Semantic mapping and lexical acquisition: are CAI Methods effective?

Semantic Mapping and Lexical Acquisition: Are CAI Methods Effective?

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本稿は語彙習得が目的であることを明らかにした語彙学習と語彙獲得率との関係を調査したものである。中上級の ESL クラスで、これから学習する内容について心理的な準備をさせると語彙獲得率が著しく向上するという仮説がある。実験では大学レベルの ESL 読解クラスの学生４６人を被験者とした。先ず被験者を実験的なグループと従来の教授法によるクループとに分ける。独立変数は意味の地図作成（SM）である。SM とは意味の連想をたどって一つの単語から次の単語へと次々に関連する単語の網を広げて地図状の図を作るものである。従来の教授法によるグループの被験者には SQ3R メソッドで語彙を教える。このグル.プは従来の授業の形式に従って指示を与える。実験的グループの学生には同じ単語を SM メソッドで教える。これには意味音声直接認識の訓練を加える。このグループの被験者にはインターネットを通して処置を行なう。これは新しい単語を教える場合にコンピュータを使った教授法が紙と鉛筆による従来の教授法同様に効果があるものかどうかを見定めるということがこの研究の今一つの目的でもあったからである。両グループ共に相当量の語彙を習得した事が結果として分かった。

This study investigated the relationship between explicit vocabulary instruction and the rate of lexical acquisition. It was hypothesized that metacognitive strategy training in semantic mapping would significantly increase the rate of lexical acquisition for upper-intermediate ESL learners. Forty-six students enrolled in a university-level ESL reading course participated; subjects were divided into treatment and control groups. The independent variable was semantic mapping training. Subjects in the control group were taught vocabulary through the Survey, Question, Read, Review, Recite (SQ3R) method. This group received instruction in a regular classroom setting. Students in the experimental group were taught the same words through the Semantic Mapping method, which included direct semantic and phonological awareness training. Subjects in this group were given the treatment via the Internet because an implicit aim of this study was to determine whether computer-assisted instructional (CAI) methods are as effective as traditional (paper and pen) methods for teaching new vocabulary. Results indicated that both groups learned a significant amount of vocabulary.

Introduction

The Information Technology (IT) revolution is rapidly changing the way people are reading, and a growing number of second language (L2) teachers are using the Internet to deliver content and teach. Obviously, reading and learning new vocabulary via the Internet is quite different from reading and learning lexical items with paper texts. With the recent interest in teaching L2 learners with the Internet, effective methods need to be developed to increase reading proficiency and expand learners' vocabulary comprehension. Furthermore, ESL and EFL students need to be given effective strategies to be able to take in and process electronic sources of information. The question of whether teaching vocabulary and reading with the Internet is more effective than traditional paper and pen methods is still unanswered. Empirical studies that make comparisons between the two methodologies are needed.

The need for the development of effective methods and strategies for reading Internet texts is directly connected to the need for intermediate ESL/EFL learners to rapidly increase their vocabulary. The possession of a large lexicon is one of the primary differences between native speakers and adult L2 learners in university contexts; some lexical researchers argue that vocabulary knowledge is the most critical feature of reading ability (Grabe, 1993). Furthermore, a number of surveys

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show that second language learners themselves cite the absence of a large vocabulary as being the main source of difficulty in reading English texts (Barnett, 1986). Second language learners, researchers and theoreticians all point to the importance of reading and vocabulary learning, yet there is no consensus about the most efficient way for L2 learners to acquire a native-like vocabulary.

For one thing, Second Language Acquisition (SLA) researchers and theoreticians are still in disagreement over whether vocabulary should be explicitly *taught* in second language learning classrooms. Some claim that explicit vocabulary instruction is not useful, nor is it as efficient as incidental vocabulary acquisition (Johnson, 1982; Krashen, 1989), while other researchers argue that explicit vocabulary instruction is not only useful but that it may also increase the rate of acquisition for adult L2 learners in academic contexts (Laufer, 1994; Moore & Surber, 1992; Richards, 1976; Schreck & Schreck, 1991; Taglieber, Johnson & Yarbrough, 1988; Twaddell, 1973).

What both camps agree on is that good readers/vocabulary learners are people who use a variety of strategies to help them read more effectively. Knowledge of reading strategies is not intuitive for most people, and learning styles researchers have made a strong case that students benefit from metacognitive awareness training; thus, professional language educators have an obligation to help increase the number of reading strategies second language learners are familiar with. Furthermore, since a great number of university level ESL/EFL students prefer to learn vocabulary explicitly (via memorization and direct in-class instruction), teachers of English as an international language have a responsibility to supplement the preferred language learning strategy of their students. Jack Richards (1976) holds:

> What is the most desirable model theoretically may turn out to be the least effective in actual use.... So, for example, while rote memorization may not be a justifiable strategy on theoretical grounds, there may be learners who enjoy and succeed in learning material through memorization. (p. 78)

One effective (direct) vocabulary learning strategy is semantic mapping. Semantic mapping (also known as concept mapping, word webbing, and plot mapping) is a term which describes a variety of strategies designed to show how key words or concepts are related to one another through graphic representations (Heimlich & Pittleman, 1986; Johnson & Pearson, 1984).

Research in metacognitive strategy training with ESL learners in university level reading courses demonstrates that second language learners benefit from explicit vocabulary instruction by means of semantic mapping (Carrell, Pharis & Liberto, 1989). Semantic mapping might be a completely new way to learn vocabulary for many ESL/EFL students; however, Letteri's (1982) work indicates that learning styles and strategies can be altered through consciousness raising instruction.

Twaddell (1973) proposes that it is through extensive contact with the foreign language and skill in intelligent use of context clues, not from word-matching or laborious grammar translation, that vocabulary expands. He also states that these skills can be taught and learned. In other words, L2 readers need to develop a tolerance for ambiguity and *learn* skills that enable them to become good guessers.

Twaddell (1973) says it is through successive encounters with a word and by guessing the meaning of a word in a variety of contexts that second language learners come to know the correct meanings of the word. If it is true that meaning is mapped onto form after multiple exposures in a variety of contexts, it follows that conscious vocabulary instruction does facilitate vocabulary/language acquisition.

Explicit vocabulary instruction need not bear any resemblance to grammar translation methods; it does not need to involve a word for word matching between a learner's native language and a target language. Instead, explicit vocabulary instruction should actively engage learners in context-embedded activities which activate the schema a learner brings to the classroom.

Furthermore, vocabulary instruction should enhance students' motivation for learning the target language. Since active participation in the learning process enhances motivation, well-designed computer programs may have high motivational value. Well-designed Internet programs motivate students by providing users individualized feedback in interactive, context-embedded environments (Johnson & Oltenacu, 1996). Therefore, explicit vocabulary instruction using semantic mapping exercises employing the Internet as a tool may be useful for facilitating the expansion of adult L2 learners' vocabularies in academic contexts.

Take for example, ACT Laboratory Ltd. They have created an Internet web site that is useful for explicit vocabulary instruction using semantic mapping; the web site is called NewsDEN (http://www.actden.com). NewsDEN is a well-designed Internet site that displays authentic newspaper stories in an interactive, question-posing environment. Each NewsDEN article facilitates vocabulary acquisition and comprehension in a unique manner. NewsDEN provides texts that have glossed vocabulary words with hypertext links, semantic maps, almanacs and other sources of information. All texts and vocabulary items used in this study are from NewsDEN articles.

The purpose of the present study was to determine whether metacognitive strategy training via semantic mapping (an explicit vocabulary learning method) would facilitate vocabulary acquisition significantly over SQ3R (a semi-passive vocabulary learning method). Subjects in the Semantic Mapping group were given the treatment via the Internet because an implicit aim of this study was to determine whether computer-assisted instructional methods are as effective as traditional (paper and pen) methods for teaching new vocabulary.

Hypotheses

To determine whether metacognitive strategy training in semantic mapping, using the Internet as a tool, would facilitate vocabulary acquisition significantly more than incidental (passive) vocabulary acquisition through the reading of these same texts, the present study posed the following hypotheses.

First of all, the researcher hypothesized that there would be no significant difference in the rank level scores of the experimental (Semantic Mapping) and control (SQ3R) Groups, using Nation's (1990) Vocabulary Levels Pre-test.

Secondly, it was hypothesized that there would be no difference between the experimental and control groups in the percentage of individuals who would have an increase in their Vocabulary Levels Post-test scores.

Finally, the researcher hypothesized that the semantic mapping group would learn a significantly greater amount of vocabulary compared to the SQ3R group, as measured by the NewsDEN Vocabulary Post-tests.

Methods
Subjects

Forty-six ESL students participated in a (quasi-experimental) study in which the control group (N=12) were taught lexical items through reading and reading-writing exercises using the Survey, Question, Read, Review, Recite Method (see SQ3R Method below), while the experimental group (N=34) were taught these same words through reading and writing exercises and the independent variable, semantic mapping (see Semantic Mapping Method).

The subjects were intact groups of ESL learners enrolled in a course called Upper-Intermediate Reading in an Intensive English Language Program (at Portland State University, USA), a non-random sample population. The subjects were between 19-25 years of age. Furthermore, the student population was non-homogenous: they came from a variety of cultural and ethnic backgrounds and had different first language backgrounds. The length of each course was 10 weeks and consisted of 3.15 contact hours per week. Classes met three times per week. The experimental group consisted of two classes. Thus, there were two teachers present during the treatment, the primary researcher and a colleague who was teaching the other section of Upper-Intermediate Reading. The classes were merged in order to get more than thirty subjects in the experimental group.

Procedures

Since the focus of this study was vocabulary learning, the most important factor in determining the two groups' comparability was their vocabulary levels. Subjects were given Nation's (1990) "A Vocabulary Levels Test" on the first day of class. To determine whether there was a significant difference between the two groups' vocabulary levels, t-tests were performed and rank scores were compared between groups. The t-tests showed that the average vocabulary levels of the experimental group and of the control group were comparable; there was no statistically significant difference.

To determine whether both instructional groups were starting off with comparable vocabulary levels, Nation's (1990) "A Vocabulary Levels Test" was administered as a pre-test. Then, at the end of the quarter, this same measure was given as a post-test in order to determine whether the Semantic Mapping or SQ3R method had a significant impact on increasing the subjects' general/overall vocabulary levels.

In order to determine the effectiveness of the independent variables (semantic and phonological awareness training) on comprehending new lexical items, immediately prior to receiving the treatments, each group was given a vocabulary comprehension pre-test containing unknown words. To measure subjects' long-term memory of these words, modified versions of the same tests were given two weeks later, and at the end of the ten-week quarter.

Subjects in the experimental group were additionally given the NewsDEN Vocabulary Checklist on the first day of class. The control group was not given this

vocabulary checklist. Thus, it was the words that the experimental subjects said they did not know which became the lexical items on the NewsDEN vocabulary comprehension pre- and post-tests.

During weeks three, five and seven, the experimental group received semantic mapping treatments and the control group received instruction (with the same reading materials) using the SQ3R method. Prior to reading the NewsDEN articles, each group took a NewsDEN vocabulary pre-test. Subjects were given ten minutes to complete each pre-test.

After taking the pre-test, the experimental group received phonological and grammatical information about each word listed from the researcher. Furthermore, they were asked to state which type of contextual clue could be used to guess each lexical item correctly. Ten minutes was allotted for this phase.

The control group did not receive the phonological and grammatical information about each word but *was* asked to identify the contextual clues. Ten minutes was allotted for this phase. For each of the NewsDEN pre- and post-test questions, a contextual clue could be used to guess the lexical item correctly.

Table 1
Weekly Procedures

Week One:	Administered the NewsDEN vocabulary checklist to experimental group. Afterwards, chose thirty unknown words from the checklist and developed vocabulary pre- and post-tests based on these words. Administered Nation's (1990) "A Vocabulary Levels Test" to both groups as a pre-test.
Week Three:	Administered NewsDEN Vocabulary Pre-Test One. Gave semantic mapping treatment number one to the experimental group and SQ3R treatment number one to the control group.
Week Five:	Administered NewsDEN Vocabulary Post-Test One to both groups on Monday. On Friday, administered NewsDEN Vocabulary Pre-Test Two; gave semantic mapping treatment number two to the experimental group and SQ3R treatment number two to the control group.
Week Seven:	Administered NewsDEN Vocabulary Post-Test Two to both groups on Monday. On Friday, administered NewsDEN Vocabulary Pre-Test Three; gave semantic mapping treatment number three to the experimental group and SQ3R treatment number three to the control group.
Week Nine:	Administered NewsDEN Vocabulary Post-Test Three to both groups.
Week Ten:	Administered NewsDEN Vocabulary Post, Post-Test to both groups. Administered Nation's vocabulary levels test to both groups as a post-test.

Two weeks after taking each of the NewsDEN vocabulary pre-tests, the experimental and control groups took the corresponding NewsDEN post-test. At the end of the quarter, one week after the administration of NewsDEN Post-Test Three, subjects took Nation's (1990) vocabulary levels test as a post-test. Also at this time, both groups took the Final NewsDEN Post-Test. This test contained the same lexical items as the NewsDEN pre- and post-tests but it was a vocabulary/definition matching test modeled directly after Nation's vocabulary levels test. Table 1 provides a detailed description of the procedures followed for this experiment.

Computer Controls

Because the Internet (NewsDEN) was the source for all of the reading materials, several procedures were implemented to prevent limited computer proficiency from interfering with the results. First, the researcher ensured that there was always at least one proficient Internet user at each computer terminal during the administration of the experimental treatments. As a second control, the subjects in the experimental group were taught to use the Internet and NewsDEN prior to receiving the experimental treatment. As a third control, to ensure that all subjects had access to the treatment materials, printed copies of the reading materials were given to both the experimental and the control groups. As a result of these procedures, the variable of limited computer knowledge was controlled for.

The Semantic Mapping Method

After each NewsDEN vocabulary pre-test was administered and scored, the researcher asked the experimental group two core questions to activate schemata. These core questions, and the corresponding NewsDEN article titles, are shown in Table 2.

Table 2
Core Questions

Title of NewsDEN Article	Core Questions
Two East Van youths open gym coffee bar with help from federal government	Is it easy for immigrants to start businesses? Why or why not?
Disabled girl's school fight goes to Supreme Court	Do you believe a school has the right to deny education to anyone? Why or why not?
Uganda sheds horrible past, with women leading the way	What do you know about Uganda? What do you know about the role of women in Uganda?

As the subjects responded to the core questions, the researcher wrote key words from the student responses on the whiteboard. While the researcher was writing the key vocabulary on the whiteboard, the other instructor led a group discussion of the core question and clarified the meaning and pronunciation of unknown words.

Next, the subjects were told to look at their computer monitors to see the first page of a NewsDEN article. The first page of each NewsDEN article contained the title of the story and a picture representative of the story's central idea. Subjects were asked to read the title and to look at the picture next to the title. Then the subjects were asked to brainstorm and to predict what each story would be about. The vocabulary from this brainstorming session was mapped onto the whiteboard and added to the pre-existing lexical items and phrases from the core question phase. At this time, super-ordinate and subordinate categories were created and links were drawn between vocabulary items (using directional arrows).

Next, the subjects were asked to read the article. Subjects were given ten minutes to read each article. While the students were reading the NewsDEN article, a skeleton semantic map was drawn on the whiteboard.

After the reading phase, subjects were asked to click on the link to the "Story-At-A-Glance" skeleton semantic map at their computer terminals, and they were also given paper copies. The skeleton maps contained the main idea and supporting details of each NewsDEN story. The Story-At-A-Glance maps are visually organized to represent the rhetorical or textual organization pattern of each news article. For example, since the NewsDEN story "Two East Van youths open gym coffee bar with help from federal government" has a time-order (sequential) pattern, the central idea for the article is located at the top-center of the page and lines are drawn to boxes below this which contain the supporting details of the story.

Next, subjects were instructed to read the information presented in each Story-At-A-Glance dialogue box. While students were reading the Story-At-A-Glance maps, they were given a copy of the "More Info" section. Each "More Info" section contained definitions for the vocabulary from each NewsDEN article. Some of these were used as the basis for the NewsDEN vocabulary pre- and post-tests definitions. During the reading phase, students were also instructed to click on the hypertext links to the More Info section. The paper copies were provided to ensure that each subject had access to all of the vocabulary definitions (because there were three students at each computer terminal).

Once all of the subjects had received the More Info definitions, they were asked to map the vocabulary from the whiteboard onto their Story-At-A-Glance skeleton maps (using either blue or black ink). This was done as a whole class activity. At this time, the skeleton map, which was drawn on the whiteboard during the reading phase, was used as a model of how to connect the vocabulary items to the details on the Story-At-A-Glance skeleton maps.

After the subjects finished mapping these pre-reading vocabulary items, they were asked to map the vocabulary items from the More Info section onto their Story-At-A-Glance skeletons. For this phase, subjects were first given time to work individually and later given time to work with partners to create the semantic maps. For the words that the subjects thought they already knew (from the More Info section) they were again told to use either blue or black ink. For new vocabulary items, the subjects were told to use pencil or a different color of ink (e.g., red). This was done so that the new vocabulary items could quickly and easily be referred to when the subjects used their semantic maps to study these lexical items.

While creating their own unique maps, subjects were encouraged to ask each other and the researchers about concepts in the news articles, about difficult or new vocabulary items and about the mapping procedure. At the end of each mapping

session, subjects were asked to compare and discuss similarities and differences between their map and the semantic map of a member of a different group. Finally, they were told to take their semantic maps home and to study them for the upcoming NewsDEN vocabulary post-test. Table 3 outlines the semantic mapping procedure and shows the time spent on each phase.

Table 3
Semantic Mapping Procedure

Activity	Time Spent
1. Presentation and discussion of core question	5 minutes
2. Preview activity: look at the title of the NewsDEN article and picture; then discuss and map key words and phrases	5 minutes
3. Subjects read the article and look at glossed vocabulary in the More Info section	10 minutes
4. Subjects map vocabulary from the whiteboard onto the At-A-Glance skeleton maps	5 minutes
5. Subjects map vocabulary from the More Info Section individually	5 minutes
6. Subjects map vocabulary from the More Info section with their groups	5 minutes
7. Subjects compare their semantic map with the map of a student from another group. They make revisions to maps as appropriate.	5 minutes
Total	40 min.

The Survey/Question/Read/Recite/Review (SQ3R) Method

The SQ3R Method entailed five phases: 1) surveying the text, 2) questioning the text to gain a purpose for reading, 3) reading the text, 4) reciting (paraphrasing), and 5) reviewing (summarizing main ideas). The procedures used for the control group are outlined in Table 4.

Results

In brief, the results were as follows: 1) the experimental and treatment groups started off with the same vocabulary levels, as measured by the rank vocabulary levels pre-test scores; 2) both groups learned a significant amount of vocabulary, as measured by the mean scores of the NewsDEN Comprehension Tests; 3) the semantic mapping group's mean scores were higher, overall, than the SQ3R groups' mean scores on the NewsDEN Comprehension Tests; and 4) neither groups' rank level scores on Nation's Vocabulary Levels Post-test significantly increased.

Table 4
The SQ3R Procedure

Activity	Time Spent
1. *Survey Phase*: Looking at the title of the NewsDEN article and picture; noticing bolded, italicized and underlined words; skimming the introductory and concluding paragraphs	3 minutes
2. *Survey Phase*: Writing "What I Already Know"	3 minutes
3. *Question Phase:* Turning the title of the story into a Purpose Question; writing the purpose question on the SQ3R handout	2 minutes
4. *Question Phase:* Sharing the purpose questions with the class	7 minutes
5. *Reading Phase:* Reading	10 minutes
6. *Reading Phase:* Discussing the answers to the purpose questions	5 minutes
7. *Recitation Phase*: Paraphrasing the story alone	5 minutes
8. *Recitation Phase*: Comparing the paraphrase with a partner	3 minutes
9. *Review Phase:* Summarizing in their own words	2 minutes
Total	40 min.

Discussion

The most important findings of this study are related to the learning effect and the method effect.

The Learning Effect

Since both instructional groups received instruction via active learning techniques, it is possible that it was the active learning techniques that led to the statistically significant *learning effect*.

However, two other important factors need to be considered when interpreting these results. The first relates to the nature of the vocabulary instruments. Lui and Nation (1985) report that nouns and verbs are the easiest lexical items to learn and adjectives and adverbs are among the most difficult. An analysis of the vocabulary items on the NewsDEN comprehension tests reveals that fully fifty percent (50%) of the target words were nouns and twenty-five percent (25%) were verbs (20% were adjectives and 5% were idiomatic expressions). Thus, it seems that one reason both groups learned a significant amount of the target vocabulary may be the high probability that the subjects had little difficulty in acquiring a large proportion of the words. That is, subjects may have had little difficulty learning the low-frequency nouns and verbs through incidental exposure to these words in the contexts that they were presented in.

Nation's findings lead the researcher to speculate that a higher percentage of more "difficult" words (e.g., adjectives and adverbs) should have made up the majority of the target vocabulary on the comprehension test instruments. In other

words, it may be that adjectives and adverbs are more difficult to acquire through incidental exposure. This invites empirical testing.

Another factor that needs to be addressed when interpreting the *learning effect* result is the fact that *both* groups received extensive instruction in the reading strategy of guessing vocabulary from context. To be specific, the context clues that were taught were: 1) definition, 2) example-illustration, 3) contrast, 4) logic, 5) Latin and Greek word parts, 6) grammar, and 7) punctuation. Not only were these subskills taught and practiced, but the NewsDEN pre- and post-tests were explicitly designed so that the subjects could make use of guessing vocabulary from contextual clues. Furthermore, subjects in both instructional groups were encouraged to use these skills when taking the comprehension tests. This leads to the speculation that even if the students did not actually know the target words, they may have made use of their guessing from context skills in order to obtain significantly higher post-test scores.

If this study were to be repeated, it would perhaps be wise to include an experimental group which received no explicit instruction in guessing from context. This data would potentially clarify the question of whether instruction in the use of contextual clues led to this result.

The Method Effect

On the surface, the result that subjects who received the semantic mapping treatment did not acquire a greater amount of vocabulary seems to suggest that instruction in semantic mapping techniques (and in the phonological aspects of words) does not facilitate greater lexical acquisition than do methods which do not explicitly teach these aspects of words. Therefore, the present study does not appear to support Channell's (1988) claim that associations which are both phonological and semantic will be most beneficial in facilitating the long term comprehension of new vocabulary. In other words, the results seem to indicate that direct vocabulary instruction using the semantic mapping method (with its emphasis on the semantic and phonological features of words) is not more time-efficient than incidental vocabulary learning methods with upper-intermediate L2 learners.

However, these findings are consistent with Underwood's (1969) assertion that acoustic features of words are less important for storage in memory when the meaningfulness of the words is great for non-beginners. In addition, the results do not appear to provide clear support for Henning's (1974) findings that learners in the intermediate stages of language acquisition store words according to their meanings rather than according to their phonological features.

However, before making any strong conclusions about this result in comparison to other bodies of evidence, it is appropriate to first examine the nature of similarities between the semantic mapping and the SQ3R methods.

In regard to similarities between the instructional methods, the result of no significant *method effect* could have been obtained because the SQ3R method was not a purely passive reading method. In other words, subjects in the SQ3R group received reading instruction using active learning techniques not via purely passive reading instruction. While any semantic and phonological associations made by subjects in the control group were due to incidental exposure to the target NewsDEN vocabulary, it may be that the SQ3R group had a sufficient number of exposures to the various features of these new words to have acquired them.

As mentioned above, both groups received instruction in active learning methods in an integrated-skills framework. Thus, all subjects were required to engage in speaking, listening, reading and writing tasks to acquire the lexical items. Therefore, it may be that the use of an integrated skills approach in which subjects are exposed to the target vocabulary and required to use the various skills may be sufficient to have increased their receptive knowledge of the NewsDEN vocabulary.

Another factor may have been that the independent variable of phonological awareness was not sufficiently controlled for in the SQ3R group. The researcher observed that during the SQ3R treatment, students verbally asked each other the meanings of unknown words and how to pronounce them. Thus, the control group *did* have practice using the phonological aspects of the target vocabulary. Thus, this incidental exposure to the target vocabulary may have also contributed to this result.

In addition to the insufficiently controlled for variable of phonological awareness, it seems likely that the independent variable of learning semantic associations was not sufficiently controlled because of the decision to use the SQ3R method. That is, one important component in the SQ3R treatment is to have students practice making connections with what they know about the content of the reading materials. The subjects were asked to make a number of associations verbally and in writing. In other words, the control group *did* spend a large amount of time making semantic connections with the target vocabulary. Thus, even though the control group did not receive the semantic mapping treatment, they were given direct vocabulary instruction in learning the semantic and phonological aspects of the target vocabulary. Given these considerations, it seems that a replication of the present study with a purely passive reading method would be more likely to produce the expected result of a significant *method effect* (Note: A *purely passive reading method* is one in which students are given a text to read; they are not supplied with any reading or vocabulary instruction). This speculation invites further empirical testing.

One final factor that needs to be addressed when interpreting this result is the problem of having a low number of subjects in the control group. In order to get a normal distribution, the minimum number of subjects needed in a given group is thirty. Thus, because of the small sample size of the control group, it is quite possible that this result could have been different if there had been at least 30 subjects. Therefore, the fact that there were only twelve (12) subjects in the control group lessens the generalizability of this finding. This suggests that the results need to be verified by further study.

Implications for Teaching Academic ESL/EFL
Primary Implication

The study suggests that the use of direct vocabulary instruction using the semantic mapping method (with its focus on phonological instruction and semantic association training) does not, *in and of itself,* appear to be more efficient at helping upper-intermediate L2 readers to rapidly increase the size of their vocabulary. After all, the SQ3R method, which did not include these components, was found to be equally effective. Since both groups learned a significant amount of the target vocabulary, the primary implication of this study for teachers who teach English to

academic ESL students is that they should teach vocabulary using active learning methods in an integrated-skills framework.

Other Implications: The Importance of Context

Another contribution that this study attempts to make relates to the learning of vocabulary using context. Judd (1978) says that most L2 instructors agree that vocabulary should be taught in context and that context is essential in interpreting the meaning of a word. However, the bulk of the experimental literature indicates that vocabulary is not best learned in context initially. For this reason, Nation (1982) reveals that nearly all experiments which compare learning vocabulary in context to learning word pairs "have not produced results which favour learning in context" (p. 24). Nation (1982) takes Judd's argument one step further and says that it is not enough to simply teach target vocabulary in just one context. Nation argues that words should be presented in a "number of different contexts" in order to help the learners grasp their full meaning (p. 22).

In the present experiment, students in both instructional groups were given extensive instruction and practice with using contextual clues to guess the meanings of the target NewsDEN vocabulary. Thus, since there was a significant *learning effect* for both groups, the results of this study add weight to the notion that teaching upper-intermediate academic ESL students to learn new vocabulary by using context clues is perhaps the most efficient way to rapidly expand academic ESL students' vocabulary.

Final Implications: The Importance of CAI

The final contribution this study has made to the field of academic ESL instruction is related to the use of computer-assisted instructional (CAI) methods.

Recently, there has been much debate over whether the use of CAI methods to teach reading and vocabulary is as efficient as traditional teaching methods (Schreck & Schreck, 1991). To many teachers of ESL, computer-assisted instruction has been a great challenge and disappointment. Rather than develop effective educational approaches which might be enhanced by computers, the trend has been just the opposite. IT has often stood in the way of effective vocabulary instruction due to poorly designed software and ineffective methodologies (Schreck & Schreck, 1991).

Information Technology need not stand in the way of effective language instruction. The results of this study show that semantic mapping and CAI/IT methods are truly effective for rapid vocabulary expansion. Moreover, since the semantic mapping method was as effective as the traditional paper and pen method, it can be deduced that professional language educators have a responsibility to incorporate similar methods into their EFL/ESL courses.

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