The Effect of Semantic Mapping on Reading Comprehension

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The research reported here examined the relative effectiveness of semantic mapping, as an interactive pre-reading strategy, on reading comprehension of Iranian undergraduate students (non-EFL majors). It also examined whether there was an interaction between gender and the effect of teaching semantic mapping strategy on reading comprehension. The participants in this study consisted of 120 male and female pre-intermediate undergraduate students taking a General English course at Urmia University in Spring 2008. A Certificate of Advanced English Reading Paper (CAE) was administered to measure the students' proficiency at the beginning of the research. Later, the participants were semi-randomly (Mackey and Gass, 2005) assigned into experimental and control groups. The experimental group was instructed on how to employ semantic mapping strategy in reading while the control group received normal reading instruction. The post-test results supported the findings of earlier research that instruction on the application of semantic mapping contributed to reading comprehension. Further findings and implications are discussed in the paper.

Keywords: Semantic Mapping, Reading Comprehension, General English, EFL Learners

ESL and EFL students are a population who need special attention in reading development, especially those who wish to pursue academic work in their second language. As a matter of fact, learning how to read informational texts to obtain content–area knowledge becomes critical for their success. Reading involves abilities to remember main ideas and certain details, to link the text to the readers' prior knowledge, and to recognize and build rhetorical frames which organize the text information (Grabe & Stoller, 2002). In order to improve students' reading, different studies have attempted to discover the effectiveness of various reading strategies as instances of learning strategies. Learning strategies are important in language learning because they enhance students' learning, and students make use of them for active, self-directed involvement that is essential for developing communicative competence (Oxford, 1990).

Regarding the importance of strategies in EFL learners' success and their growing interest in effective language learning, the present study scrutinized the effect of applying semantic mapping as a learning strategy on reading comprehension. It also examined whether there was an interaction between gender and the effect of teaching semantic mapping strategy on reading comprehension. In this study, gender was considered a moderator variable, and English language proficiency level of the candidates was controlled at pre-intermediate level. The present study was specifically conducted to answer the following research questions:

1. Is there any statistically significant difference between the experimental group (receiving training on the application of semantic mapping strategy) and the control group in reading comprehension?
2. Is there any statistically significant relationship between gender and the effectiveness of semantic mapping strategy training on reading comprehension?

The following null-hypotheses were formulated as tentative answers to the above questions and were subjected to a variety of statistical analyses at the probability level of less than 0.05.

H01: There is no statistically significant difference between the experimental group (receiving semantic mapping instruction) and the control group in reading comprehension.

H02: There is no statistically significant relationship between gender and the effectiveness of semantic mapping strategy training on reading comprehension.

Semantic mapping is a technique developed by Johnson and Pearson (1978) and has its roots in cognitive psychology. It assumes that students come to class with some fragmentary knowledge or even misconceptions about the topic the teachers are going to teach. Semantic mapping is indeed a graphic representation of one's ideas and attitudes toward a key concept and is used to categorize and connect the jumbled stuffs. According to Zaid (1995), semantic mapping is a visual representation of knowledge, a picture of conceptual relationship. He defines semantic mapping as a graphic arrangement showing the major ideas and relationships in text or between word meaning and a categorical structuring of information. In teaching reading, semantic mapping helps teachers to get students to focus not just on individual details but also on the structure of a text and to conceptualize the structure of the paragraph and short essay.

A large body of literature supports that prior knowledge of text-related information strongly affects reading comprehension. The brainstorming phase of semantic mapping (intended to activate the readers' prior knowledge) gives the teacher an insight into the schemata of each of his/her students, thus revealing the amount of interest, level of readiness, gaps, misconceptions, and errors (Pearson & Johnson, 1978). Typically, in brainstorming, ideas from one student will trigger ideas from other students "in chain reaction thought process" (Heimlich & Pittelman, 1986, p. 34). According to Heimlich and Pittelman (1986), other advantages of semantic mapping are: motivating students of all grades, integrating thinking with reading, integrating assessment with teaching, and making judgments concerning the appropriate instruction needed.

In order to enhance the comprehensibility of reading passages, Curtain (1997) proposes techniques such as advance

organizers, story mapping, story grammars and semantic mapping as pre-reading strategies. She argues that previewing new structures and vocabulary and helping students make connections between the new concepts and the old ones allow them to draw on their background knowledge, which aids comprehension. Confirming previous research findings, she adds, "encouraging students to draw meaning from the pictures in the reading or additional or related visuals can also help text comprehension" (p.1).

Zaid (1995) implemented a semantic mapping reading activity in a study conducted to explore the use of semantic mapping as a classroom technique in a Communicative Language Teaching (CLT) context. He aimed to display some areas of correlation between what a semantic mapping activity does and the principles and objectives of CLT. Based on his findings, he notes that there are three places in a lesson where semantic mapping may be used: as a pre-assignment strategy to activate students' prior knowledge or to help the teacher in assessing the students' readiness to do the assignment; as a strategy to allow students to record what they are learning during the assignment; and as a post-assignment strategy to allow them to integrate or synthesize what they have studied. In totality, a semantic mapping activity aids students in viewing learning from an organized versus a fragmented perspective. His most-quoted category, which consists of five phases to incorporate semantic mapping in the classroom is worth mentioning here:

a. Introducing the topic: The teacher studies a unit in the syllabus and determines whether semantic mapping can be useful. The teacher announces the topic of the unit by drawing a large oval on the board. Heimlich and Pittelman (1986) state that some teachers display a picture relating to the topic to stimulate students' thoughts and get the brainstorming procedure going.

b. Brainstorming: The teacher asks students to think of ideas that might be related to the topic introduced. This brainstorming phase allows students to make use of their prior knowledge or experiences, attempting to explain how people integrate new information with their existing knowledge or framework

(Alverman & Swafford, 1998; Kalgern, 1992).

c. Categorization: The teacher does his best to encourage students to see relationships among their suggestions in order to form what Antonacci (1991, p. 174) calls "category clusters".

d. Personalizing the map: After each student makes a copy of the pre-assignment map, the teacher provides the students with some material on the topic. Since semantic mapping is designed to show the relationship between the verbal and the visual, this material is typically a reading passage. New information is thereby integrated with prior knowledge.

e. Post-assignment: The last part of the class period is used to record students' suggestions from their personal maps on the pre-assignment, a chalkboard version of the map. The discussion will probably centre on the amount of information acquired from the reading and how the original map has been modified.

Zaids' (1995) research findings display that semantic mapping is *interactive* because in drafting the map, students work with each other both before and after the targeted language. It is an *informational-gap activity* since the students must fill in gaps in the map and in their personal schemata of the topic as the map takes the shape. It is a *predictive activity* because in the pre-reading phase, the students' discussion basically anticipates what will appear in the reading material. It is *student- centred* because the semantic map makes use of the students' prior knowledge and because students control the input at each stage of the map building.

El-Koumy (1999) acknowledges that semantic mapping has emerged as a teaching technique to increase comprehension. This technique has become popular in the teaching of reading comprehension because of its multiple advantages in this area. The major advantage of this technique is that it integrates new information with previous knowledge. El-Koumy (1999) conducted research comparing the effects of three semantic mapping strategies on reading comprehension of learners of English as a foreign language. These groups were instructed by the researcher using the same reading material, but employing three different semantic mapping strategies: (1) teacher-initiated

semantic mapping (2) student-mediated semantic mapping (3) teacher-student-interactive semantic mapping. Reading comprehension of all the participants was tested both prior to and at the end of the treatment. The results showed no significant differences in mean scores on the pre-test among the three groups of the study. On the other hand, the post-test results revealed that students in the teacher-student-interactive semantic mapping group scored significantly higher than the teacher-initiated semantic mapping and student-mediated semantic mapping groups.

Similarly, Griffin, Malone and Kameenui (1995) investigated the facilitative effect of graphic organizers (GO) instruction (as an example of semantic mapping strategy) and the degree of explicitness in GO instruction with 99 L1 fifth-grade students in five treatment conditions: explicit GO instruction, explicit-comprehension instruction without GO, implicit GO instruction, implicit-comprehension instruction without GO, and traditional basal instruction. The training was conducted over a 10-day period with 45 minutes per day in the students' classrooms. The GOs used in the study were designed to reflect the hierarchy of information within the passage and the relationships of this information within the hierarchy. The results showed no significant difference in participants' performances on the immediate and delayed post-tests with short-answer comprehension items, and participants who received GO instruction did not perform better in either immediate or delayed recall of the training material. (Actually, the students who received traditional basal instruction performed significantly better than students who received implicit GO instruction in the delayed recall of the teaching material.) However, students who received GO instruction performed significantly better on the recall of novel texts as a transfer measure than students who received the traditional basal instruction.

To conclude, Block and Pressly (2002) point out that comprehension involves more than thirty cognitive and metacognitive processes. Comprehension instruction, therefore, involves a complex and long-term commitment to teach students the necessary strategies and to provide them with sufficient practice to use these strategies effectively. It should be mentioned

that as most of the strategies introduced for developing reading and/or learning may be context- and individual-specific, before generalizations are voiced out for prevalent use of such techniques, their efficacy should be carefully tested in a variety of contexts. As it is the case with all techniques, semantic mapping should similarly not be overused. Heimlich and Pittelman (1986) and Zaid (1995) caution CLT teachers not to have their students make overly detailed and multileveled semantic maps that may result in confusing visual displays. Hanf's (1971) suggestion (intended for native-speakers) that not more than six or seven secondary-level categories be used in semantic mapping may need revision before it can properly be applied for beginning EFL students.

Method

Participants

The participants in this study were 120 pre-intermediate undergraduate students (two separate classes) taking a general English course at Urmia University. There were 60 students in each class (control vs. experimental) and the number of females and males was not equal in either group. For reasons of logistics, it was not possible to randomize the subjects and an intact group design was accordingly used in the study. Although the groups were intact in design, they were semi-randomly assigned to control and experimental groups as recommended by Mackey and Gass (2005). A standard reading test (CAE) was administered to measure the students' language proficiency in this study at the beginning of the research, the results of which indicated no significant difference between the control and experimental groups. Table 1 shows the characteristics of the participants used in the study.

Materials

The materials which were used in the study consisted of a) a standard reading comprehension test, the institutional Certificate in

Advanced English (CAE), to assess the learners' proficiency and to establish homogeneity of the groups at the beginning of the treatment, b) reading passages of the General English book (by SAMT Punishers) used during the course, c) printed models of graphic organizers for teaching the strategy of semantic mapping, and d) a test of reading comprehension based on an unseen passage from the General English book used for teaching reading during the treatment (called SAMT post-test here) .

Table 1
Characteristics of the participants

Group	Major	N	Female	Male	Age Range	L1: Turkish	L1: Kurdish	L1: Persian
Experimental	Educational Sciences	60	38	22	18-23	36	15	9
Control	Geography	60	45	15	18-25	31	23	6

Procedure

The design of the study was a non-probabilistic intact group design, and for reasons of logistics (Mackey & Gass, 2005), it was impossible to have true random sampling of the participants. Two classes were, however, randomly chosen among numerous groups taking a General English course at Urmia University in Spring 2008. One of the groups was semi-randomly assigned as the control group and the second group as the experimental group. Before the treatment began, both groups took a standard reading test (CAE) to establish the initial differences or similarities in reading ability of the two groups. The results showed no statistically significant initial differences between the groups (see below). The experimental group was instructed on how to employ semantic mapping strategy in reading by the researchers in ten 30-minute sessions for two months during the second semester of 1386-1387 academic year (2008). During the treatment, the experimental group were taught how to construct the content of a passage in the form of a tree graph and reflect the hierarchy of

information within the passage. Additionally, they were taught how to illustrate the interrelationship among ideas and details in a text through the use of semantic maps. The kinds of semantic maps and graphic organizers which were used depended on what kind of reading materials was taught. During this period, the control group received no instruction on reading comprehension via semantic mapping. At the end of the study, both groups were examined using the same CAE test and a reading comprehension test based on the General English book as noted in the *Materials* section.

Findings

In order to make sure that the participants in both the control and experimental groups were of the same proficiency level at the beginning of the study, an independent samples *t*-test was used. As shown in Tables 2 and 3, the difference between the mean scores on the pre-test was not statistically significant. This suggests that students in the two groups were fairly homogeneous in their reading comprehension ability at the beginning of the study.

Table 2
CAE pre-test results for experimental and control groups

Group Statistics

	grouo	N	Mean	Std. Deviation	Std. Error Mean
pretest	1.00	60	2.9833	2.01260	.25983
	2.00	60	2.7667	2.06148	.26614

Group 1: Experimental group
Group 2: Control group

Table 3
Independent t-test based on CAE pre-test for experimental and control groups

		Levene's Test for Equality of Variances	
		F	Sig.
pretest	Equal variances assumed	.430	.513
	Equal variances not assumed		

To answer the research questions posed above, the following two-way ANOVAs were used to find out any difference between groups in terms of the application of semantic mapping strategy and any moderating effect of gender in the control and experimental groups on both CAE and General-English-book-based post-tests.

As shown in Table 4, the results revealed that the F-ratio was significant for semantic mapping group at the P≤0.05 level in the CAE-related post-test, so the first hypothesis was rejected. The same Table also reveals that there was not any statistically significant relationship between the students' gender and the effectiveness of semantic mapping strategy training on reading comprehension, which leads us to confirm the second null-hypothesis as far as CAE post-test is concerned. No significant interaction effect was observed either, meaning that semantic mapping strategy and sex did not interact to produce a different effect.

Table 4

Tests of between –subjects effects based on CAE post-test

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	45.657[a]	3	15.219	3.997	.009
Intercept	1331.290	1	1331.290	349.671	.000
sex	.018	1	.018	.005	.945
grouo	37.270	1	37.270	9.789	.002
sex * grouo	.008	1	.008	.002	.965
Error	441.643	116	3.807		
Total	2086.000	120			
Corrected Total	487.300	119			

a. R Squared = .094 (Adjusted R Squared = .070)

Regarding the fact that CAE proved a very difficult test for both groups and led to insufficient variance, it was decided that another simpler test would be a better replacement, and for this purpose, an unseen passage from the students' course book was selected at a similar readability level as the average readability of the passages in the book and was made into another post-test. The test was piloted and revised several times before it was administered to the target control and experimental groups.

The performance of the participants and their differences are illustrated in Table 5 below. As shown in Table 5, as far as the post-test based on the General English book (called SAMT post-test) is concerned, the results revealed that the F-ratio was significant for semantic mapping at the $p \leq 0.05$ level, so the first hypothesis was rejected. The same results also revealed that there was not any statistically significant relationship between candidates' gender and effectiveness of semantic mapping strategy training on reading comprehension in the General-English-related post-test (or SAMT post-test), which confirms our second null-hypothesis.

Table 5

Tests of between-subjects effects based on SAMT (General English) post-test

Tests of Between-Subjects Effects

Dependent Variable: samt

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	844.021[a]	3	281.340	33.908	.000
Intercept	9526.132	1	9526.132	1148.110	.000
sex	.206	1	.206	.025	.875
grouo	674.521	1	674.521	81.295	.000
sex * grouo	1.207	1	1.207	.145	.704
Error	962.479	116	8.297		
Total	13214.000	120			
Corrected Total	1806.500	119			

a. R Squared = .467 (Adjusted R Squared = .453)

In order to avoid the problem of having incomparable males and females, which could pollute the result of ANOVA, it was further decided to randomly select equal number of males and females from each group (15 of each) and run the analyses again. Table 6 shows the relevant statistics. The results revealed that the F-ratio was significant for semantic mapping at the $P \leq 0.05$ level, so the first null-hypothesis was rejected for the third time. The results also revealed that there was not any relationship between students' gender and the effectiveness of semantic mapping strategy training on reading comprehension with equal number of males and females, providing us with some more evidence to confirm our second hypothesis.

Table 6
Tests of between-subjects effects based on SAMT (General English) post-test 15 males and 15 females chosen randomly from control and experimental groups

Tests of Between-Subjects Effects

Dependent Variable: sam15

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	399.396[a]	3	133.132	17.541	.000
Intercept	6045.815	1	6045.815	796.598	.000
sex	.333	1	.333	.044	.835
grouo	399.263	1	399.263	52.607	.000
sex * grouo	.003	1	.003	.000	.984
Error	432.604	57	7.590		
Total	6932.000	61			
Corrected Total	832.000	60			

a. R Squared = .480 (Adjusted R Squared = .453)

Discussion

  The results of this study are in accordance with the previous studies such as Zaid (1995) Heimlich and Pittelman (1986) who found that using semantic mapping as a pre-reading strategy had a significant effect on students' reading comprehension. The verbal protocols obtained from participants (not reported and analyzed here, however) confirmed that semantic maps are particularly valuable because a good semantic map can show the key parts of a whole and their relations at a glance, thereby allowing a holistic understanding that words alone cannot convey. Our findings revealed that in this study gender as a moderate variable did not have any effect on the effectiveness of semantic mapping on reading comprehension. As it was mentioned earlier, the number of males and females were not equal in this study. If the number of males and females were equal and big enough, the results could possibly have been different (although this was tested with a smaller number of participants in each group, where a significant

difference was again found).

The results of the study also showed that there were some areas of correlation between semantic mapping activity and principles and objectives of CLT. Semantic mapping is *interactive* because in drafting the map, students work with each other both before and after the targeted language. It is an *informational-gap activity* since the students must fill in gaps in the map and in their personal schemata of the topic as the map takes the shape. It is a *predictive activity* because in the pre-reading phase, the students' discussion basically anticipates what will appear in the reading material. It is *student-centered* because the semantic map makes use of the students' prior knowledge and because students control the input at each stage of the maps building. It is *teacher-friendly* because it allows the EFL teacher unobtrusively to pre-assess the students' readiness to do an assignment, take immediate steps (as in vocabulary introduction) to enhance their preparation, and to post-evaluate how well the students integrated or synthesized what they have studied. And finally, it is an *integrative activity*, since it allows students to connect previous knowledge with new knowledge, thereby expanding their reservoir of knowledge through that interrelationship.

As far as language teaching and learning are concerned, a growing number of English learners at language centers are interested to use language for expression of meaning and CLT is pervasive in Iranian language institutes, and recently in pre-university English courses, so semantic mapping activity in this context can help students and syllabus designers to achieve their communicative goals of teaching reading interactively. The need for comprehension strategies is something that both students and teachers are aware of, yet one of the problems in applying comprehension strategies seems to be unfamiliarity with the techniques through which students can better comprehend and recall reading materials. It is recommended therefore that students be taught how to design semantic maps because the semantic aspect of a text plays an important part in reading comprehension. If students, at different proficiency levels, organize the text semantically, they will be able to read more effectively. Semantic

mapping as a teaching technique helps students to increase comprehension because of its multiple advantages in reading comprehension. The major advantage of semantic mapping is that it integrates new information with prior knowledge. It is used as a strategy to activate, to assess and to embellish students' prior knowledge of a topic before reading, which seems to have considerable merit.

Conclusions

The aim of this research was two-fold: on the one hand to investigate the effect of semantic mapping instruction on reading comprehension, and on the other, to look at the relationship between gender and the effectiveness of semantic mapping strategy training on reading comprehension. The results displayed that semantic mapping instruction had a significant effect on students reading comprehension, but there was not any statistically significant relationship between gender and the effectiveness of semantic mapping training on reading comprehension. While the study suffers from design problems of non-randomised sampling, and the findings may not therefore be generalizable to wider similar contexts, the results reported here seem to suggest that the familiarity of the readers with the pre-reading strategy of semantic mapping and its application will lead to better comprehension although further research may be required to substantiate this claim, especially in other EFL contexts.

Notes

1. The fact that CAE is a relatively advanced-level test and more appropriate to check the proficiency of advanced candidates is evident as it is a Level 4 examination (out of 5) in the UCLES Cambridge Main Suite, supposed to more 'difficult' than those falling lower in the list (FCE, Level 3; PET, Level 2, KET; Level 1). In order to compare the difficulty levels of the reading passages in KET and CAE objectively, we calculated the readabilities of the passages in the reading papers of these two tests and found the

following values: CAE average readability: 10.89; KET average readability: 11.06, both in Fry index. As such, although CAE is intended for high proficient test-takers, in practice there is no meaningful difference (as far as Reading Paper is concerned) between these tests. Accordingly, our decision to make use of CAE, which is more face-valid for candidates doing tertiary education, is more justified. The fact that the reading passages in KET are general-level in nature and intended for the user to 'understand the gist of a tourist brochure with the help of a dictionary' (UCLES, 2001) and the like makes such passages (and KET) unsuitable for university students pursuing a more academically-oriented reading course. Furthermore, when we noticed the CAE Reading Paper was rather difficult for our test-takers at the outset of the study (despite its having a similar readability to KET), we decided to supplement our findings using another tailor-made post-test which included reading passages at the same readability as those in the textbook the candidates studied during the course, called SAMT post-test in this study.

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