# Developing Lexical Complexity in EFL Students' Essays via Creative Thinking Techniques

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## ABSTRACT

This study attempted to investigate the effect of teaching creative thinking techniques on the development of lexical complexity in EFL students' essays in both timed and untimed conditions. For this quasi-experimental study, 54 female undergraduates of English literature, assigned to two groups of 27 each, were selected from two intact writing classes. In addition to their regular writing class, both groups were taught for 10 extra sessions through an online tool named Padlet. The experimental group (EG) was taught creative thinking techniques and the comparison group (CG) practiced extra process writing activities. Moreover, TOEFL essay questions were administered as pre and posttests. In both timed and untimed essays, three indices of lexical complexity, namely lexical density, lexical sophistication and lexical variation were measured through an automatic analyzing software. Mixed MANOVA showed that practicing creative thinking techniques had a significant effect on improving lexical complexity of EFL students in both conditions. Thus, material developers and EFL writing teachers could benefit from incorporating activities related to these techniques in EFL writing textbooks and also EFL classes, teaching students to develop lexical complexity in their essays.

*Keywords*: Creative thinking techniques, EFL writing; lexical complexity, Padlet

## INTRODUCTION

In recent years, developing creative thinking in English language teaching has gained attention (Iakovos, 2011; Tin, 2013). One of the skills in which creative thinking could play a crucial role is writing because many writing problems are related to thinking problems and learners should become acquainted with more thinking

techniques (Flower & Hayes, 1977; Rao, 2007). In fact, creative thinking "promotes problem solving which is a higher order thinking skill" (Szerencsi, 2010, p. 286) and hence could equip students for better, and more sophisticated, writing (McNamara, Crossley, & McCarthy, 2010). Indeed, it is crucial to investigate the impact of these kinds of techniques on writing complexity, specifically in an EFL context and at university level. Furthermore, to investigate students' writing performance, some factors such as timed/untimed conditions should be taken into account. In educational institutions or some international examinations such as TOEFL test, essays should be written under quite severe time constraints. Therefore, it may be necessary to investigate the writing performance of students in both timed and untimed conditions. In this study, the researchers aim to investigate the effect of teaching creative thinking techniques on improving the lexical complexity of EFL students' essays and explore its effect under timed and untimed conditions.

## LITERATURE REVIEW

### Creative Thinking and Writing

Creative thinking has been defined by Alvino (1990, p. 50) as "a novel way of seeing or doing things that is characterized by four components including FLUENCY (generating many ideas), FLEXIBILITY (shifting perspective easily), ORIGINALITY (conceiving of something new), and ELABORATION (building on other ideas)". Different techniques for improving creative thinking may include: visualization and creative dramatics, divergent thinking strategies, brainstorming, use of metaphors and analogies (synectics), Torrance and Safter's incubation model, commercial and competitive programs, and SCAMPER (Eragamreddy, 2013).

Reviewing various studies shows that among the above mentioned techniques, brainstorming, synectics, and SCAMPER were classified as divergent thinking techniques (e.g., Hummell, 2006; Smith, 2006; Takahashi, 2007). In other words, they bring unrelated elements or diverse ideas together which is the reason of their use for improving L1 and L2 writing in various studies (Keyes, 2008; Majid, Tan, & Soh, 2003; Rao, 2007).

### Brainstorming

Brainstorming practice provides a trigger for thinking in novel and various directions and increases students' confidence for producing ideas and "it is the students' experience of purposely hatching these ideas that is useful" (Kawenski, 1991, p.264). According to (Cropley, 2001, p. 98), brainstorming has four fundamental rules:

Criticism is ruled out

- Freewheeling is welcomed: the wilder the ideas the better

- Quantity is wanted, because the greater the number of ideas produced, the greater the probability that original, useful ideas will emerge

- Combination and improvement are sought

## Synectics

According to Joyce and Weil (2003), synectics gives us the chance to channel new ways of seeing things, communicating, and facing problems. In fact, "synectics is a procedure for bringing together elements which do not seem to belong together" (McLeod & Cropley, 1989, p.107) by producing different kinds of analogies through two processes called 'making the familiar strange' and 'making the strange familiar' (Eragamreddy, 2013).

## SCAMPER Technique

Eberle (1972) developed the SCAMPER technique based on the list of idea spurring questions which Alex Osborn (1953) introduced. The acronym stands for Substitute, Combine, Adapt, Modify/Magnify/Minify, Put (to other uses), Eliminate/ Elaborate, and Re-arrange/Reverse which will be used as a checklist for forming creative ideas (Mowat, 2011; Smith, 2006).

## Lexical Complexity in Writing

As stated by Read (2000), a good writing should have special lexical characteristics and used vocabulary effectively. Accordingly, Fellner and Apple (2006) indicated, "if lexical complexity and comprehensibility are not taken into account, students could conceivably be identified as having improved their writing fluency merely on the strength of having written the same simple sentence repeatedly over the timed period" (p. 20).

A term used by Read (2000) for lexical complexity is lexical richness which contains three well known measures-lexical density (LD), lexical sophistication (LS), and lexical variation (LV), as stated by Laufer and Nation (1995).

As Bulon, Hendrikx, Meunier and Goethem (2017) explained, complexity proved to be a basic and valid indicator of language development and progress. Hence, they focused on complexity rather than accuracy and fluency in students' writing performance.

## Purpose of the Study

Based on the arguments previously mentioned, creative thinking could play a crucial role in writing and practicing idea generation techniques which could also have an effect on writing, specifically on writing complexity. Therefore, the researchers sought to investigate the effect of divergent creative thinking techniques (Takahashi, 2007) on the lexical complexity of EFL students' essays in both timed and untimed conditions. Thus, this study tries to answer the following research question:

1. Does teaching creative thinking techniques affect EFL students' lexical complexity in timed writing?

2. Does teaching creative thinking techniques affect EFL students' lexical complexity in untimed writing?

## METHODS

### Participants and Research Setting

The participants of this study were 54 female undergraduate students of English literature at Alzahra University. After administering a writing proficiency test of TOEFL (Lougheed, 2004), the participants were selected from among 63 sophomores who scored one standard deviation above, and below, the mean as intermediate language proficiency learners. Participants were from two intact writing classes. The instructor of both classes was kept constant and she taught creative thinking techniques to the experimental group (EG) and practiced extra process writing activities with the comparison group (CG) through an online tool named Padlet in one academic term for 10 sessions.

### Instrumentation

The study was conducted through applying different instruments including writing proficiency test, timed/untimed pretest and timed/untimed posttest, all of which are explained in more detail in the following sections.

**Writing Proficiency Test and Timed/ Untimed Pretest.** A topic from the range of writing topics of a paper-based TOEFL test (Lougheed, 2004) with the title "*If you could invent something new, what product would you develop? Use specific details to explain why this invention is needed*" was selected and administered as the writing proficiency test and also timed pretest. To eliminate the effect of time restriction, the students were required to write another essay on the same topic as the untimed pretest without any time limitation at home.

**Timed/Untimed Post-test.** The post-test was like the pretest, but with a different topic "*If you could go back to some time and place in the past, when and where would you go? Why? Use specific reasons and details to support your choice*" being selected from the TOEFL test and administered after the completion of ten sessions for both groups. Students were required to write a timed post-test in 30 minutes in class and an untimed post-test at home.

### Procedure

In the first session of the class, the participants were given a topic from the writing topics of a TOEFL exam to see how homogenized they were. There was a 30-minute time limit and a 250-300 words limit. These essays were used for two purposes:

First, for determining the students' level of proficiency, two raters scored the papers. The raters were MA graduates in TOEFL and experienced teachers who had experience in assessing the writing section of TOEFL test. The raters used TOEFL paper-based test writing scoring guide (ETS, 2014). This rubric has a 6 scale point from 0-6 and a score between 2 points on the scale (5.5, 3.5) could be reported. In order to ensure the consistency of scores between the two raters, a Pearson–product moment correlation coefficient was run to investigate the inter–rater reliability. The result of Pearson–product moment

correlation coefficient ($r = 0.92$, $p < 0.05$) indicated a high correlation between the two raters.

Then, among the 63 students, 54 students who scored one standard deviation above and below the mean, were selected as intermediate and randomly assigned into two groups of 27. Second, the essays considered as pretest, were analyzed by an analyzing software named Lexical Complexity Analyzer (LCA) (Lu, 2012). Lu considered different components in learner's language use such as lexical density (LD), lexical variation (LV), and lexical sophistication (LS) for measuring lexical complexity. Based on his definition, lexical density is the ratio of lexical words (Nlex) to the number of words (N). Lexical variation or original Type-Token Ratio (TTR) is measured as the ratio of the number of word types (T) to the number of words (N) in a text. Lexical sophistication is computed as the ratio of the number of sophisticated word types (Ts) (i.e., the "beyond 2000" words) to the total number of word types in a text.

The next stage comprised of learners writing an untimed essay on the same topic as their timed essay. These essays were also analyzed via the LCA.

## Teaching Setting

An online teaching tool named Padlet was introduced to both groups. Padlet "allows a student to post thoughts on a common topic using electronic sticky notes on a shared digital wall" (Davis, 2013, p. 12). According to Halsted (2014), Padlet which is a new technological tool gives students an opportunity to write and post their notes via a digital board and share their unique ideas and their creative work on the Padlet wall. In order to eliminate the effect of using Padlet on the experimental group, both groups were required to use Padlet. Whereas the EG practiced creative thinking techniques through Padlet, the CG practiced extra process writing activities with it.

## Activities

The researcher taught three creative thinking techniques namely brainstorming, synectics, and SCAMPER to the experimental group. The control group was taught process writing in line with the syllabus of the class.

## Creative Thinking Activities.

*Brainstorming.* Topics and activities that would motivate students to think and generate ideas were selected. Two kinds of activities named 'idea links' and 'sense making' were selected from VanGundy (2005) and students were required to generate ideas based on the sample provided and practice the assigned topics. The following is one example which was provided for students:

To illustrate "Sense Making Ideas", consider a publisher's problem of how to increase book sales.

Here are some ideas that this technique might spark:

- *Smell:* Produce books that contain fragrances that reflect literary themes.

- *Sight:* Include a page of slides to illustrate topics.

- *Taste:* Include free stamps to encourage book buyers to mail in coupons redeemable for discounts on future book purchases.

- *Touch:* Make book covers with different textures that invite people to touch them. Once people pick up a book, they will be more likely to buy it.

- *Hearing:* Put audio-digital computer chips (like those in greeting cards) in the inside covers of books. When someone opens the front cover, the book says, "Buy me, please!" or mentions some benefit of the book's contents.

**Synectics.** The exercises and lesson plans for teaching synectics were mostly from "Models of Teaching*"* by Joyce and Weil (2003). In this phase, students were asked to practice "stretching exercises". These exercises were not related to any special topic and just helped students to practice metaphoric thinking before they follow sequence of synectics' phases. Three kinds of analogies were used as the basis of synectics activities including personal analogy, direct analogy, and compressed conflict. In personal analogy, students needed to empathize with objects or ideas that they use. For instance, "be a cloud. Where are you? What are you doing? How do you feel when the sun comes out and dries you up?" (p. 243). In direct analogy

students should compare two objects or concepts. It is not necessary that the comparison be similar in all respects. For example, students were asked to think of their textbook as an old shoe or as a river and in this way, the teacher provides a structure, a metaphor, with which the students can think about something familiar in a new and strange way. Another analogy, compressed conflict, is a two-word description of an object, where the two words are in conflict with each other. For instance, 'How is a computer shy and aggressive?'

After introducing the model and practicing it, students were required to apply it in writing their assigned topic.

***SCAMPER Technique.*** The third technique was SCAMPER. The activities for this technique were taken from Mowat (2011). For instance, students were asked to take an idea in a text or story to the future and thus different questions based on this acronym were asked such as, could you SUBSTITUTE the idea in the story with another idea? Could you COMBINE your own knowledge of science with knowledge of the tale? Could you ADAPT the architecture to reflect futuristic type? Could you MODIFY the narration to be reflective of possible speech in future? Could you add humor to the story by PUTTING TO OTHER USES the items? What details could you ELABORATE upon at the beginning of the story that would immediately communicate to readers the tale's futuristic setting? Could you REVERSE or REARRANGE key elements

in the tale's final scenes to provide a new twist to the story? Through practicing some activities students were taught how to use this technique for generating ideas.

**Writing Activities.** For the comparison group, the students were required to practice process writing. The purpose of assigning these activities was to help students practice the elements taught in class. They were required to write good topic sentences, thesis statements, and were taught how to improve the unity and coherence of their written production. Every draft was revised by the researcher twice. When the first draft was studied by the researcher, she provided corrective feedbacks such as Grammar or Coherence as to where the problem lies and the students were required to rectify the problem, then once more the piece of writing was marked by the researcher and feedback provided. Writing three versions for every piece of writing helped the learners to see where the problem was and try to overcome it.

## Posttest

After 10 practice sessions, a post-test was administered. Students were required to write one timed essay in 30 min in class and after one session interval they were asked to write an untimed essay (at home) on the same topic. As the last step, lexical complexity of students' timed and untimed handwritten essays, were typed by the researcher to be measured through LCA.

## Topic Selection

Regarding the selection of topics for pretest and post-test, in order to use standardized tests and control the difficulty level of the topics, two TOEFL essay questions from the same genre, i.e., descriptive, were selected.

## Data Analysis

For analyzing the data, the mean and standard deviation of the scores on the writing proficiency test were tabulated. To find out the go-togetherness of the two sets of scores provided by the two raters, the Pearson correlation coefficient was applied. Scores obtained from the investigation of three indices of lexical complexity (LD, LS, and LV) in timed and untimed essays through LCA (Lu, 2012) were transferred to SPSS 18. Since there were three dependent variables in each set of scores, multivariate analysis of variance (MANOVA) was chosen as the suitable statistical technique and for investigating changes from pretest to posttest and comparing the experimental and the comparison groups as two independent groups, mixed MANOVA was run. In fact, within-subject effect (changes from pretest to posttest), between-subject effect (between the experimental and the comparison group), and interaction of time and group effect were investigated.

## RESULTS

According to the purpose of the study, a number of instruments for analyzing the relevant data were utilized to answer the research questions.

## Participant Selection

Table 1 shows the descriptive statistic of writing proficiency scores with the mean being 3.77 and the standard deviation 0.80, respectively. Students who scored one standard deviation above and below the mean were selected and randomly divided into two equal groups of 27. Means for Three Lexical Complexity Measures of the Experimental and the Comparison Group (Pretest and Post-test) in Timed and Untimed Essays Inter-Rater Reliability.

Two experienced teachers of EFL writing assessed participants' essays. In order to ensure the consistency of the scores between the two raters, a Pearson-product moment correlation coefficient was run to investigate the inter-rater reliability. The result ($r = 0.92$, $p < 0.05$) indicates a high correlation between the two raters.

Table 1

*Descriptive statistics of writing proficiency scores, timed and untimed pretests and posttests essays*

| Measures | Groups | Time | Essays | Mean |
|---|---|---|---|---|
| Lexical density | Experimental | Pretest | Timed | 0.44 |
| | | | Untimed | 0.44 |
| | | Posttest | Timed | 0.50 |
| | | | Untimed | 0.51 |
| | Comparison | Pretest | Timed | 0.43 |
| | | | Untimed | 0.44 |
| | | Posttest | Timed | 0.45 |
| | | | Untimed | 0.46 |
| Lexical Sophistication | Experimental | Pretest | Timed | 0.20 |
| | | | Untimed | 0.21 |
| | | Posttest | Timed | 0.23 |
| | | | Untimed | 0.23 |
| | Comparison | Pretest | Timed | 0.22 |
| | | | Untimed | 0.22 |
| | | Posttest | Timed | 0.22 |
| | | | Untimed | 0.23 |
| Lexical variation | Experimental | Pretest | Timed | 0.73 |
| | | | Untimed | 0.76 |
| | | Posttest | Timed | 0.84 |
| | | | Untimed | 0.88 |
| | Comparison | Pretest | Timed | 0.73 |
| | | | Untimed | 0.77 |
| | | Posttest | Timed | 0.77 |
| | | | Untimed | 0.80 |

## The Effect of Teaching Creative Thinking Techniques on EFL Students' Timed Essays

Table 1 indicates that the mean score for lexical complexity indices including LD, LS, and LV in pretest are 0.44, 0.20, and 0.73, respectively for the EG and 0.43, 0.22, and 0.73, respectively for the CG. Likewise, mean scores in post-test are 0.50, 0.23, and 0.84, respectively for the experimental and 0.45, 0.22, and 0.77, respectively for the comparison group. In order to make any statistical claim on the obtained results, multivariate analysis was conducted.

According to Table 2, Wilks' Lambda test indicates that there is a statistically significant difference ($F$ (3, 50) = 31.77, $p$ < 0.05, partial η = 0.65) between the groups and according to Cohen's (1988, as cited in Leech, Barrett, & Morgan, 2005) criteria for the effect size (small = 0.14, medium = 0.36, large = 0.51, or very large = 0.70), there is a large significant difference between the groups in terms of lexical complexity of their timed essays. Furthermore, there is a substantial main effect for time, ($F$ (3, 50) = 169.79, $p$ < 0.05, partial η = 0.91) which indicates that there is a statistically significant difference in students' performance over time on lexical complexity measures from pretest to posttest. Moreover, the two-way time by group interaction was statistically significant, ($F$ (3, 50) = 37.76, $p$ < 0.05, partial η = 0.69) (See Table 2) which indicates the EG outperformed the CG over time.

In order to clarify which lexical complexity measure contributed to the significant overall effect, univariate F tests for each variable were carried out. The univariate statistics indicate that there is a significant difference from pretest to post-test for lexical density ($F$ (1, 52) = 88.30, $p$ < 0. 05, partial η = 0.62) and lexical variation ($F$ (1, 52) = 323. 24, $p$ < 0. 05, partial η = 0.86) but not for lexical sophistication ($F$ (1, 52) = 3.95, $p$ > 0.05, partial η = 0.071).

Interaction of time and group shows that there is a significant difference between the EG and the CG in terms of lexical density ($F$ (1, 52) = 43.08, $p$ < 0.05, partial η = 0.45) and lexical variation ($F$ (1, 52) = 50.82, $p$ < 0.05, partial η = 0.49) but not on lexical sophistication ($F$ (1, 52) = 1.17, $p$ > 0.05, partial η = 0.02).

Table 2

*Multivariate statistics for the effect of group, time, and time\* group in timed essays*

| Effect | | F | Hypothesis df | Error df | Sig | Partial Eta squared |
|---|---|---|---|---|---|---|
| Group | Wilks' Lambda | 31.771[a] | 3 | 50 | 0.000 | 0.656 |
| Time | Wilks' Lambda | 169.798[a] | 3 | 50 | 0.000 | 0.911 |
| Time*group | Wilks' Lambda | 37.768[a] | 3 | 50 | 0.000 | 0.694 |

Table 3
*Univariate tests for lexical density, lexical sophistication, and lexical variation in timed essays*

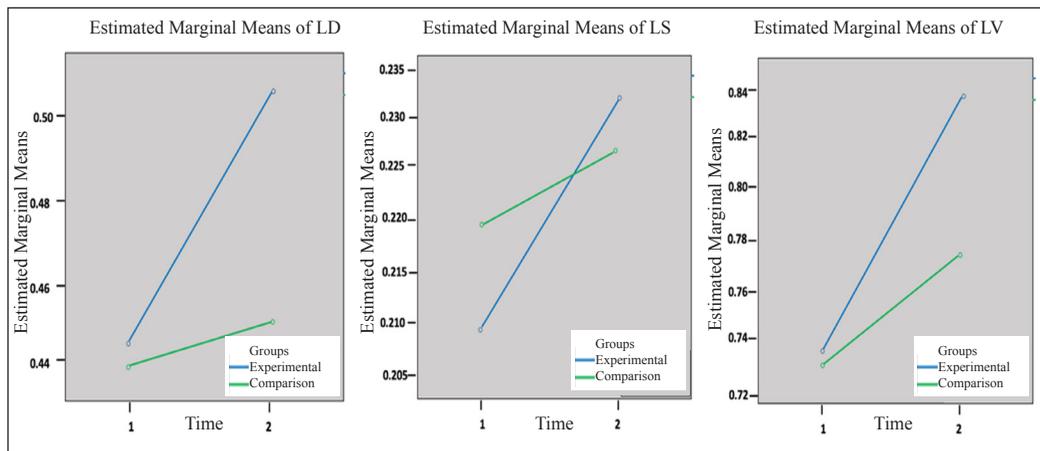| Source | Dependent Variable | Type III Sum of Squares | Df | Mean Square | F | Sig. | Partial Eta Squared |
|---|---|---|---|---|---|---|---|
| | LD | 0.037 | 1 | 0.037 | 88.30 | 0.00 | 0.629 |
| Time | LS | 0.006 | 1 | 0.006 | 3.95 | 0.05 | 0.071 |
| | LV | 0.149 | 1 | 0.149 | 323.24 | 0.00 | 0.861 |
| | LD | 0.018 | 1 | 0.018 | 43.08 | 0.00 | 0.453 |
| Time* group | LS | 0.002 | 1 | 0.002 | 1.17 | 0.28 | 0.022 |
| | LV | 0.023 | 1 | 0.023 | 50.82 | 0.00 | 0.494 |
| Error | | | 52 | | | | |



*Figure 1.* Linear graphs show the different mean scores from pretest to post-test for LD, LS and LV in timed essays (from left to right)

Thus, as depicted in Figure 1, there is an increase in lexical complexity measures from pretest to post-test and the EG outperformed the CG in the two measures of lexical density and lexical variation in the post-test.

## The Effect of Teaching Creative Thinking Techniques on EFL Students' Untimed Essays

In order to answer the second research question and investigate the untimed essays, another mixed MANOVA was run. Table 1 showed that the mean scores for lexical complexity measures in the pretest for the EG are 0.44, 0.21, and 0.76, respectively compared to 0.44, 0.22, and 0.77 for the comparison group. Meanwhile 0.51, 0.23, and 0.88 were reported for the EG compared to 0.46, 0.23, and 0.80 for the CG in post-test. These numbers illustrate that the experimental and comparison groups are not much different at the time of pretest but they are different at the time of post-test in untimed essays. Furthermore, multivariate analysis was conducted in order to check if

time, group and the interaction of time and group make any significant difference in the lexical complexity of students' untimed essays.

As Table 4 shows, significant multivariate effects were found for the group, ($F$ (3, 50) = 35.70, $p$ < 0.05, partial η = 0.68) and time ($F$ (3, 50) = 117.21, $p$ < 0.05, partial η = 0.87) as well as for the interaction between time and group, ($F$ (3, 50) = 36.63, $p$ < 0.05, partial η = 0.68). The results show that there is a significant difference between the EG and the CG from pretest to post-test. In addition, significant effect was found for time*group interaction, displaying that the EG showed much more improvement from pretest to post-test in terms of lexical complexity of their untimed essays and that the treatment was highly effective.

Furthermore, investigating a univariate F test for each variable in this analysis indicates which dependent variable (or lexical complexity measure) contributed to the significant overall effect.

According to Table 5, significant differences were found for LD ($F$ (1, 52) = 101.56, $p$ < 0.05, partial η = 0.66), LS ($F$ (1, 52) = 21.13, $P$ < 0.05, partial η= 0.28) and LV ($F$ (1, 52) = 264.37, $p$ < 0.05, partial η = 0.83). There is significant interaction of time*group for LD, ($F$ (1, 52) = 37.18, $p$ < 0.05, η = 0.41) and LV ($F$ (1, 52) = 84.79, p < 0.05, partial η = 0.62) which shows that the EG had higher improvement in these two lexical complexity measures. Estimating

Table 4
*Multivariate statistics of group, time, and time*groups effect in untimed essays*

| Effect | | F | Hypothesis df | Error df | Sig | Partial Eta |
|---|---|---|---|---|---|---|
| **Group** | Wilks' Lambda | 35.70[a] | 3 | 50 | 0.00 | 0.682 |
| **Time** | Wilks' Lambda | 117.21[a] | 3 | 50 | 0.00 | 0.876 |
| **Time*group** | Wilks' Lambda | 36.63[a] | 3 | 50 | 0.00 | 0.687 |

Table 5
*Univariate tests for lexical density, lexical sophistication, and lexical variation in untimed essays*

| Effect | Dependent variables | Type III Sum of Squares | Df | F | Sig | Eta |
|---|---|---|---|---|---|---|
| **Time** | LD | 0.052 | 1 | 101.56 | 0.00 | 0.66 |
| | LS | 0.007 | 1 | 21.13 | 0.00 | 0.28 |
| | LV | 0.142 | 1 | 264.37 | 0.00 | 0.83 |
| **Time*groups** | LD | 0.019 | 1 | 37.18 | 0.00 | 0.41 |
| | LS | 0.001 | 1 | 3.13 | 0.08 | 0.05 |
| | LV | 0.046 | 1 | 84.79 | 0.00 | 0.62 |
| **Error** | | | 52 | | | |

effect size also shows large significant differences between the two groups for lexical density and lexical variation.

As Figure 2 indicates, differences exist between the two groups in the two lexical

complexity measures at the post-test and therefore it could be claimed that those who practiced creative thinking techniques wrote more complex essays in untimed condition.
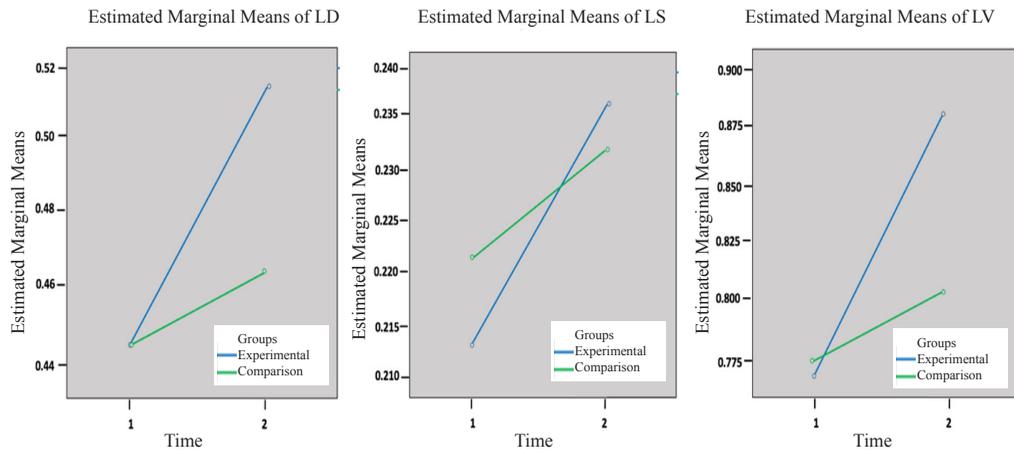


*Figure 2.* Linear graphs show the different mean scores from pretest to post-test for LD, LS, and LV in untimed essays (from left to right)

## DISCUSSION

The research questions of this study attempted to investigate the effect of teaching creative thinking techniques on the lexical complexity of EFL students' writing performance in two timed and untimed conditions and the results indicated a positive effect. The significant differences were specifically obvious in lexical density and lexical variation. Therefore, it could be concluded that teaching creative thinking techniques can be beneficial in enhancing the lexical complexity of both timed and untimed essays.

In fact, Tin (2013) refered to creative thinking and mentions that the necessity to say something new which we had not

yet explored and for which we did not have the language to express, forced us to retrieve less accessible words and develop complexity.

It can be stated that some of the findings of this study are similar to previous studies which focused on considering creative thinking as an important ability that potentially exists in every individual and has an effect on language teaching and learning (e.g., Albert and Kormos, 2011; Otto, 1998; Pishghadam & Javdan Mehr, 2011; Pishghadam, Khodadady, & Zabihi, 2011). One of the differences between previous researches and the present study is that the focus of those studies has been more on the relationship between creative thinking and language learning and language use but not

the causal effect of this ability on language. For instance, a study by Pishghadam and Javedan Mehr (2011) focused on the relationship between creative thinking ability and learners' writing performance and similarly showed a positive relationship between them.

The findings of the present study are in line with the results of some studies which focused on the causal effect of teaching creative thinking techniques on EFL students' writing performance such as Maghsoudi and Haririan (2013), Manouchehry, Farangi, Fatemi, and Qaviketf (2014), and Rao (2007). Those studies were conducted on EFL students, but they just investigated the effect of brainstorming on students' writing performance and not the three techniques together.

Some studies used synectics and SCAMPER for improving the writing performance of students but they were all conducted in the L1 context. For instance, Conley (2001) investigated the effect of six steps of synectics for making metaphoric language in L1 writing and Majid et al. (2003) investigated the effect of SCAMPER on improving children's writing performance in terms of accuracy in grammar, richness in vocabulary, and complexity of sentences. In these studies, it was shown that teaching the synectics technique could improve students' writing performance but SCAMPER did not show any positive effect on participants' writing.

One important factor investigated in this study was comparing the effect of two different conditions for writing (i.e., timed/ untimed). It is believed that timed essays are an indicator of students' normal vocabulary range (Muncie, 2002) and considered important in the assessment of students' written compositions. Besides, it should be emphasized that lexical complexity in timed essays is an important factor. In fact, the effective retrieval of vocabulary is crucial in timed written compositions such as essays for placement in writing courses or essays which are written as an integral part of class assignment (Engber, 1995).

This study focused on developing foreign language learners' lexical complexity and its well-known variables (i.e., lexical density, lexical sophistication, and lexical variation) via teaching creative thinking techniques.

To accomplish the above objective, we ensured having homogenized groups by testing their writing proficiency level before these teaching sessions, testing lexical complexity through pretest and posttest via using a software to be objective. Moreover, as mentioned before, we had a process writing class, thus the accuracy of students' writing was checked in various drafts which were written as an assignment in class during the time of the study and their progress were examined. Furthermore, the goal of this research was to improve current understandings of the effect of creative thinking techniques on lexical complexity measures for future EFL writing studies and as Lu (2012) mentions, our hope is that knowledge obtained about lexical richness could contribute to understanding of the entire picture.

# CONCLUSION

The result of this study showed that practicing three creative thinking techniques, named brainstorming, synectics, and SCAMPER, together could improve the lexical complexity of essays written under both timed and untimed conditions. The results could be useful and applicable for material developers, syllabus designers and writing teachers. In fact, material developers can prepare textbooks which provide learners with activities and the appropriate procedure of using these techniques. Syllabus designers are recommended to choose activities which tap students' creative thinking abilities because students can practice idea generation and hence become proficient in finding new ideas for their writing assignments. Moreover, students are obliged to search for new vocabularies to write about their novel ideas which may lead to the complexity of their writing.

EFL teachers could take advantage of creative thinking techniques in their essay writing classes. Although brainstorming is usually restricted to thinking about the topic for 5 or 10 minutes before the actual writing, it should be mentioned that brainstorming has some rules which could be applied and teaching these activities could assist students to generate novel ideas. Therefore, teachers could use these different activities in their classrooms based on the ability of their students in addition to assigning part of class time to practicing other techniques such as synectics and SCAMPER which could be very interesting to the students and influential in improving their writing complexity.

# ACKNOWLEDGEMENT

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