Iranian EFL students' argumentative essays. To achieve this goal, a one-way ANCOVA procedure was used. Before running ANCOVA, its assumptions were checked. Figure 1

and Table 1 show the result of checking the assumptions of linearity and homogeneity of regression slopes, respectively.

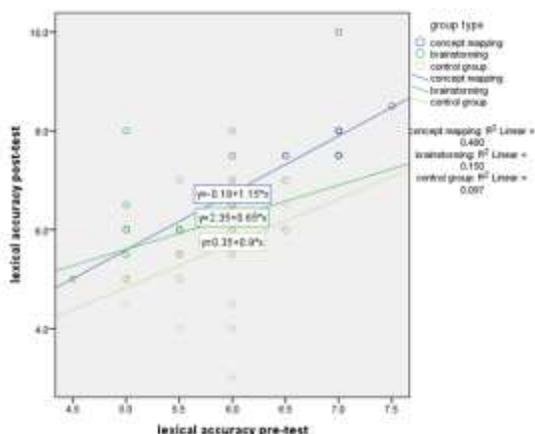


Figure 1. Linearity Assumption for Lexical Accuracy

Figure 1 shows that the scores of the groups form more or less linear straight lines. This indicates that the assumption of linearity was met.

As it is seen in Table 1, the significance level of the interaction between group and lexical accuracy pre-test (0.550) is greater than the statistically significant level (0.05). Therefore, it can be claimed that the homogeneity assumption was observed. Having met the assumptions, the researchers used the ANCOVA procedure to check if there is any significant difference.

Table 1
Homogeneity of Regression Slopes for Lexical Accuracy

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	63.074 ^a	5	12.615	17.170	.000
Intercept	.380	1	.380	.517	.474
Group	.687	2	.344	.468	.628
lex.acc.pre	14.541	1	14.541	19.792	.000
group * lex.acc.pre	.884	2	.442	.601	.550
Error	61.715	84	.735		
Total	3572.000	90			
Corrected Total	124.789	89			

a. R Squared = .505 (Adjusted R Squared = .476)

The results are shown in Table 2. The results show significant differences among the effects of concept mapping instruction, brainstorming instruction, and conventional instruction [$F(2, 86)=11.32$, $p \leq .0005$] on lexical accuracy of argumentative essays.

Table 2
Test Statistics for ANCOVA on Lexical Accuracy

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	62.190 ^a	3	20.730	28.47	.000	.498
Intercept	.214	1	.214	.29	.590	.003
lex.acc.pre	17.818	1	17.818	24.47	.000	.222
Group	16.487	2	8.243	11.32	.000	.208
Error	62.599	86	.728			
Total	3572.000	90				
Corrected Total	124.789	89				

a. R Squared = .498 (Adjusted R Squared = .481)

Table 2 also shows a significant result for the pre-test [$F_{(1,86)} = 24.47$, $p \leq .0005$]. This means that there are statistically significant differences among the three groups on the post-test after controlling for the initial differences on the pre-test. The index of partial eta squared is about .21, meaning that about 21% of the variance in the dependent variable is due to the effect of the independent variables. To locate the significant differences among the groups, pairwise comparisons were made. As it is shown in Table 3, the difference between the concept mapping and brainstorming groups is not significant ($p \geq .05$), but the difference between both experimental groups and the control groups is significant ($p \leq .0005$).

Table 3
Pairwise Comparisons on Lexical Accuracy

(I) group type	(J) group type	Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b	
					Lower Bound	Upper Bound
concept mapping	Brainstorming	.379	.291	.195	-.198	.957
	comparison group	1.076*	.246	.000	.588	1.565
brainstorming	comparison group	.697*	.234	.004	.231	1.163

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

4.1.2. The Second Research Question

The second research question sought to find out if there were any significant differences among concept mapping, brainstorming and conventional instruction on EFL students' grammatical accuracy of argumentative essays. To this end, an ANCOVA procedure was run. Again, before using ANCOVA, all its assumptions, including linearity and

homogeneity, had to be checked. Figure 2 and Table 4 show the result of checking the linearity and the homogeneity assumptions, respectively.

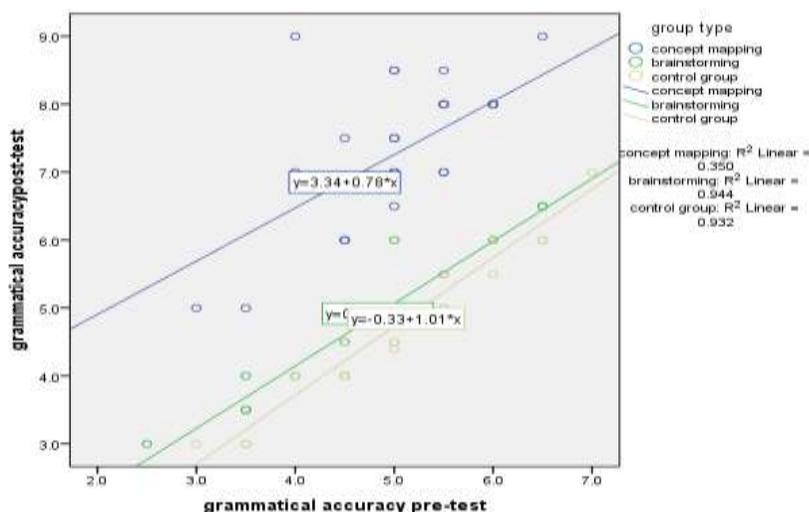


Figure 2. Linearity Assumption for Grammatical Accuracy

As all lines are straight in Figure 2, it can be inferred that the assumption of linearity has been met for grammatical accuracy. Moreover, as it is shown in Table 4, the significance level of the interaction between group and grammatical accuracy pre-test is larger than the significant level set (0.05). Therefore, the homogeneity assumption is observed.

Table 4
Homogeneity of Regression Slopes for Grammatical Accuracy

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	175.266 ^a	5	35.053	119.6	.000	.877
Intercept	3.429	1	3.429	11.7	.001	.122
Group	5.795	2	2.897	9.8	.000	.191
grm.acc.pre	55.329	1	55.329	188.8	.000	.692
group * grm.acc.pre	.565	2	.282	.964	.386	.022
Error	24.615	84	.293			
Total	3168.610	90				
Corrected Total	199.881	89				

a. R Squared = .877 (Adjusted R Squared = .870)

Having checked the assumptions, the researchers used the ANCOVA procedure. The results are presented in Table 5. The results of ANCOVA show significant differences among the three groups [$F_{(2)} = 189.73$, $p \leq .0005$] with regard to grammatical accuracy. Table 4.5 also shows a significant level of difference for the pre-test [$F_{(1)} = 197.45$, $p \leq .0005$]. This means that there are statistically significant differences among the three groups on the post-test even after the initial differences among the groups are removed. The

index of the strength of association shows that 82% of the variance in the dependent variable is due to the effect of the independent variable. According to Cohen (1988), this is indicative of a very large effect size.

To locate the significant differences among the groups, a pairwise comparison was used. As it is shown in Table 6, the difference between concept mapping and brainstorming groups is significant in favor of concept mapping. Meanwhile, the difference between both experimental groups and the control group is significant, indicating concept mapping and brainstorming are both more effective than conventional teaching.

Table 5
The Statistics for ANCOVA on Grammatical Accuracy

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Squared	Eta
Corrected Model	174.701 ^a	3	58.234	198.8	.000	.874	
Intercept	3.138	1	3.138	10.7	.002	.111	
grm.acc.pre	57.813	1	57.813	197.4	.000	.697	
Group	111.107	2	55.553	189.7	.000	.815	
Error	25.180	86	.293				
Total	3168.610	90					
Corrected Total	199.881	89					

a. R Squared = .874 (Adjusted R Squared = .870)

Table 6
Pairwise Comparisons for Grammatical Accuracy

(I) group type	(J) group type	Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b	
					Lower Bound	Upper Bound
concept mapping	Brainstorming	2.178*	.140	.000	1.899	2.456
concept mapping	comparison group	2.505*	.140	.000	2.227	2.782
brainstorming	comparison group	.327*	.140	.022	.049	.605

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

4.1.3. The Third Research Question

The third research question investigated the effects of concept mapping, brainstorming, and conventional instruction on EFL students' writing anxiety. An ANCOVA procedure was used to answer this question. Prior to the ANCOVA procedure, its assumptions (including linearity and homogeneity of regression slopes) were checked. Figure 3 checking for the linearity assumption and Table 7 checking for the assumption of homogeneity, show that the mentioned assumptions have been met.

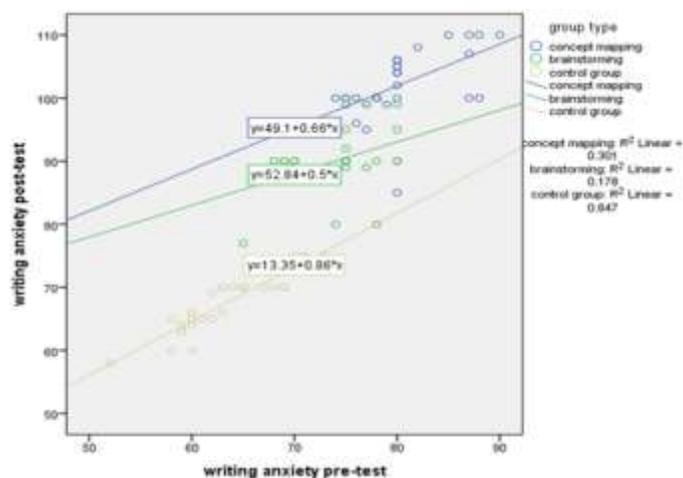


Figure 3. Linearity Assumption for Writing Anxiety

Table 7

Homogeneity of Regression Slopes for Writing Anxiety Post-pest

Source	Type III Sum of Squares	df	Mean Square	f	Sig.
Corrected Model	19105.150 ^a	5	3821.030	249.151	.000
Intercept	483.279	1	483.279	31.512	.000
Group	126.474	2	63.237	4.123	.020
wrtg.anx.pre	800.979	1	800.979	52.228	.000
group * wrtg.anx.pre	37.883	2	18.942	1.235	.296
Error	1288.239	84	15.336		
Total	695527.000	90			
Corrected Total	20393.389	89			

a. R Squared = .937 (Adjusted R Squared = .933)

As it is observed in Table 7, the significance level of the interaction between groups and writing anxiety is greater than the significant level set (0.05). This means that the homogeneity assumption has been satisfied. The results of the ANCOVA procedure for writing anxiety are presented in Table 8.

The results of the ANCOVA procedure show significant differences among the effects of concept mapping, brainstorming, and conventional instruction on writing anxiety [$F_{(2)} = 79.34$, $p \leq .0005$]. In addition, Table 8 shows a significant result for the pre-test [$F_{(1)} = 55.100$, $p \leq .0005$]. This means that there are statistically significant differences on the post-test even after controlling for the initial differences on the pre-test. The index of the strength of association shows that about 65% of the variance in the dependent variable is due to the effect of the independent variables. The remaining 35% of the variance is still unaccounted for.

Table 8

Test Statistics for ANCOVA on Writing Anxiety

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Squared	Eta Squared
Corrected Model	19067.266 ^a	3	6355.75	412.175	.000	.935	
Intercept	454.992	1	454.99	29.507	.000	.255	
wrtg.anx.pre	849.644	1	849.64	55.100	.000	.391	
Group	2447.138	2	1223.56	79.349	.000	.649	
Error	1326.123	86	15.42				
Total	695527.000	90					
Corrected Total	20393.389	89					

a. R Squared = .935 (Adjusted R Squared = .933)

To locate the significant differences among the groups, a pairwise comparison was used. As Table 9 shows, the concept mapping group has significantly outperformed the brainstorming group. Meanwhile both experimental groups have outperformed the conventional group.

Table 9

Pairwise Comparison for Writing Anxiety Post-test

(I) group type	(J) group type	Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b	
					Lower Bound	Upper Bound
concept mapping	Brainstorming	7.683*	1.194	.000	5.309	10.057
concept mapping	control group	22.875*	1.854	.000	19.189	26.561
Brainstorming	control group	15.192*	1.370	.000	12.468	17.916

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

4.2. Discussion

This study was aimed at investigating the effect of concept mapping and brainstorming strategy instruction on lexical and grammatical accuracy as well as writing anxiety of Iranian EFL students in argumentative essays. The results of the present study find accordance with some of the previous studies, but are also in contradiction with several other studies.

With regard to the lexical accuracy of argumentative essays, the findings indicated that both groups were significantly better than the conventional group. However, there was no significant difference between brainstorming and concept mapping groups. With regard to grammatical accuracy, the two experimental groups acted significantly better than the

control group, but this time, the concept mapping group also performed significantly better than the brainstorming group.

In line with these findings, Nobahar, Nemat Tabrizi, and Shaghaghi (2013) concluded that concept mapping instruction had a significant effect on the expository writing accuracy of Iranian inter-mediate EFL students. There are also similarities between the findings of this study and other studies like Shakoori, Kadivar, and Sarami (2017), Puteri Zarina and Husna Fatimah (2015), Meghyasi and Hashamdar (2015), Gardener (2015), Al-Shaer (2014), Talebinezhad and Mousapour Negari (2009), and Jafari and Zarei (2015), indicating the efficacy of concept mapping strategy instruction on fostering students' achievement in the writing skill. Contrary to these studies, Ojima (2006) concluded that concept mapping is not effective on writing accuracy.

In addition, Rao (2007), Maghsoudi and Haririan (2013), Haririan, Maghsoudi, and Madani (2014), Farangi, Fatemi, and Qaviketf (2014), Khalili, Tahriri, and Ghorbanpour (2015), Manouchehry, and Amoush (2015) have reported that brainstorming can boost students' writing ability. This is in line with the part of the findings of this study indicating the effectiveness of brainstorming compared to conventional teaching. The results of studies by Hashempour, Rostampour, and Behjat (2015) and Mahdian Mehr, Aziz Malayeri, and Bayat (2016) are also in line with the result of this study, suggesting the efficacy of brainstorming strategy as a pre-writing activity over conventional teaching of writing.

With regard to the third question, the findings of this study showed that concept mapping was a more helpful strategy in reducing writing anxiety than brainstorming and conventional teaching. This finding lends support to that of Nesbit and Adesope (2006) and Schweiker-Marra and Marra (2000). The finding is also similar to that of Jegede, Alaiyemola, and Okebukola (1990), who reported that concept mapping can reduce learning anxiety.

On the other hand, contrary to the findings of this study, Machida and Dalsky (2014) found that concept mapping strategy was not beneficial for the writing achievement of high anxiety students, although it was useful for low anxiety students.

Several factors may have contributed to these findings. Concept mapping and brainstorming require students to write words related to the main topic. These activities can act as spelling practice resulting in better lexical accuracy. Considering the fact that concept mapping involves more writing than brainstorming, there will be more practice with spelling in concept mapping resulting in better outcomes than brainstorming. This means

that such pre-writing activities can contribute to fewer lexical and grammatical mistakes, because an acceptable amount of practice may bring about more focus on form.

As brainstorming and concept mapping are known to provoke thinking, generate ideas and help learners think creatively, they can help learners frame materials in a logical fashion so that they produce a better text. The strategies in this study were practiced individually rather than in groups, because students may feel embarrassed generating ideas in front of their peers or showing their concept maps to others. This way, students may feel free to write whatever they have in mind. Therefore, another factor contributing to these results may be the individualistic mode of doing the pre-writing activities.

Moreover, concept mapping and brainstorming activities may motivate dynamic participation of learners in the classroom resulting in empowering students to gauge their intellectual capacity to solve their problems. Students' curiosity for using new strategies as pre-writing activities may also have increased their motivation in writing.

Using strategies like concept mapping can raise students' confidence in accomplishing a task. This can lead students towards independence in writing. In a drawn concept map, there are main topics in the middle of the map. This can be the reason for the students to better set the goals of writing and write better topic sentences and illuminate details with the help of branches of a concept map. The complex shape of a concept map can also help them generate more complex sentences and connect students' prior knowledge to their present knowledge. These factors may positively affect grammatical accuracy.

The age range of the participants, the milieu of the class, and the instructor's way of teaching may also be factors that could have affected the findings. For the sake of manageability, they were not the concern of this study.

5. Conclusion and Implications

The findings of this study suggested that both concept mapping and brainstorming strategies are more effective than conventional teaching on improving writing accuracy and reducing writing anxiety. Given the multiple benefits of these strategies, it can be concluded that both strategies should be given priority in writing classes.

The strategies used in this study were individual and group activities. Group activities can create more ideas than individual strategies. It can be concluded that not only can individual strategies be beneficial but also group strategies may bring more plausible results and that the selection of the type of strategy could affect learning. In other words, since each of the two strategies is effective in its own way, teachers are advised to be eclectic about the strategies they want to use.

In addition, using a strategy is all about planning a task. This means that planning is an essential part of doing a task which must be decided upon by the course instructor. A teacher, as a help rather than a boss, will help students to achieve more plausible learning and have a peaceful mind during an activity. Therefore, a teacher who guides students to choose the right strategy can minimize the anxiety of the students.

A strategy that has high active involvement of students, reduces the anxiety of the students, gives students time to plan and think, calls upon the background knowledge of the students, generates the largest number of ideas, helps students to draw what they have in mind in a graphical way, and does not involve cognitive overload in a way that students cannot handle its implementation can be of high use. This study concluded that concept mapping followed by brainstorming have all the above-mentioned characteristics.

The findings of this study may have theoretical as well as pedagogical implications for researchers, learners, teachers and syllabus designers. Apart from shedding light on the less explored aspects of the variables under investigation here, the findings can encourage learners and teachers to make more active use of both brain storming and concept mapping strategies. Moreover, the result of this study can help curriculum designers to design course books based on the concept mapping and brainstorming strategies to encourage students to write argumentative essays with fewer lexical and grammatical mistakes and lower writing anxiety

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