أثر استعمال خرائط المفاهيم على التحصيل في القواعد و ميول التفكير الناقد لدى الطلبة العراقيين في المرحلة الثانوية

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المستخلص

سعى البحث إلى الكشف عن أثر خرائط المفاهيم على التحصيل في القواعد و ميول التفكير الناقد لطلبة الإعدادية الدارسين اللغة الإنكليزية لغة أجنبية ، للتثبت من تحقيق أهداف البحث في الدراسة الحالية، فرضت الباحثة فرضيتين صفريتين لمعرفة أثر خارطة المفاهيم على تحصيل الطلبة والاحتفاظ بالتحصيل في مادة القواعد. أن مجتمع البحث الحالي يتمثل بطلبة الإعدادية / الصف الرابع / الدراسة الصباحية ، حيث يبلغ عدد الطالبات الكلي هو (73) طالبة. وللتحقق من الفرضيات المذكورة آنفا ، اختيرت عينة الدراسة بصورة قصديه والتي تضم (60) طالبة والتي توزعت على مجموعتين :مجموعة تجريبية ومجموعة ضابطة ،كل مجموعة تضم (30) طالبة. وطبق الاختبار القبلي قبل البدء بالتجربة وذلك لغرض مكافئة المجموعتين من ناحية قدراتهم في القواعد وبعد الانتهاء من التجربة تم تطبيق الاختبار البعدي على المجموعتين لغرض التحقق من فاعلية الطريقة على تحصيل الطلاب في قواعد اللغة الانكليزية. واخذ بالحسبان أداء الطالبات على مقياس ميول التفكير الناقد كاختبار قبلي و بعدي للمجموعتين التجريبية و الضابطة.

بعد تحليل البيانات باستعمال الوسائلِ الإحصائيةِ مثل: الاختبار التائي لمجموعتين مستقلتينِ، تحليل التباين باتجاه واحد واختبار شفهي ، واظهرت النتائج وجود فروقات ذات دلالة إحصائية عند مستوى (٠.٠٥) بين المجموعتين في اختبار التحصيلَ ومِقياسَ ميول التفكير الناقد. وعلى أساس النَتائِجِ الإيجابيةِ و لصالح المجموعةِ التجريبيةِ التي درست بطريقةِ خرائط المفاهيم أوصت الباحثة بضرورة تطوير إمكانيات الطلاب في التحصيل و ميول التفكير الناقد لديهم. وأقترحت بعض المقترحات التي تساهم في تطوير تدريس اللغة الانكليزية لغة أجنبية.

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Abstract

The current study aims at investigating the effect of using concept mapping as a teaching method on the Iraqi secondary students' achievement in English grammar and their critical thinking dispositions. Therefore, two hypotheses were formulated to investigate the effect. The total population consists of (73) female students in the 4th secondary stage- for the academic year 2015-2016. The chosen sample of the research consists of (60) female students. It is divided into two groups; each one consists of (30) students to represent the experimental and the control groups of the study.

In addition to that, a pre-test was administered before the beginning of the experiment for the sake of equalizing the two groups and investigating the students' capabilities in English grammar. After conducting the experiment, an achievement post-test was administered for the two groups in order to discover any improvements in grammar. The performance of both groups on the pretest and posttest of the critical thinking dispositions scale has been taken into account.

The obtained data were analyzed by using various statistical means such as: t-test for two independent groups, one way analysis of variance ANOVA, and Scheffe's test. The study results showed a statistical significant difference at ($\alpha = 0.05$) level between the two

groups in the grammar test and critical thinking disposition scale. In the light of the positive results in favor of the experimental group which taught by concept instructional method, some recommendations to improve students' achievement in grammar and critical thinking dispositions are put forward. Moreover, some suggestions are provided for further studies in the field of teaching English as a foreign language.

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Sana'Khalifa Salih

Abstract

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I. Introduction

In teaching and learning of English concepts, teachers should take into consideration that students are from varied backgrounds and that they do not all learn in the same way. In addition, recently teaching is a process in which students interacts with teachers in

terms of the principles of learner-centred learning and , "not a linear process with a one-way delivery of knowledge".

Iraqi secondary students are provided with a large amount of new information especially in English grammar. To achieve meaningful learning, English educators should know the importance of facilitating critical thinking skills and dispositions through interaction in a learning environment.

In secondary school, students must make an appropriate link between established learned concepts and principles with new knowledge in order to be able to make sound decisions practically (All& Havens, 1997:1210-1213). The main challenge facing teachers of English as an obligatory subject in Iraqi secondary schools, is how to enhance students' conceptual understanding as well as affective characteristics associated with teaching/learning process. Drawn on this challenge, the basic aim of the present study was to investigate the effect of Concept Mapping as a teaching method on secondary school students' achievement in grammar and critical thinking dispositions. This research was based upon Ausubel's theory of meaningful learning (1968) in which an appropriate connection between prior knowledge and new one in a learning task is highly needed.

It is claimed that knowing the grammar of the target language is a way for expressing ourselves and communicating easily with others to achieve the ultimate goal of teaching English (Fromkin & Rodman, 1993:13). The problem is not attributed to the students' detective knowledge of the system of English, but in the way they use English.

Moreover, they do not need to know about the forms of sentences but they want to know how to use sentences meaningfully to perform different communication acts (Brumfit &Johnson, 1979:124). The problem springs from a failure of the memory system rather than the language system, the majority of students are unable to remember different and accumulated grammar rules to produce an error-free repetition of the material at the end of each grammar course. Consequently, secondary students need to be exposed to new teaching techniques to be involved in the interactive process that enables them to organize knowledge hierarchically in their cognitive structure by using English communicatively in meaningful situations.

1.1 Questions of the Study

In light of the preceding discussion, this study aims to illuminate the following research questions:-

1. Is there any statistical indicative difference ($\alpha = 0.05$) between the average achievement test scores of the female students in the experimental group and control group attributed to the teaching method (concept mapping vs. conventional)?

2. Is there any statistical indicative difference ($\alpha = 0.05$) between the average critical thinking dispositions scores of the female students in the experimental group and control group attributed to the teaching method (concept mapping vs. conventional)?

1.2 Hypotheses of the Study

1.There is no statistically significant difference between the mean scores of the experimental group, which is taught according to the concept mapping teaching method and those of the control group, which is taught conventionally in the post- achievement test of English grammar.

2.There is no statistically significant difference between the mean scores of the experimental group, which is taught according to the concept mapping method and those of the control group, which is taught conventionally in the post-administration of the critical thinking disposition assessment scale.

1.3 Operational Definition of Terms

- Concept Mapping is a method of teaching in which diagrams are used by teachers and learners to transmit basic information and present the relationships among concepts in a hierarchical structure.

The researcher adopts the following definitions.

- Grammar is the "formal study of the structure of a language which describes the way the words are organized and fit together in meaningful constructions" (Williams, 2005: 27).

- Achievement: it refers to "the extent of learners' acquisition for specific experiences occurred through the process of instruction. It can be measured through degrees gained by learners in specific achievement tests performed for specific purpose"(Samara, 1989: 16).

- Critical Thinking is" a mode of thinking about any subject, content, or problem in which the thinker analyzes, assesses, and reconstruct it skillfully" (Paul & Elder, 2008: 88).

- Critical Thinking Disposition is "the pre-disposed attitude one innately possesses regarding critical thinking" (Ricketts, 2003: 23).

1.4 Limits of the Study

The study is limited to:

1.Using concept mapping in teaching grammar focus in the prescribed textbook" English for Iraq 4th Preparatory Student's Book "

2.Iraqi female students of the 4th Secondary grade in Al - kawarzmi School in Erbil during the academic year 2015-2016.

2. Conceptual Framework& Pervious Studies

2.1 Concept Map

In any subject, concepts are the basic building blocks for higher-level thinking. Novak (1998:22) defines concept as "perceived regularity in events or objects, or records of events or objects, designated by a label". Arends (2009: 320) states that concept learning is not simply classifying objects and ideas and deriving rules and principles but they provide the foundations for the idea networks (schemata) that guide our thinking, understanding these schemata and enhancing meaningful learning. According to Novak et al. (2000:3), the learner exerts no effort to relate new concepts to prior relevant knowledge to achieve rote learning.

Concept Map is a graphical tool used by teachers and learners to organize, connect, and synthesize information hierarchically. Concept maps are made by butting concepts or propositions in circles or boxes with an attempt at explaining relationships between them by

connecting lines and linking words (Kili &Cakmak, 2013:153; Novak & Canas, 2006:1).

2.2 Concept Mapping Based Instruction

Concept mapping resides in the Ausuble's meaningful learning theory. It facilitates connecting new learning to prior knowledge, acquiring wide and varied knowledge of different concepts in a short period and incorporating new concepts and propositions into the learner's existing cognitive structures. As a result, knowledge is hierarchically organized in the cognitive structure from "more inclusive and more general to less inclusive, more specific concepts and propositions" (Akinsanya & Williams 2004:41; Novak & Gowin, 1984:92). Consequently, concept mapping will facilitate critical thinking of learners easily.

To create meaningful learning, Ausubel asserts that students should be emotionally able to integrate new concepts with their establishing knowledge in their cognitive structure, and to trigger critical skills and dispositions rather than simply memorising concepts or propositions (rote learning) (Mellish et al. 1998:27). Furthermore, the student should be able to open new ways of thinking to build new meanings (Gravett, 2001:18). Conceptual clarity means altering the existing knowledge structure of students according to the new information received (Mouton, 1996:118). Concepts are powerful bases for constructing knowledge meaningfully. According to Vygotsky (1978:124) and Peters (2000:166-172), active learning means a process in which learners' new knowledge is made on their existing

knowledge and different background brought to the learning situation. The teacher, as facilitator, is responsible for selecting successful teaching techniques that enable students to construct their own concepts and skills through the active use of meaningful interaction, and to think critically and creatively in order to make meaningful sense of the learning situation (Mouton,1996:118).

In teaching, to use concept-mapping can be uneasy to students who are familiar with a rote learning. A didactic environment with its passivity, cannot foster creative and critical thinking in students because it deprives them from any emotional engagement in the learning environment. As a teaching method, concept-mapping helps students to construct new knowledge and makes them think critically and analytically (Ramsden, 1992:86). Concept maps give students an opportunity to "1) think about the connections between the concept being learned, 2) organize their thoughts and visualize the relationships between key concepts in a systematic way to learn meaningfully and 3) reflect on their understanding" (Kili & Cakmak, 2013:157).

As a teaching method, concept mapping can be used in different ways. AL Hwidi (2005) explained that the concept map can be used by teachers during the teaching learning process as in the following ways:

1) Pre- teaching: - Teachers can construct the concept map and draw it on the board or use the over head projector to be seen as an advanced organiser in front of the students.

2) During- teaching:- Students are provided with a copy of concept maps prepared by teachers built on a certain topic to benefit from.

3) Post- teaching: - Teachers can ask individuals or groups of students to construct concept maps, suitable for the lesson or for the unit, then they check their students' weakness in the use of the key words or link -words between the sub-concepts and help them to overcome the weakness later (AL Hwidi, 2005: 310, as cited in Akif, 2013:34-35).

There are certain steps that the teacher should take into account inside the classroom to ensure the effective use of concept maps as a teaching and learning tool for meaningful learning. They are summarized as follows:

1) Teachers define the context by constructing a focus question. A focus question clearly specifies the problem or issue which should be resolved by building the concept map, for example, our focus question is “what is condition if ?” (Kili & Cakmak, 2013:155).

2) Teachers make their students know about the main concepts and the sub concepts in the lesson.

3) Teachers write the main concepts and the sub concepts in the lesson on the board to attract their students' attention to think about them.

4) Teachers make a meaningful relation between the main concepts and the sub concepts by finding the appropriate linking – words.

5) Teachers can organise the concepts hierarchically and put the most inclusive concept at the top of the pyramid and then they write the linking words on the arrows.

6) Teacher makes his students move from the top of the pyramid (the main concepts) to the bottom (the subordinate) by giving the sub-concepts and more examples.

7) Finally, teachers ask students to construct concept maps about the subject matter either individually or in groups (Affana & AL Khozendar, 2007: 135, as cited in Akif, 2013:34).

8) A concept map is never finished. Several revisions should be made to produce good maps and other concepts can be added by student under the guidance of teacher in classroom work (Kili& Cakmak, 2013:157).

2.3 Critical Thinking

Critical thinking as a process or outcome, has been defined by many philosophers differently because its multifaceted nature (Moattari et al., 2014: 70). According to Dewey (1933:9), critical thinking is active, persistent, and careful consideration of a belief or supposed form of knowledge in terms of the grounds which support it and the further conclusions to which it tends. Additionally, secondary teaching aims at creating active, autonomous and lifelong learners by fostering critical and creative thinking in them (Albergaria Almeida, 2010: 590).

Ennis (1993:180) defines critical thinking as “reasonable reflective thinking focused on deciding what to believe or do”. By Critical thinking, learners work hardly to get the deeper meaning inherent in the written and spoken word and to think beyond the surface meaning (Pescatore, 2007: 330).

According to Paul& Elder (2008: 88), critical thinking is the "key to see the interconnected logic of any subject and to think within that logic". Pascarella& Terenzini (1991: 118) define critical thinking as "the individual’s ability to do some or all of the following: identify central issues and assumptions in an argument, recognize important relationships, make correct inferences from data, deduce conclusions from information or data provided, interpret whether conclusions are warranted on the basis of the data given, and evaluate evidence or authority". Halpern (1996: 5) defines critical thinking is the probability of achieving a desirable outcome through the use of the cognitive skills or strategies by learners.

According to Lipman's more inclusive definition of critical thinking (1988:39), it is a “skillful, responsible thinking that facilitates good judgment because it 1) relies upon criteria, 2) is self-correcting, and 3) is sensitive to context”. A suitable way of encouraging students' critical thinking is to take responsibility for their own learning. After identifying, analyzing, and evaluating new information, they must know what to do with that new information (Coughlin, 2010: 50). Also, it is a purposeful, and organized effort exerted by persons to ensure their understanding and to make sense of their world by the careful

examining of their thinking and the thinking of others (Chaffee,1988: 29).

It is argued that the best method of facilitating critical thinking by students is to create a learning environment that encourages "interaction, dialogue, discourse and collaboration" (Gravett, 2001:47) and concept–mapping is vital for creating such an environment. To achieve effective teaching, the educator must know about the important factors which contribute to meaningful learning (Fraser et al., 1993:77). According to the main principle of Ausubel's assimilation theory, the most important thing is how to organize new knowledge into an existing structure of cognition. As a result, the organized cognitive structure plays an essential role on the "accuracy and clarity" of new information, and on a student's ability to retrieve information. The well organized or connected knowledge can be effectively and highly accessed when needed (Gravett, 2001:19).

2.3.1 Components of Critical Thinking

1) Critical thinking skills

Critical thinking is described as "a composite of attitudes, knowledge and skills" (Watson and Glaser, 1964: 10) as shown in Figure 1. The dispositions are important part of a critical thinking and vital for improving one's thinking skills. The cognitive skills and affective dispositions should be developed in students (Facione, 1990: 14). Critical thinking skills are fundamental part of a critical thinking. These skills include "interpretation, analysis, evaluation, inference,

explanation, and self-regulation" as identified by a group of experts (ibid, 6).

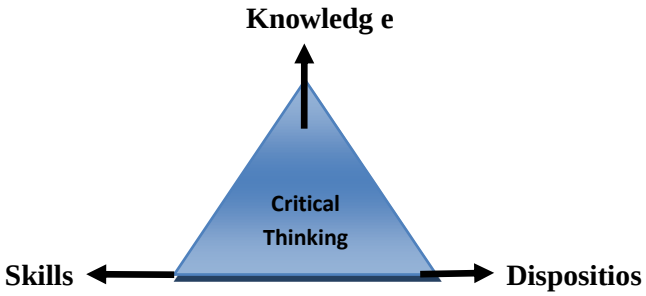

Figure 1. Model of critical thinking components (Rhoades et al., 2009:44).

2) Background Knowledge

Background knowledge is an essential component for determining the quality of learners' thinking in the area and their ability in making reasoned judgments (Balin, 2002: 368).

3) Critical Thinking Dispositions

Critical thinking skills are not enough. It is found that critical thinking is "more more than the successful use of the right skill in an appropriate context. It is also an attitude or disposition to recognize when a skill is needed and the willingness to exert the mental effort needed to apply it." (Halpern, 1999: 72). In addition, disposition is the "tendency to do something, given certain conditions" (Ennis,1996:166). Critical thinkers are intellectually courageous, fond of questioning unlike others who accept things without question (Paul, Elder & Bartell, 1997: 13). In fact, skills of critical thinking can be taught, unlike a disposition towards critical thinking that needs a long

time to be developed as a result of culturing process of an individual's life (Friedel, 2006:9).

The ideal critical thinkers are characterized as: "habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry and persistent in seeking results that are as precise as the subject and the circumstances of inquiry permit" (Facione,1990:2). Concept-mapping is needed to encourage critical thinking by students in which they work in groups on a certain subject matter collaboratively (Karola, 1995:36). Thinking critically requires cognitive work and the attitude to do this type of work. It is essential to promote critical thinking dispositions in classroom instruction. Halpern (1998:452) defined critical thinking dispositions:

"A critical thinker exhibits the following dispositions or attitudes: (a)willingness to engage in and persist at a complex task, (b) habitual use of plans and the suppression of impulsive activity, (c) flexibility or open-mindedness, (d) willingness to abandon nonproductive strategies in an attempt to self-correct, and (e) an awareness of the social realities that need to be overcome (such as the need to seek consensus or compromise) so that thoughts can become actions".

2. 4 Previous Studies

The purpose of Green's study (2010) is to evaluate the use of concept mapping in promoting critical thinking in nursing students. It is based on Assimilation Theory. The sample consists of (75) senior baccalaureate students enrolled in clinical courses at a Midwestern university. The concept maps are scored according to criteria from Daley et al. (1999). "Validity, awarding points for propositions, hierarchy, cross-links, and examples" are taken into account in scoring students' concepts. Results reveal that concept mapping strategy promotes thinking critically over time.

The aim of Fahim & Rahimi 's study (2011) is to investigate "the effect of concept mapping strategy on the listening performance of EFL university students". The sample consisted of (55) students majoring in English translation at Payam Nour University. Composition writing and concept maps were used to collect data. Based on their concepts maps, the experimental group students wrote paragraphs and compositions. According to the results obtained, the experimental group scores on the post- test are higher than that of the control group. Thus, the finding shows that concept mapping as an instructional technique improves the writing skill.

The purpose of Lawson's study (2012) is to investigate the effectiveness of concept mapping to enhance undergraduate nursing students' critical thinking skills. This study is built on the framework of Ausubel’s assimilation theory. The sample is randomly divided into experimental and control groups. Concept mapping is used to teach the experimental group and the traditional nursing care plans are used

to teach the control one. The skills of critical thinking are measured by the "California Critical Thinking Skills Test". The results show that using concept mapping improves critical thinking skills.

The aim of Emmanuel 's (2013) study was to investigate the effects of concept mapping strategy on the chemistry concepts achievement of secondary school students. It is a quasi-experimental in its design. To collect data, a randomly selected sample of (1357) chemistry students from two schools in Nigeria was used. An achievement test was constructed on structure of "matter and energy changes". The experimental group significantly achieved higher than the control group. The use of concept mapping strategy is highly recommended.

Akif 's study (2013) investigates the effects of concept mapping on the students' achievement and retention in grammar at the university level. The sample of (60) students is randomly chosen and divided into two groups and each one consists of (30) students. To test students improvement in grammar, an achievement post-test was administered to both groups after conducting the instruction. After a period of three weeks, the same post -test was re-administered in order to test the students' retention in grammar. On the basis of the results attributed to the experimental group taught by concept map strategy, some recommendations are presented.

3. Methodology

A semi-empirical procedure is used to achieve the aims and verify the hypotheses of the study.

3.1 Research Design

This study adopts a quasi- experimental pre-test post-test control design in which two classes were chosen, one class served as experimental group and one as control. The main goal of this research is to determine the effect of the independent variables (concept mapping teaching method and conventional one) on the dependent variables (achievement in English grammar and critical thinking dispositions) under study. To achieve the study aims, the experimental group and the control one take the same achievement test in English and the same scale of critical thinking dispositions before the study and one week after the end of it. The control group is taught according to the traditional method in which the facts and principles are presented by the teacher and the students are mainly asked to listen to the lectures and take notes. Teacher questions are emphasized. The main role of the student is to verify his teacher-designed explanations and use of textbooks. Student participation is highly discouraged. However, the experimental group is taught by using concept teaching method with different procedure in which many concept maps prepared by the teacher and the students on different language areas concerning grammar, to aid the instructional process (see Table 1).

(1) Experimental Design

Groups	Dependent Variables (Pre-test)	Independent Variables	Dependent Variables (Post-test)

Experimental	**Achievement Test**	**Concept Mapping**	**Achievement Test**
Control	**Critical Thinking Disposition Scale**	————	**Critical Thinking Disposition Scale**

3.2 Population and Sample of the Study

The total number of the 4th secondary students' population is (73) students, and (60) students of the 4th secondary grade has been chosen from two classes to be a sample of the study, enrolled in the English course for the 2015-2016 academic years in Erbil. The age levels of the students ranged from 16-18. The average age for students is 17 years old. This sample has been intentionally selected from Al- Khwarizmi school due to the fact that the researcher is a school staff member, a status which is likely to facilitate the process of conducting the experiment of the study. The researcher has selected randomly section (A) which includes (37) students to be the experimental group, and section (B), which includes (36) students to be the control group. After excluding students who had previous experience for statistical purposes, i.e., repeaters, each group is left with (30) students. Thus, the total number of the sample is (60) students (see Table 2).

(2): The Sample of the Study

Group	Section	Number of Students before Exclusion	Number of Excluded Students	Number of Students after Exclusion
Experimental	**A**	**37**	**7**	**30**
Control	**B**	**36**	**6**	**30**

Total		**73**	**13**	**60**

3.3 Equivalence of the Samples

To achieve equalization between the two groups, the age of the female students has been calculated by months. Daniles 's intelligence test (1975) is used to find out the intelligence of both groups which is for the Iraqi environment. And a multiple choice test contained 20 items has been constructed and its validity and reliability have been verified by the researcher to equalize students in the previous knowledge. Additionally, the students' average scores in the Baccalaureate Exam of the third intermediate stage have been taken from the school manager. Also, the Critical Thinking Dispositions scale has been administrated. Therefore, the variables including (age, intelligence, previous knowledge, total average in English courses of the 3rd intermediate stage during the previous academic year 2014-2015 and the pre-test of the critical thinking dispositions have been controlled for both groups as shown in Table 3.

(3): Means, Variance and T -Value of the Five Variables

Groups / Variables	Experimental 30 students		Control 30 students		T- Values		Significance
	Mean	Variance	Mean	Variance	Tabled	Computed	Level at 0.05
Age	**180.11**	**168.70**	**178.14**	**216.41**	**2**	**0.54**	**Not significant**
Intelligence	**24.16**	**9.33**	**25.06**	**12.12**		**1.05**	**Not Significant**
Previous Knowledge	**9.88**	**7.15**	**8.98**	**11.21**	**df 58**	**1.13**	**Not significant**
Total Average	**65.12**	**88.30**	**64.17**	**86.41**		**0.388**	**Not significant**
Critical Thinking Dispositions	**71.34**	**342.1**	**70.11**	**339.7**		**0.254**	**Not significant**

3.4 Instruments of the Study

The instruments for data collection include the following:

3.4. 1 Achievement Test

The purpose of constructing a pre- post test was to measure the students' achievement in grammar in order to compare the effect of using the concept mapping as a teaching method with that of the conventional method. Also, it was built according to the criteria of the test specification. Grammar and functions reference (future, past, present and condition) in the content of the seven units were covered in the test. After analyzing the content, the behavioral objectives are identified to cover that content according to the Bloom classification. The behavioral objectives at four levels (knowledge, comprehension, applying and analyzing) are measured in the test items. The achievement test designed by the researcher, falls into four sections including knowledge (8 items), comprehension (10 items), applying (15 items) and analyzing (7 items) as shown in table (4).

(4): Table of Specification

Bloom Level / Skill weight	Knowledge 20%	Comprehe-sion 25 %	Applying 37.5%	Analyzing 17.5%	Total
Future 35%	2	4	6	2	14
Past 25 %	2	2	4	2	10
Present 20%	2	2	3	1	8
Condition 20%	2	2	2	2	8
Total	8	10	15	7	40

There are 40 items in the achievement test; thus the full mark of the test is 40. One mark has been given to each correct choice. Incorrect items or ignored items have been given zero.

3.4. 1.1 Face Validity and Reliability of the Grammar Test

The test has been exposed to (12) experts in the fields of ELT and Linguistics at Al- Anbar University. In the light of the experts' views, the items kept in the test have been judged valid and practical by at least (10) members of the jury, i.e. 83%. For the purpose of ensuring the clarity of the test items and instructions, the achievement test has been administrated to the sample of (30) students chosen from the 4th secondary students in Erbil. The results of the pilot test have indicated that the instructions are clear and the time needed to answer the whole items of the test is about 45 minutes. Also, the achievement test has been administrated to the pilot sample of (100) students chosen from the 4th secondary students in Erbil for finding out the level of difficulty and discrimination power of its items in addition to the efficiency of the distracters.

Also, the formula of Kuder- Richardson (KR 20) is used to calculate the reliability coefficient. The result is found to be (0.88). Then, the difficulty coefficient and the discrimination coefficient were calculated for each item in the test. The difficulty coefficient ranges between (0.23) and (0.73), whereas, the discrimination coefficient ranges between (0.31) and (0.58). Consequently, the results are within the acceptable level for the purpose of this study (Ebel, 1972:552). Moreover, the distracters are efficient and attractive

because they take negative values and they are more attractive to the lower group of test takers than to the upper group.

3.4.2 The Critical Thinking Disposition Assessment scale

The Critical Thinking Disposition Assessment Scale was developed by Ricketts and Rudd in 2005.It contained 26 items and it was adopted in the present study to measure the dispositions of the critical thinking of the 4th secondary grade students. According to Chi-Square values for the Jury members' agreement on the scale items, two items are judged as invalid and they are omitted. The items are in the engagement and the innovation domains. The final form of the scale contains 24 items represented by three domains as subscales including " eleven questions in the Engagement, six questions in the Cognitive Maturity, and seven questions in the Innovativeness". A Likert scale with five points ranged from (1= strongly disagree) to (5= strongly agree) is used to measure each item in the scale. The highest score on the instrument is 120 and the lowest one is 24 (see Appendix 2). The high scores on the instrument mean that the respondents have strong critical thinking dispositions. The scale presents three subscale scores and an overall score.

With high engagement, individuals behave as good thinkers, effective communicators, problem solvers, and decision- makers. Whereas, with high cognitive maturity, individuals are aware of the complex essence of problems and they avoid the superficial reasoning. Furthermore, they are conscious of the biases that hinder their decision making. Finally, high levels of innovativeness means

persons with a strong determination to learn more about a situation. They are as "hungry for learning" (Towns, 2012: 9-10; Demircioğlu& Kilmen, 2014: 207).

3.4.2.1 Validity of the Critical Thinking Scale

The critical thinking scale has been exposed to a number of experts in Psychology and TEFL of Al-Anbar University and Kirkuk University, to judge whether the components of the scale are valid or not, suitable or not. 80% of the experts agree that the scale items are valid to investigate the research questions and their valuable comments were taken into consideration.

3.4.2.2 Pilot Administration of the Critical Thinking Scale

A pilot administration of the scale has been conducted to a sample of (50) students selected from another school in Erbil randomly. The instructions of the scale have been explained by the researcher herself to the students who are asked to identify the extent to which they agree or disagree with the scale items. Consequently, the scale's instructions and items are clear. It has been observed from the pilot administration that the suitable time to answer the whole items of the Critical Thinking Disposition Assessment Scale is about (30) minutes.

3.4.2.3 Reliability of the Critical Thinking Scale

The reliability level of the scale items has been measured by conducting a pilot study to a sample of (20) students, randomly selected from the target population and then re-administrated to the same sample after two weeks. The reliability coefficient for the total score on the scale ($\alpha = 0.91$). The reliability of the separate scales

were found to be as Engagement ($\alpha = 0.92$); Cognitive Maturity ($\alpha = 0.80$); and Innovativeness ($\alpha = 0.81$). Additionally, to estimate the reliability of the instrument, a post-hoc Cronbach's Alpha was also calculated. Results one subscales were high for Engagement ($\alpha = 0.91$), Cognitive Maturity ($\alpha = 0.79$), Innovativeness, ($\alpha = 0.88$), and a total score ($\alpha = 0.89$). The acceptable consistency of reliability means that the scale items were appropriate for study aims.

3.5 Procedures of the Study

After identifying the topics of the grammar materials included in "English for Iraqi 4th Preparatory Students Book", the researcher reads a number of previous studies on the application of teaching conceptual maps. The population was identified and the samples on which instruments were applied, were also selected. The test and the scale were designed. Validity and reliability of the adopted scale and questions of the grammar test were verified.

Before the experiment, the students in both groups were asked to answer the pre- test items in grammar. Also, the two groups were also given a critical thinking dispositions scale to measure their critical thinking dispositions. After that, the students in the two groups participated in 24 thirty-minute study sessions, two sessions each week. The students in the experimental group are taught by using concept mapping. Both groups were taught by the researcher. A week after the experiment, the students of both groups received a post-test after 24 sessions in order to observe the probable effect of using concept mapping on the students' achievement in grammar. Finally,

the groups were also given a critical thinking dispositions scale to measure their critical thinking dispositions after the experiment. Results were analyzed and the questions of the study were answered.

3.6 Final Administration

Finally, the researcher has administered the study instruments to the sample after consolidating their clarity, validity and reliability. The students' responses have been assigned marks according to the options they chose. After that, the data has been processed statistically by the use of the computer (SPSS). The grammar achievement test and the critical thinking dispositions scale have been applied on 3rd April / 2016 to the study samples.

3.7 Statistical Tools

The following statistical treatments were used for analyzing the study results: Arithmetic Means, Standard Deviations, Chi-Square, Cronbach Alpha Formula, Kuder- Richardson (KR 20), a t-test for two independent groups, one way analysis of variance ANOVA, and Scheffe's test.

4 Study Results and Discussions

4.1 Results Related to the First Question

In order to answer the first question, the means, standard deviations and T- value of the post-achievement test scores of both groups have been calculated as shown in Table (5).

(5): Means , Standard Deviations and T -Value of the Post Achievement Test for the Two Study Groups

Groups	No. of	Mean	Standa	Variance	df	T Value*	Sig

	Subjects		rd Deviation			Com-puted	Table Value	nificance Level at 0.05
Experimental	30	30.9	4.83	23.33	58	3.99	2	Sig nificant
Control	30	25.51	5.43	29.51				

Table (5) shows the means of the post-achievement test scores in grammar of the two groups as (30.9& 25.51). It is noted that there is a clear difference between the two means of the two groups. To find out the significant difference between the two means, T- test for two independent samples was applied. Thus, the computed T- value (3.99) is higher than the tabled T-test one (2) at 0.05 level of significance and under 58 degree of freedom. According to the result, there is a statistical significant difference between the two groups in the post grammar achievement test in favour of the experimental group. Thus, the first hypothesis is rejected. The results of this study are in consistence with other studies of Fahim & Rahimi (2011); Emmanuel 's (2013); Akif (2013) which showed that concept mapping strategy has many positive effects as improving students' achievement.

4.2 Results Related to the Second Question

To answer the second question, the means, standard deviations and T- value of the post-achievement test scores of both groups have been calculated as shown below in Table (6).

(6): Means, Standard Deviations and T Value for the Post Administration of the Critical Thinking Dispositions Scale for the two Study Groups

Groups	No. of Subjects	Mean	Standard Deviation	Variance	df	T Value*		Significance Level at 0.05
						Com-puted	Table Value	
Experimental	30	82.6	18.745	351.37	58	2.136	2	Significant
Control	30	72.07	18.84	352.06				

Table (6) shows a clear difference between the means of the post- administration of the critical thinking disposition scale scores of the two groups as (82.6& 72.07). In order to investigate the significant difference between the two means, T- test for two independent samples was applied. Thus, the computed T- value (2.136) is higher than the tabled t-test value (2) at 0.05 level of significance and under (58) degree of freedom. The result indicates a statistical significant difference between the two groups in the total critical thinking dispositions of the post- administration in favour for the experimental group. In order to explain this difference, one way ANOVA was used.

(7) :ANOVA for Students' Grades on the Post Administration of the Total Critical Thinking Disposition Assessment Scale for the Two Study Groups

Source of Variance	Sum of Squares	df	Mean Squares	F		Significance Level at 0.05
				Computed Value	Table Value	
Between Groups	1664.26	1	1664.26	4.223	4	Significant
Within Groups	22857.3	58	394.1			
Total		59				

Table 7 shows the analysis results in which the computed F-value (4.223) is higher than the tabled t-test value (4) at 0.05 level of significance and under (1 and 58) degree of freedom. The analysis result reveals that there is a statistical significant difference between the two groups in the post- administration of the critical thinking dispositions in favour of the experimental group. Thus, the second hypothesis is rejected. This result is supported by Green's experimental study (2010); Lawson (2012) & Chabeli (2010) in which concept mapping strategy has a significant effect on facilitating, enhancing and improving critical thinking. Similarly, using concept maps can lead to the development of "deep meaningful teaching and critical thinking" unlike more surface approaches (Pill et .al, 2005: 40).

To find out the differences between the two groups, Scheffe's Test is used to compare the means of the two groups in the post-administration of the total Critical Thinking Disposition Assessment Scale as shown in Table (8). Thus, a significant difference between the two groups is in favour of the experimental group.

(8): Means and Scheffe Values in the Post Administration of the Total Critical Thinking Disposition Assessment Scale for the two Study Groups

	Mean	Control	Critical Scheffe Value
		72.07	10.2
Experimental	82.6	10.53	

To find out the differences between the scores of the two groups on each domain of the Critical Thinking Disposition scale, ANOVA for students' scores in each domain of the Critical Thinking Disposition Assessment Scale including (Engagement, Innovation and Cognitive Maturity) has been calculated. Table (9) shows that the computed F- value (1.12) is lower than the tabled t-test value (4) at 0.05 level of significance and under (1,58) degree of freedom. According to the analysis results in Table 9, there is no significant difference at (0.05) between the two groups with reference to the first domain (Engagement) of the critical thinking dispositions scale.

(9): ANOVA for Students' Grades on the Critical Thinking Disposition Assessment Scale (Engagement Domain) for the Two Study Groups

Source of Variance	Sum of Squares	df	Mean Squares	F		Significance Level at 0.05
				Computed Value	Table Value	
Between Groups	93.75	1	93.75			
Within Groups	4872.1	58	84.002			
Total	4968.85	59		1.12	4	Not Significant

With reference to the second domain (Innovation) of the critical thinking disposition Assessment Scale, Table (10) shows that the computed F- value (6.02) is higher than the tabled t-test value (4) at 0.05 level of significance and under (1, 58) degree of freedom. The analysis indicates a statistical significant difference between the two groups in the innovation domain of the post- administration of the scale in favour for the experimental group.

(10): ANOVA for Students' Grades on a Scale of the Critical Thinking Dispositions (Innovation Domain) for the Two Study Groups

Source of Variance	Sum of Squares	df	Mean Squares	F		Significance Level at 0.05
				Computed Value	Table Value	
Between Groups	153.63	1	153.63	6.02	4	Significant
Within Groups	1479.93	58	25.52			
Total	1633.56	59				

To find out the differences between the two groups, Scheffe's Test is used to compare the means of the two groups in the post administration of the Critical Thinking Disposition Assessment Scale (Innovation Domain) as shown in Table (11). Thus, a significant difference is found between the two groups in favour of the experimental group.

(11):Means and Scheffe Values in the Post Test of the Critical Thinking Dispositions (Innovation Domain) for the Two Study Groups

Mean		Experimental	Control	Critical Scheffe Value
		19.97	16.77	2.61
Experimental	9.97		3.2	

Finally, with reference to the third domain (Cognitive Maturity) of the critical thinking disposition scale, Table (12) shows that The computed F- value (8.18) is higher than the tabled t-test value (4) at 0.05 level of significance and under (1, 58) degree of freedom.

Accordingly, there is a statistical significant difference between the two groups in the cognitive maturity domain of the post- administration in favour for the experimental group.

(12):ANOVA for Students' Grades on a Scale of the Critical Thinking Dispositions (Cognitive Maturity) for the Two Study Groups

Source of Variance	Sum of Squares	df	Mean Squares	F		Significance Level at 0.05
				Computed Value	Table Value	
Between Groups	385.04	1		8.18	4	Significant
Within Groups	2728.6	58	47.04			
Total	3113.64	59				

To find out the differences between the two groups, Scheffe's Test is used to compare the means of the two groups in the post administration of the second domain of the Critical Thinking Disposition Scale (Cognitive Maturity) as shown in Table (13). Thus, a significant difference between the two groups is found out in favour of the experimental group.

(13) :Means and Scheffe Values in the Post Test of the Critical Thinking Dispositions (Cognitive Maturity) for the Two Study Groups

	Mean	Experimental	Control	Critical Scheffe Value
		24.23	19.17	3.54
Experimental	24.23		5.6	
Control	19.17			

The study results are similar to the findings of other studies, such as the one by Shirley (2012), in which participants' critical thinking dispositions were positively correlated with the written achievement on concept maps as an increase in critical thinking skills.

The significant differences in favour of the experimental group in the achievement as well as critical thinking dispositions could be ascribed to many factors as follows:

1. Concept mapping strategy enables students to behave freely and semi-naturally and to learn cooperatively.

2. Putting students in active situations to interpret the information given meaningfully and go beyond the book knowledge by making connections between the new knowledge with the existing cognitive framework.

3. In applying concept maps strategy, there is a good chance for playing different roles by learners such as, critical thinkers, researchers and problem solvers that enable them to use English language in different situations meaningfully.

4. Concept maps strategy is very vital for developing students' critical thinking dispositions towards engagement, innovation and cognitive maturity through the process of learning new concepts, skills, and attitudes.

4.3 Recommendations

Based on the study results, the following recommendations are presented:

1. The concept mapping strategy should be included in the programs of teachers education and their English method course content.

2. Teachers of grammar should be provided with a pamphlet which includes a full explanation for each lesson by using concept map strategy.

3. Conducting the experimental and semi-experimental studies to show the effect of the educational teaching programs based on the concept mapping strategy in developing thinking skills through the English language subject. Also, the need still exists for researchers to capture students' growth of critical thinking over time by using other critical thinking instruments.

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