

THE COMPARATIVE IMPACT OF CONCEPT MAPPING STRATEGIES ON FIELD DEPENDENT AND FIELD INDEPENDENT EFL LEARNERS' VOCABULARY ACHIEVEMENT

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ABSTRACT

This study aimed to investigate the comparative impact of concept mapping techniques on field dependent (FD) and field independent (FI) EFL learners' vocabulary achievement. To this end, 66 EFL learners at the third grade of high school were selected on the basis of their performance on the Key English Test (KET) and a Group Imbedded Figure Test (GEFT) to assign groups as field dependent and field independent participants. To ensure the homogeneity of the participants regarding vocabulary, prior to the study, a piloted vocabulary achievement test was given to the participants too. Both groups experienced concept mapping techniques. At the end of the course, an independent sample t-test was run between the obtained means of the two groups on a piloted researchers - made post-test on vocabulary achievement to determine whether there was any significant difference between the mean scores of the two groups on the post-test. The results revealed no significant difference between the mean scores of the two groups. However, by implementing concept maps techniques language learners indicated their thoughts and their way of thinking through the process of making maps to reap the reward; meaningful and systematic learning.

KEYWORDS: concept mapping, field dependent, field independent, vocabulary achievement

INTRODUCTION

Authentic communication requires EFL learners to use words both accurately and appropriately. As Boonkongsan and Intaraprasert (2014) emphasize, in English as a second language or English as a foreign language, vocabulary is the vital part of the four language skills; listening, speaking, writing and reading. New word learning includes "an ongoing elaboration of knowledge about the word and the ability to use it" (Wesche & Paribakht 2000, p. 197). According to Nation (2000) learning new words is a cumulative process in which words are set up and improved as they come together; in primary steps of learning, learning connected words is

not suitable for learners. Research reveals that there is a close relationship between personality traits and vocabulary achievement (Chang, Weng & Zakharova 2013; Rostampour & Niroomand, 2014). Reviewing the literature has indicated that field dependence (FD)/ field independence (FI) is one of the most favoured and studied cognitive/learning style dimensions.

Chinien and Boutin (1993) asserted that field dependence/independence, “which constitutes an important aspect of individual differences among students regarding the way they acquire and process information, appears to hold promising potential for the design and development of effective instructional material” (p.307). On the basis of different characteristics of FD and FI persons in performing activities and tasks, it seems that considering learners’ learning styles and adjusting the teaching strategies based on individual differences among the learners is a must. Concept mapping as a teaching strategy has widely been in the review of literature in the education field (Adesope & Nesbit 2013; Chabeli 2010; Liu, Chen and Chang 2010; Maas & Leaby 2014; Nosratinia, Mirsafae and Shakeri 2013; Novak 2010). Concept mapping is a procedure for ‘meaning making’ (Cañas, et.al. 2002) ‘meaning construction’ (Da Costa, Da Rocha and Favero 2004), and ‘knowledge construction’ (Da Rocha et.al. 2004). Stoyanov and Kommers (2006) claim that concept map is the sole mapping technique that lets “different formats of spatial organization of ideas” and as the sole mapping technique that provides learners with using “any sort of labelled idiosyncratic links” (p. 302).

It needs to be acknowledged that, to date, there are not enough studies and findings about addressing concept mapping and vocabulary achievement considering field dependence/independence learning styles.

Vocabulary Achievement

Harmer (1991) argued that “If language structures make up the skeleton of language, then it is vocabulary that provides the vital organs and the flesh” (p.153). Singleton (1999) asserted, to learn a foreign or second language it is important to have a ‘nitty-gritty’ of the lexicon not mastery in grammatical rules. Moreover, Bromely (2007) considers vocabulary as “a principle contributor to comprehension, fluency, and achievement” (p.528). All in all, Richards and Renandya (2002) believed that lexicon is a fundamental part for being a proficient in speaking, writing, reading and listening.

Vocabulary Learning Strategies

In a general view, language learning strategies could play the role as facilitators of the language learning process (Oxford 1990, & Griffiths 2008). On the other hand, according to Cameron (2001) vocabulary learning strategies (VLS) are activities that are taken to comprehend and retain lexicon.

Takač (2008) argued that vocabulary learning strategies are specific strategies that are applied in only vocabulary achievement of the second and or foreign language. In this regard, Gu (2003) stressed VLS include strategies for ‘using’ as well as ‘knowing a word’. Moreover, using a strategy mostly indicates the way and quality of learning new vocabulary. ‘Each strategy a

learner uses will determine to a large extent how and how well a new word is learned' (p.4). VLS have some traits to be useful and practical.

Concept Mapping

Development of concept maps in 1972 was done in the course of Novak's research program at Cornell university where he tried to understand changes in children's knowledge especially knowledge of science (Coffey et.al. 2003; Novak & Canas, 2007). Valadares (2013) claims that Novak has made concept mapping more humanistic rather than cognitivist. Concept mapping 'in its pure Novakian - style, is thus, a human activity – a means of modelling knowledge by humans in a form that is easily understood by other humans, not by machines' (Canas & Carvalho, 2004). Canas and Carvalho (2004) introduced concept map as "a graphical representation of a person's (or group of persons') understanding of a domain" or "a knowledge representation scheme" (p.1). Chiou (2008) went further and introduced concept mapping as 'a meta-learning strategy' that learners apply to enhance their learning freely (p.376). According to Canas and Novak (2013), concept maps have specific characteristics that distinguish them from other knowledge representation tools; Namely, *Propositional Structure*. Canas and Carvalho (2004) believed that, this structure makes a distinction between concept map and other tools such as mind map and brain map. Canas and Novak (2013) introduced another feature of concept mapping; *hierarchical structure*: Keeping the concept maps hierarchal with a single root makes it easier for the learner to grasp how concept maps are constructed. *Focus question* is the other characteristic of concept maps. It is the way to describe the context for a concept map in order to solve the problem (Canas and Novak 2013). *Cross-Link* is the other significant characteristic of concept maps that Canas and Novak (2013) introduced it as a linkage among concepts in different parts of a concept map. Concept mapping can be used for several purposes (Plotnick 1997, p.2): to generate ideas (brainstorming); to design complex structures (long texts, hypermedia, large web sites); to communicate complex ideas; to aid learning by explicitly integrating new and old knowledge; and to assess understanding or diagnose misunderstanding. Thus, presenting invisible and indirect conceptual sentences and texts clearly is the main advantage of concept mapping leading to promotion in the process of acquiring knowledge meaningfully (Åhlberg 2013). To accelerate meaningful learning Coffey et.al (2003) pointed out that, the "process of concept mapping for educational purposes can foster the learning of well-integrated structural knowledge as opposed to the memorization of fragmentary, unintegrated facts" (p.7). Some approaches of concept map have been considered: Learner –constructed concept map (Ruiz-Primo, 2000), Expert skeleton concept map (Novak & Canas 2008), Pre-selected map, seeded map (Oliver, 2008), and collaborative concept map (Gao et.al 2007).

Concept mapping as a useful technique has been widely used in educational disciplines, for instance, teaching enhancement (Hay, Kinchin and Lygo-Baker 2008), instructional strategy (Udeani & Okafor 2012), as a way on identifying slow learners and adopting effective methods of tackling their problems. Business (Ryssel et al. 2008), nursing (All & Havens 1997; Chabeli 2010; Ghोजazadeh et al. 2014; Harpaz, Balik and Ehrenfeld 2004), biology (Dhaaka 2012; Kinchin 2000;), pharmacy communication courses (Hill 2004), as a new method of assessment (Brüssow & Wilkinson 2007; Jennings 2012; Ruiz-Palomino & Martinez-Canas 2013; Williams 2004), a strategy for promoting meaningful learning in medical education (Hoffman, Trott and

Neely 2002; Pinto & Zeitz 1997), listening comprehension (Sabbaghan & Ansarian 2013), and reading comprehension (Saeedi et al. 2013). Research has also been conducted on concept mapping which prepares the college to manage the resulting curricular materials (McDaniel, Roth and Miller 2005), and research tool (Iuli & Helldén 2004).

Personality Traits

There is a classification of individual differences, concepts like “level of knowledge, cognitive styles, learning styles, personality traits to list but a few” (Stoyanov & Kommers 2006, p. 303).

Field Dependence and Field Independence

Cognitive style refers to a different strategy each person uses for encoding, storing and presenting (Atkinson 2004). Allinson & Hayes (2012) went on further and asserted that cognitive style is as “an individual’s preferred way of gathering, processing and evaluating data” (p. 2).

Considering the cognitive or learning styles suggested by authors such as Dunn and Dunn’s leaning styles (1978), Howard Gardner’s Multiple Intelligence theory (1983), Kolb’s learning styles (1985), Witkin, et.al. (1977), FD/FI cognitive style has been largely studied in literature (Chapelle & Heift 2009; Danili & Reid 2006; Davis 2006; Goode, Goddard and Pascual-Leone 2002; Holmes, Liden and Shin 2013; Hudson, Li and Matin 2006; Rittschof 2010; Thomas & McKay 2010; Tinajero et al. 2012). According to Frank and Keene (1993) ‘the construct of FD/FI refers to the stable and pervasive preference of individuals for analytical or global information processing’ (p. 14). Unlike FD person, FI one can easily distinguish a stimulus from their surroundings (Leventhal & Sisco 1996). The other difference is that FD person is more sociable than FI one, so it may have an impression on selecting different major in university and occupation too (Ford et al. 2002). In contrast to the FI people, FD ones prefer group work and follow the group instruction. Therefore, the FI learners are self-reliant while FD learners are not (Chapelle & Heift 2009).

Khodadady & Zeinali (2012) investigated the relationship between field dependence, independence learning style and the international English language testing system (IELTS) listening comprehension. They found out that FI learners outperformed in listening comprehension and their tasks and did the best in fill-in -the -gap questions, in contrast, FD learners had a good performance on multiple choice and matching tasks. In sum, in researches (Maas & Leauby 2014; Cyr & All 2009), the focus of the study was on usage and effectiveness of concept mapping in different types of educational field. However, the effect of concept mapping as an instructional strategy on FD and FI EFL learners’ vocabulary achievement has not been explored yet.

RESEARCH QUESTION

The following research question was raised:

Is there any significant difference between the impact of concept mapping on field dependent and field independent EFL learners’ vocabulary achievement?

METHODOLOGY

Participants

A piloted KET was administered on 120 participants. Then, 90 participants whose score fell within one standard deviation above and below the mean were selected. The Group Imbedded Figure Test (GEFT) was administered to classify the participants into two groups of 33 FD and FI EFL learners as well. Afterwards, a piloted researchers-made pre-treatment vocabulary achievement test was administered to ascertain that the participants did not have any familiarity to the target words taught in the treatment phase.

Instruments

To fulfill the purpose of the present study the following instruments were applied:

KET Language Proficiency Test

In order to homogenize the language proficiency of the participants, the researchers administered the Key English Test (KET), developed in 2009. the level of the exam (KET) was A2 of the Common European Framework of Reference (CEFR). It is the first level Cambridge ESOL exam. The test composed of three parts. The total time of the exam is one hour and fifty minutes.

Two Researchers-made Tests of vocabulary achievement

A researchers-made test of vocabulary achievement was conducted in the pre-treatment phase, the test had 40 items including target words regarding the content, English vocabulary in Use. It is worth mentioning that before the administration of the test it was piloted on 40 additional participants with almost similar characteristics to the target group. In piloting stage the reliability of the test turned out to be 0.81 and 10 items known by the target group were removed and 30 items were selected for the treatment phase. After the treatment, a parallel researchers-made test was applied in the post-treatment test. Prior to the administration, the test was piloted. So 40 additional participants with almost similar characteristics to those in the study were involved in the pilot test. In the piloting stage the reliability of the test turned out to be 0.89. The time allocated for each test was 20 minutes.

The Group Imbedded Figure Test (GEFT)

To shed light into the cognitive traits of the participants in terms of field dependent (FD) and field independent (FI), The Group Imbedded Figures Test (GEFT) (Witkin, Oltman, Raskin, & Karp, 1971) was administered. Accordingly, the test was comprised of a booklet containing 25 complex geometric designs, sorted into three sections. The task consisted of finding and marking the indicated simple designs within the complex designs. The alpha coefficient of the GEFT test had been reported as 0.82. the maximum score would be 18. Those who scored above 11 were FI students and those who scored below were FD students. The time allocated for the test was 25 minutes.

Textbook

The learners's course book was "English Vocabulary in Use" (pre-intermediate & intermediate) by Stuart Redman; Cambridge University Press (2003). The selected material from the book was applied during the treatment phase.

Procedure

To accomplish the objective of the study, a piloted KET was administered on 120 participants. Then, 90 participants whose score fell within one standard deviation above and below the mean were selected. The Group Imbedded Figure Test (GEFT) was administered to classify the participants into two groups of 33 FD and FI EFL learners. Afterwards, a piloted researchers-made pre-treatment vocabulary achievement test was administered to ascertain that the participants did not have any familiarity to the target words taught in the treatment phase. Then the treatment sessions; concept mapping as an instruction tool was introduced to both experimental groups in ten 50 minute-sessions during a five-week period excluding the pre and post-test sessions. Novak and Gowin (1984)'s basic guidelines for the construction of a concept map were adopted.

Table 1: Novak and Gowin (1984)

<i>Brainstorming Phase:</i>
1. Start by defining the main topic, also called the focus question. Enclose this main topic in a circle or a box.
2. Once the main topic is defined, the next step is to identify and make a list of the most important concepts associated with the topic.
<i>Organization Phase:</i>
3. Next, decide the order of those concepts, going from the most abstract concepts to the most specific ones (top to bottom). Organize those concepts in the mapping workspace in a hierarchical arrangement.
<i>Linking Phase:</i>
4. The next step is the addition of links to form an initial concept map.
5. Then relationships among the concepts are described by adding linking phrases to the map.
6. Once this is done, cross links, which link concepts from different areas or sub-domains of the map, are identified.
<i>Finalizing Phase:</i>
7. For completeness, the map is reviewed to identify possible improvements or changes.

During the treatment phases, which included 30 words, in each session about 5 words were taught. At the very first session the researchers used an example to get the participants familiar with the concept-mapping technique. In fact, the participants practiced the guidelines of the technique (Novak and Gowin 1984) to be able to use it as their learning strategy. Figure 1 illustrates concept map example. In this example the researchers provided the participants with a concept (a noun) for example "housing", then they drew a circle on top of the board and wrote

the concept in it and then they asked some questions for brainstorming and thinking about the concept such as: Do you live in a house or an apartment? Or talked about the rooms in each to motivate participants to take part in the activity, then different concepts or ideas from participants were received such as “house”, “apartment” “bedroom”, kitchen”, and so on, related to the concept. Next stage was the linking phase where the researchers found relationships among concepts by connecting them with labelled lines. In the last stage, the researchers and participants reviewed the map and made some changes if necessary.

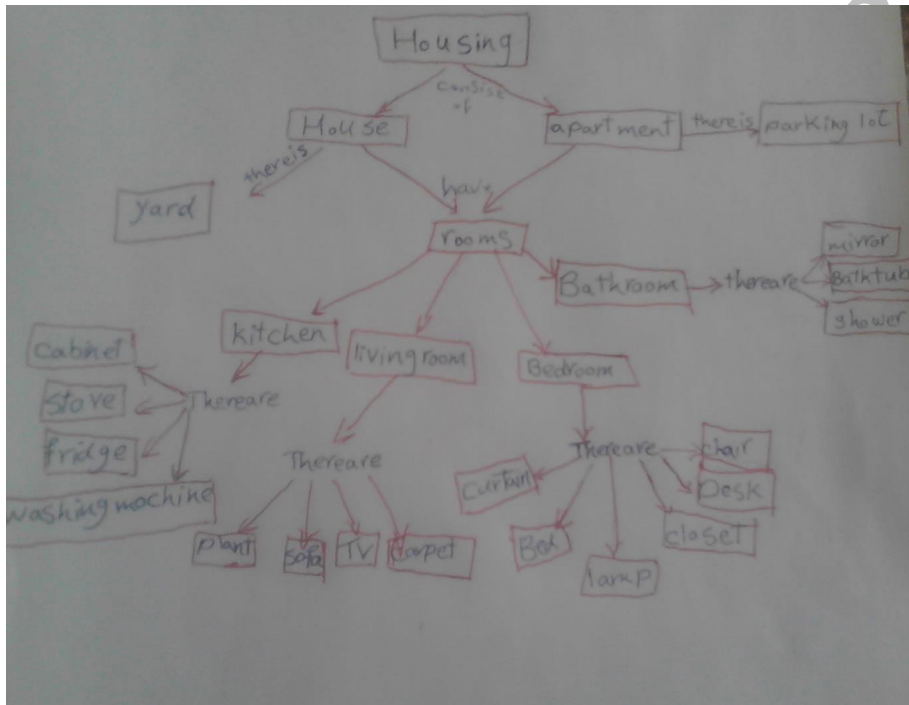


Figure 1: A concept map example

From the second session the participants put to practical use Learner – Constructed concept maps by themselves according to the received and practiced guidelines. They did it in about five to ten minutes. While monitoring, the researchers kept helping if needed. The researchers checked the maps and asked some questions to ascertain whether the participants had known the meaning of the word and also the relation among the concepts. Every session before starting the new lesson, the researchers had a review of the previous sessions. The researchers asked the participants to make a sentence or a phrase with the already learned vocabulary. Then the researchers started teaching new vocabularies by providing participants with a new topic and giving some definitions of the new words. After the treatment phase, a piloted post- treatment vocabulary achievement test was administered to both experimental groups on the 11th session.

Finally, after the piloted post- treatment test, the researchers administered the questionnaire on the participants’ attitude toward concept mapping to assess their attitudes and feedback.

RESULTS AND DISCUSSION

Key English Test (KET)

After being piloted on 40 participants with rather similar characteristics to the target group, the KET was administered to check the homogeneity of the participants in terms of their language proficiency. The reliability of the test was estimated by KR-21 formula as it is presented in table 2.

Table 2: Descriptive Statistics and Reliability of the KET in piloting stage

KET test	N	Mean	Std. Deviation	Variance	KR-21
	40	28.65	8.232	67.772	0.90

Then both the KET and the GEFT questionnaire, were administered. 66 participants were divided into two experimental groups of FD and FI. An independent t-test was run to compare the FD and FI groups' means on the KET in order to prove that they were at the same level of general language proficiency prior to the main study. Based on the results displayed in table 3 it can be claimed that the FD (M = 28.54, SD = 7.46) and FI (M = 28.70, SD = 5.86) groups had almost the same means on the KET.

Table 3: Descriptive Statistics of the KET by main group

KET test	Group	N	Mean	Std. Deviation	Std. Error
					Mean
	FD	33	28.45	7.463	1.299
	FI	33	28.70	5.860	1.020

Also, to check the normality of distribution of scores, the skewness and kurtosis ratios were calculated. The results are displayed in table 4 below:

Table 4: shows testing normality assumption

Group		N	Skewness			Kurtosis		
			Statistic	Std. Error	Ratio	Statistic	Std. Error	Ratio
FD	KET	33	.525	.409	1.28	-.743	.798	-0.93
FI	KET	33	.361	.409	0.88	-.803	.798	-1.01

The results of the independent t-test ($t(64) = .14, p = .884, r = .017$ representing a weak effect size) (table 5) indicated that there was not any significant difference between the two groups' mean scores on the KET. Thus it can be claimed that they were at the same level of general language proficiency prior to the main study.

Table 5: Independent Sample Test, KET by main group

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	T	DF	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	2.897	.094	.147	64	.884	.242	1.652	-3.057	3.542
Equal variances not assumed			.147	60.593	.884	.242	1.652	-3.061	3.546

It should be noted that the assumption of homogeneity of variances was met (Levene's $F = 2.89$, $p = .094$). That is why the first row of table 5, i.e. "Equal variances assumed" was reported.

Vocabulary Achievement Test

The next step was to pilot the researchers-made vocabulary pre-treatment test on the pilot group in order to calculate the reliability of the test. As shown in table 6 the reliability of the test on piloting stage was 0.81.

Table 6: descriptive statistics of vocabulary pre-treatment test in piloting stage

Test	N	Mean	Std. Deviation	Variance	KR-21
Vocabulary Test	40	17.90	5.523	30.507	0.81

Post-Test

After applying concept mapping techniques through the treatment phase in the two groups of FD and FI, a formerly piloted vocabulary test parallel with the pre-treatment vocabulary test; was given to the participants of the two groups as a post-treatment test. In the piloting stage the reliability of the test was estimated 0.89. Table 7 shows the descriptive statistics and the reliability of the post-treatment test in the piloting stage.

Table 7: Descriptive statistics of the post-treatment test in piloting stage

Test	N	Mean	Std. deviation	Variance	KR-21
Vocabulary Test	40	23.10	9.535	90.921	0.89

After the administration of the test, an independent t-test was run to compare the FD and FI participants' means on the vocabulary in order to probe the research question posed in this study. Based on the results displayed in table 8 it can be claimed that the FI participants' ($M = 25.36$, $SD = 5.81$) had a higher mean on the vocabulary test than the FD group ($M = 22.18$, $SD = 7.34$).

Table 8: Descriptive statistics of the post-treatment test in main groups

Test	Group	N	Mean	Std. Deviation	Std. Error Mean
Vocabulary Test	FI	33	22.18	7.342	1.278
	FD	33	25.36	5.814	1.012

Also to check the normality of the distribution of scores, the skewness and kurtosis ratios were calculated. The results are displayed in table 9 below:

Table 9: shows testing normality assumption

Group		N	Skewness			Kurtosis		
			Statistic	Std. Error	Ratio	Statistic	Std. Error	Ratio
FD	Vocabulary	33	-.324	.409	-0.79	-.169	.798	-0.21
FI	Vocabulary	33	-.645	.409	-1.58	.896	.798	1.12

The results of the independent t-test ($t(64) = 1.95, p = .054, r = .23$ representing a weak effect size) (table 10) indicated that there was not any significant difference between the two groups' mean scores on the vocabulary test. Thus the null-hypothesis was supported.

Table 10: independent samples test for the post-test scores

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	T	DF	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	2.369	.129	1.952	64	.055	3.182	1.630	-.075	6.439
Equal variances not assumed			1.952	60.806	.056	3.182	1.630	-.078	6.442

It should be noted that the assumption of homogeneity of variances was not met (Levene's $F = 2.36, p = .129$). That is why the second row of table 10, i.e. "Equal variances not assumed" was reported.

DISCUSSION AND CONCLUSION

According to the findings of the study it has been ascertained that implementing concept map techniques in two groups of FD and FI EFL learners' vocabulary development had no significantly different effect. However, the comparison of the means of experimental groups in the post and pre-treatment phases of the study indicated that concept-mapping has been effective in improving vocabulary achievement of the participants. This outcome is consistent with the findings of Chang Chiou (2008). In this study, the researcher examined the impact of concept mapping as a strategy on university students', enrolled in an advanced accounting course, learning achievement and interests. In this study students were divided into two groups of experimental and control group. Concept mapping was implemented in treatment group and traditional expository teaching method in control group. The results showed that concept mapping as a meaningful learning strategy enhanced learning achievement in treatment group and outperformed their counterparts. Chiou found out that the majority of learners in treatment group were pleased using concept mapping as an assistive learning strategy. Moreover, Tabatabaei and Khalili (2014) investigated the effect of concept mapping on Iranian pre-

intermediate L2 reading comprehension. The 30 participants took part in the English language classes. They completed two thirty-minutes reading comprehension tests as the pre-test and the post-test. After the treatment phase the results of Wilcoxon Sign Rank test revealed that the participants in concept mapping group outperformed in post-test than in pre-test administration.

Using and implementing concept map as a meaningful learning tool in the classroom, students are able to represent their way of thinking and learning meaningfully through linking their prior knowledge with the existing ones, and constructing their new knowledge linking to their long term memory. By using concept map techniques students can link concepts and ideas meaningfully and also act autonomously in the learning process too. Furthermore, students are able to interact with each other by comparing their maps; sharing their ideas through visual representation of ideas and concepts too.

In addition, concept mapping technique can be implemented as a self-assessment tool. While constructing a map students link concepts and ideas meaningfully, they can observe and analyze their thinking process and monitor making a map. Teachers can assess students' learning process by comparing their works before and after implementation of concept mapping techniques. Different learning settings can be provided with students implementing concept map techniques such as; collaborative construction of concept maps, or as an individual construction of concept maps as well.

Moreover, using concept map techniques in curriculum design of text books can be applied by material developers implementing and recommending different types of concept map techniques and strategies for vocabulary development of variety of not only specific vocabulary books but also four-skilled course books.

In the present study, in spite of the positive effect of concept mapping techniques on vocabulary achievement it seems that applying concept maps on two groups of FD and FI had no significant comparative effect and both groups had the benefit of implementing of concept mapping techniques in treatment phase.

Suggestions for further research

According to the findings of the present study the following suggestions are recommended for further studies:

- a) In this study the participants ranging between 16 to 17 years as teenagers, further research can be carried out using concept maps on adult groups.
- b) In this study due to the existing prohibitions against coeducation in the language school the participants were only female students. Future research can be conducted applying concept map techniques on male students too.
- c) In this study only hand-made concept maps were applied while there is another type of concept map; computer-assisted concept map which may be time saving, so future study can be investigated using computer-assisted concept map that may or may not have different results.

d) The focus of the present study was on the effect of concept map techniques on EFL learners' vocabulary achievement. So another study can be done on other skills such as writing, speaking, reading or listening.

e) The subjects of this study were two groups of field dependent and field independent as cognitive style, the future research can take into consideration other types of cognitive styles.

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