

## **Innovative versus Traditional Approaches to L2 Vocabulary Acquisition: Examining Effects of Vocabulary Glossing and Organizing upon Rates of Learning and Retention**

### **Abstract:**

There have been various debates over what types of target word presentation facilitate versus interfere with learning and retention. Nation (2000) reviewed some of these in his article on "Learning Vocabulary in Lexical Sets: Dangers and Guidelines." One must consider not only types of word relationships however, but also the learner's age and level of language proficiency or sophistication, before making any blanket statements about what type of instructional presentation may or may not be beneficial for them, rather than causing linguistic interference. For more advanced learners such as those in this study, more highly organized texts are generally easier to understand and remember. While this is true in the area of reading comprehension, it is not clear whether having lists of target words pre-organized into semantic field sets under common conceptual "Keywords" aids in their learning and retention. In the fields of ESL/EFL education it is also unclear to what degree having bilingualized glosses available helps or hinders in the learning of target vocabulary, in particular for intermediate level adult learners. To better examine and distinguish between these two yet unclear areas, this study was undertaken.

### **1) Introduction**

How can one help language learners to build up a large target language (TL) vocabulary quickly, especially those who intend to do further academic or technical study and work in English? Since building learners' understanding of word meanings is so crucial to any other language development, more effective CALL-facilitated approaches are needed to help teach students how to systematically and successfully process and use new target language EAP/ESP vocabulary as rapidly as possible. This article proposes several evaluative and instructional tools and procedures, by which both L1 and L2 vocabulary assessment and instruction can be made more accessible and understandable by using them within a simple, yet all-encompassing model of second language vocabulary acquisition (SLVA).

The following study examines the relative contributions made by presenting target terms along with bilingual glosses and/or in pre-organized, similar or synonymous semantic field sets. Target words were presented and three kinds of vocabulary teaching and testing conditions were examined in three treatments (with all students being exposed to each method alternatively) as follows: A. Treatment Group A (Bilingualized, Pre-Organized Glosses), B. Treatment Group B (Random Bilingualized Gloss, Unsorted), and C. Random Control Group C (Monolingual target terms/L2 Only Condition). Results were expected to show any effects of increased cognitive processing required on the one hand, or of improved structuring of the L2 lexicon, as physically pre-organized words should be reflected in better organization and memory retention by the L2 mental lexicons of learners when using this latter approach. In order to examine whether this expected hypothesis would in fact turn out to be the case for these Japanese engineering college freshmen this study was done. The conclusions were expected to help shed light on the effects of

increased or deeper cognitive processing required in students having to search out meanings (whether L1 or L2) on their own, versus that required when having to organize new terms physically and cognitively into proper categories by related “Semantic Field Keyword Groups.”

Language and vocabulary learning seems to have four major aspects, each of which could perhaps be taught and assessed separately in order to better understand these processes more fully: 1) Discovery or Recognition of new or repeated information about word forms or meanings, 2) Consolidation or Integration of new information with old, 3) Prediction of particular word forms/sounds and meanings appropriate in given contexts, and 4) Production, consisting first of copied reproduction and later of original generation (Allen & Allen, 1976; Author, 1996). In simpler terms, vocabulary learning strategies (VLS) have been divided into these first two types by Schmitt (1997), although *more active production and prediction should be encouraged*. Guessing unknown word meanings is a most appropriate strategy to use when trying to anticipate appropriate words, structures and meanings as one is attempting to decode and comprehend any text. A useful metacognitive map of major essential phases of lexical processing has been given elsewhere, using a Depth of Lexical Processing Scale (Author, 2002a, 2005a) or recycling taxonomy to help make vocabulary learning more systematic and effective.

Previous findings can help us to better structure vocabulary study in ways that are more natural and effective for our students. As Moras (2001, p. 2) points out, “Research suggests that our ‘mental lexicon’ is highly organised and efficient, and that semantically related items are stored together. Word frequency is another factor that affects storage, as the most frequently used items are easier to retrieve. We can use this information to attempt to facilitate the learning process, by grouping items of vocabulary into semantic fields, such as topics (e.g. types of fruit).” This seems to indicate that the Semantic Field Keyword Approach first proposed and tested by Crow and Quigley (1985), and Quigley (1986), and made bilingual and computerized by this writer (Author, 2004a, 2004b) would also be one such method that helps to facilitate the mind’s natural storage procedures by using associative memory networks to group new target terms together under simpler, common core concepts called “Semantic Field Keywords.”

## 2) A Three-Dimensional View of Vocabulary Knowledge Acquisition and Assessment

To date most theories of SLVA have viewed vocabulary knowledge as being made up of two dichotomies of *receptive versus productive* ability, as well as a combination of growth in either *quantity or quality*. However, perhaps this dichotomous view itself is too narrow an oversimplification. Let us suppose that rather than vocabulary knowledge consisting of merely two flat dimensions of *size and depth*, there is another dimension that has been overlooked and confounded with other aspects of quality? If we were to define *quality of vocabulary knowledge* simply as “the variety and richness of information, meanings and aspects one knows about a particular word and its usages,” there is yet another aspect of word knowledge that should be disambiguated for separate attention, analysis and instruction. That is the aspect of *structure of the mental lexicon*, in other words, the *degree of organization* or *how well words are organized* within either L1 or L2 mental lexicons. Suppose we call this distinct aspect the *degree of structure* (DOS for short) or *degree of organization* one uses when encountering new target language terms.

Just as there are three states of matter--solid, liquid and gas--so too there also seem to be three major dimensions of vocabulary knowledge. These three aspects are 1) Vocabulary Size—also known as *Breadth* of one’s word knowledge, or *Quantity* of words known in a particular language, or specific field of knowledge; 2) Vocabulary Depth—also known as *Richness or Quality* of knowledge about particular words or phrases; and 3) Degree of Organization—meaning how well structured one’s vocabulary knowledge (both L1 and L2 mental lexicons) and vocabulary learning are, including one’s vocabulary learning procedures and how systematic versus random these steps, skills and strategies are. Just as Physics can measure changes in the temperature, pressure and density of water in each of its three respective states, so too a more scientific approach to SLVA would seek and enable us to measure changes within each of these three realms of vocabulary knowledge, seeking better explanatory theories with better predictive value as to how L1 and L2 vocabulary develops, both within and between their respective mental lexicons, whether receptive or productive. As phonological, morphological, semantic and syntactic understandings develop in learners, just how these domains relate and build upon one another--to form longer-term networks of mental associations, and how specific teaching and learning strategies and practices can better foster accurate retention and use--should be a major focus of SLVA research in this 21<sup>st</sup> century.

### 3) Literature Review

While various studies seem to show that learning related words in sets may cause interference for beginning level learners, this does not seem to be the case for learning by more advanced, especially adult students. Nation (2000, p. 6) acknowledges that “As learners’ knowledge becomes more established, seeing related words in sets can have a more positive effect.” Although many college and adult users of English have learnt most of the basic structures of the language, a majority of Japanese learners at least need to broaden their vocabulary to express themselves more clearly and appropriately in a wider range of situations. Both language learners’ *receptive understanding vocabulary* (meaning terms whose meanings they can recognise in reading or listening contexts), and even more-so their *productive use vocabulary* is generally still in need of much better testing to enable better development (see Author, 2002d, 2003d).

Merely incidental, indirect teaching of vocabulary (which assumed that vocabulary expansion would happen by practicing other language skills) has been shown to be too incremental and therefore insufficient to ensure needed vocabulary expansion. Vocabulary researchers (e.g. Laufer, 1997; Coady, 1997) generally acknowledge that strategies such as incidental learning and guessing at meanings from context are strategies that may only work for more advanced learners. Acknowledging that guessing correct meanings from context is a complex and difficult task, Hunt and Beglar (1998, p. 9) note that naturally “more proficient learners using texts that are not overly difficult can be expected to use this strategy more effectively than low proficiency learners,” which even most Japanese college students still are, as the vocabulary and reading test results below will amply show. In their words (p. 9), “To guess successfully from context learners need to know about 19 out of every 20 words (95%) of a text, which requires knowledge of the 3,000 most common words (Liu & Nation, 1985; Nation, 1990).”

Nowadays it is widely accepted that vocabulary teaching should be part of the syllabus, and taught on a well-planned and regular basis. Some authors, led by Lewis’ Lexical Approach (1993, 1996) argue for vocabulary to be at the center of language teaching, since as he would say, language consists of grammaticalised lexis, not lexicalised grammar. Aspects of word knowledge that need to be considered when testing or teaching vocabulary include the following eleven areas based on Gairns and Redman’s (1986) work, summarized in Moras (2001):

1) *Boundaries between conceptual meaning*: knowing not only what lexis refers to, but also where the boundaries are that separate it from words of related meaning (e.g. cup, mug, bowl);  
 2) *Polysemy*: distinguishing between the various meanings of a single word form with several but closely related meanings (head: of a person, of a pin, of an organisation); 3) *Homonymy*: distinguishing between the various meanings of a single word form which has several meanings which are NOT closely related ( e.g. a file: used to put papers in or a tool); 4) *Homophony*: understanding words that have the same pronunciation but different spellings and meanings (e.g. flour, flower);  
 5) *Synonymy*: distinguishing between the different shades of meaning that synonymous words have (e.g. extend, increase, expand); 6) *Affective meaning*: distinguishing between the attitudinal and emotional factors (denotation and connotation), which depend on the speakers attitude or the situation. Socio-cultural associations of lexical items is another important factor; 7) *Style, register, dialect*: Being able to distinguish between different levels of formality, the effect of different contexts and topics, as well as differences in geographical variation; 8) *Translation*: awareness of certain differences and similarities between the native and the foreign language (e.g. false cognates);  
 9) *Chunks of language*: multi-word verbs, idioms, strong and weak collocations, lexical phrases;  
 10) *Grammar of vocabulary*: learning the rules that enable students to build up different forms of the word or even different words from that word (e.g. sleep, slept, sleeping; able, unable; disability); and  
 11) *Pronunciation*: ability to recognise and reproduce items in speech. (Online, p. 2)

12) A twelfth extremely important word sense that needs to be learned is a particular word's *level of frequency* and which meaning(s) is/are paramount and most common. A word also has particular attributes, common collocations and examples, some of which are noted by Schmitt (2000, Ch. 3, Figure 2 "Sense relations"). As he states (2000, p. 27) it is these most frequent, common core meaning features that determine a word's membership in a concept category. To actually determine a word's particular meaning or use it correctly, however, requires more knowledge of its *appropriate contexts for use*. To number 9 above we could add the description of "*Common Associations*," as collocations, colligations and common phrasal uses are. Schmitt (2000) also notes several of these sense relations of words, particularly *polysemy*, *synonymy*, *hyponymy* and *meronymy* in his discussion of the aspects of knowing a word, and how the core features of a concept become part of its central or core meaning. These are also what common, simpler keywords capture in the Semantic Field Keyword Approach (Crow, 1986a; Quigley, 1986; Author, 2004b). Schmitt (2000) also comments that encyclopaedic knowledge (which word knowledge is) requires some form of organization and control, and it is context that "sets the parameters of what actually reaches conscious thought. . . it limits what. . . knowledge is finally activated, and it fills in the gaps. . . for future use. . . Context is necessary to activate the full resources of word meanings." (p. 28).

Since context is so important for learners to be able to differentiate the nuances of word meanings heard or read receptively or used productively, clear vocabulary teaching and learning goals must be to do more than just cover so many words from a list. As Moras (2001) states: "We must use teaching

techniques that can help realise this global concept of what it means to know a lexical item. And we must also go beyond that, giving learners opportunities to use the items learnt and also helping them to use effective written storage systems” (p. 2, Online). Finkbeiner and Nicol (2003) also examined the effects of using semantic categories upon L2 word learning, finding that vocabulary presented in semantically grouped sets is often a more effective method of teaching them, as Author (2004a, 2004b) also found when using a CALL-enhanced Semantic Field Keyword Approach, made available to his students both online, on floppy disks and on paper. Their study asked students to learn 32 new L2 labels for concepts from four different semantic categories in either a related or unrelated condition, and then translate them on a test in both translation directions. However, this study only worked in the direction of the target language.

*To be able to do develop both receptive and productive L2 vocabulary, we propose that it is most useful for learners to be trained specifically in how to better structure their vocabulary learning strategies and input, as well as better organize the patterns within their own L2 mental lexicons.* To more thoroughly examine these two areas, we have done various studies of Japanese students’ patterns of VLS use and learning, and of the effects of using various methods such as the Semantic Field Keyword Approach and more productive, bilingualized, CALL-enhanced access to target vocabulary (see various author studies, Author, 1996; 1997a, 1997b; 2002-2005). This study is a part of that on-going effort to better isolate factors that can contribute to faster, more effective SLVA on the part of Japanese college students of EFL.

#### **4. Memory and Lexical Storage Organizational Systems**

Moras (2001) offers many good insights about how to build upon the natural processes and strengths of our minds’ memory storage system, in particular when seeking to strengthen the L2 mental lexicon. He writes that

Understanding how our memory works might help us create more effective ways to teach vocabulary. Research in the area, cited by Gairns (1986) offers us some insights into this process. It seems that learning new items involves storing them first in our short-term memory, and afterwards in long-term memory. . . there seems to be some important clues to consider. First, retention in short-term memory is not effective if the number of chunks of information exceeds seven. Therefore, this suggests that in a given class we should not aim at teaching more than this number. However, our long-term memory can hold any amount of information. (p. 2, Online)

Oxford (1990) suggests memory strategies to aid learning, and these can be divided into:

- 1) Strategies that aim to create mental linkages: grouping, associating, placing new words into a context;

- 2) Strategies that apply images and sounds: using imagery, semantic mapping, using keywords and representing sounds in memory; 3) Strategies that help learners to review well, in a structured way;
- 4) Strategies that employ actions: physical response or sensations, using mechanical techniques, such as TPR, Jazz Chants and rhythm, etc. Moras summarizes the use of helpful vocabulary learning strategies:

The techniques just mentioned can be used to greater advantage if we can diagnose learning style preferences (visual, aural, kinesthetic, tactile) and make students aware of different memory strategies. Meaningful tasks however seem to offer the best answer to vocabulary learning, as they rely on students' experiences and reality to facilitate learning. More meaningful tasks also require learners to analyse and process language more deeply, which should help them retain information in long-term memory. (Moras, 2001, Online, p. 2)

### **5) Methodology and Research Questions**

Essentially three core questions are being asked, namely:

- 1) How can we better measure how well learners organize their L2 mental lexicon storage structure, as well as their use of various vocabulary learning strategies?
- 2) Does bilingual glossing and/or pre-organizing of TL vocabulary interfere with or help to stimulate better learning and retention thereof?
- 3) When combined with "pushed output productive use" (abbreviated POP task), which of these three approaches to SLVA best stimulates language learners' depth of lexical processing and structuring, and as a logical consequence, appears to most greatly enhance their retention of target language vocabulary (TLV)?

Since there is no consensus yet on either the issue of what types of glossing or annotation (See recent studies by Akbulut, 2004) may be best for language students at which phases of their learning, nor about whether their depth of cognitive processing and retention is better enhanced when meanings are provided versus when they must work them out or look them up for themselves, this study is most relevant. It can help to shed more light on the difference which various types of glossing and degrees of organizing may have upon language learners' structuring and retention of new terms within their L2 mental lexicons.

This study aimed to find out to what degree the presence or absence of bilingual glosses and/or pre-organization of new vocabulary combined with a language learning task requiring productive output generation would enhance learners' retention of those new terms. Based on logical reasoning and prior

memory research one would expect more well-organized sets of new vocabulary to be learned with greater speed and better retention. To adequately examine this hypothesis one would need to measure each student's individual time on task as well as retention, to see which treatment was most effective in terms of both speed and retention. Thus the teacher measured students' times per treatment, asking them to use a stopwatch or clock as well to better confirm their respective speeds per method of vocabulary learning. Here a CALL environment would have had a great advantage if a vocabulary learning program were preset to record both each learner's time on task, as well as their accuracy and retention rates over time (as Laufer and Hill, 2000, demonstrated could be measured effectively with other vocabulary learning strategies).

Participants: An all-male freshmen class of Japanese engineering students was exposed to three instructional methods in turn, so that all members of the class were assessed by the same treatments alternatively, with 21 students in each treatment group, although only 18 also were present for the post-test. The material used to check on the degree to which they could organize more advanced English vocabulary into appropriate semantic sets was derived from Crow's (1986a) *Vocabulary for Advanced Reading Comprehension: The Keyword Approach*. Each of the units of that text contains 60 words. Three lists were chosen from a Science Unit, omitting ten of the easier words from each list to make three lists of 50 words each of equivalent difficulty. The Control Group was given these words as they are normally presented in textbooks, randomly without any particular glossing. New words are often met by such technical Japanese college students in lists or in technical journal contexts with no form of L1 or L2 glossing. The Treatment Groups (which both groups got to be alternatively as a "double blind study") on the other hand, were of two sorts. Treatment Group A was presented with fifty words that had all been both translated and pre-organized for them into related groups under common "Semantic Field Keywords" using the Semantic Field Keyword Approach (described in detail by Crow, 1985a; Quigley, 1986; Author, 2004a). Treatment Group B had full L1 glossing of target terms on random lists, but with no pre-organized categories.

Teaching and Testing Procedure: Two types of processing should be better distinguished by proper testing—namely, between the effects of increased or deeper cognitive processing required in students having to search out meanings (whether L1 or L2) on their own, versus that required in having to organize new terms physically and cognitively into proper categories by related Semantic Field Keyword

Groups. Three kinds of vocabulary teaching and testing conditions were examined as follows:

A. Treatment Group A (Bilingualized, Pre-Organized Glosses)—being given both full L1 glossing, with a Keyword acting as an L2 overall definition or simpler synonym, and organizational assistance with all target terms pre-organized by Semantic Field Keyword Groups;

B. Treatment Group B (Bilingualized Gloss, Unsorted Treatment)—being given full L1 glossing of target terms on random lists, but with no pre-organized categories. Results would be expected to show any effects of increased cognitive processing required on the one hand, or of improved structuring of the L2 lexicon, as physically pre-organized words should be reflected in better organization and memory retention by the L2 mental lexicons of learners when using this latter approach. In order to examine whether this expected hypothesis would in fact turn out to be the case for these Japanese engineering college freshmen this study was done.

C. Random Control Group C (L2 Only Condition)—was given words with neither L1 nor L2 glossing or prior organizational help, mirroring the purely incidental exposure of an Extensive Reading approach.

*Common Teaching/Study Procedure:* The common method of study students in all groups were told to follow included these four basic steps: 1) Define target terms, 2) Group/Structure them, 3) Use them in single or grouped sentences (using them in Semantic Sets was recommended for maximum efficiency), and 4) Test by sorting each group of 50 words studied (using each of these three methods) into appropriate Semantic Field Keyword Groups.

The Control Group (having neither structure nor glossing to help them) was told there were ten common keywords highlighted for them, and asked to organize the other 50 words under each of these common keywords appropriately using whatever dictionary they preferred, and then to use each word in a sentence showing the meaning of that word correctly. (Dictionaries preferred and used by each of these students, whether text, electronic or both, are noted and reported in detail in Author, 2004b, in press.) All three groups were asked to study the words and then given a “Pushed Output Production (POP)” task (described further in Swain, 1985, 1995; de la Fuente, 2002; and Author, 2004a), namely using each of them in an original sentence that would illustrate the meaning of the word. They were told they could

combine similar or synonymous words from common Semantic Field Keyword Groups into one sentence listing alternative target words, to save time and learn more words as quickly and efficiently as possible.

When students were in the Control Group Random, Unglossed Condition naturally more time would be required to access the meanings of new words and organize them appropriately. Treatment Groups had more time to study and use these words expressively in illustrative sentences. Nevertheless, results of using this procedure should show whether being given the meaning and/or organization of target terms would significantly reduce learners' cognitive processing of them, resulting in poorer retention, or whether on the contrary if being given rapid access to both of these aspects of vocabulary knowledge would instead help learners to process, acquire and retain target terms better. Lacking time for giving and assessing a Productive Recall Test, a Receptive Recognition and Structuring Test was given unannounced after one month, requiring learners to organize target terms learned by each treatment under proper keywords. Learning 150 words in 50 word units per week (target terms shown in Appendix) was done over three consecutive weeks to give time for all students using each condition to learn 50 words by each method to ensure the test's internal validity and objectivity. The object was to see how much better retention would be when students first had access to bilingual and/or pre-organized vocabulary using Semantic Field Keyword Sets, than when words were randomly encountered with no glossing or structuring assistance provided.

## 6. Results

Clearly the only factor differing between these three groups (Control vs. Treatments A & B, which all students were on alternative weeks) was the *method used when first meeting new target words*. Thus these results should be an accurate reflection of the difference made by the Treatment Groups either having to look up or access the meanings of new terms on their own, versus being given access to unsorted bilingual glosses only, or being given both bilingual glosses and pre-organized information about both Keywords and related Semantic Field Keyword groups to which these target terms belonged.

Scoring of Tasks: Four aspects of vocabulary learning were measured, two regarding speed and two regarding accuracy, as follows. For each of three Units of 50 words, these four aspects of vocabulary

learning were measured: 1) Time to Organize (TTO), 2) Time to Produce (TTP) original sentences using these target terms, 3) Accuracy of Organization into ten appropriate “Semantic Field” categories (under simpler common Keywords which were always given), and 4) Accuracy of Pushed Output Production (POP), or the overall correctness of student-generated sentences for these ten groups of words. Only ten example sentences were required for the productive measure. Students were encouraged to think of the entire Semantic Field of six words and leave a blank for the word they were illustrating, for which most or all of the target terms could be substituted. Scoring was checked for inter-rater reliability, with 98% agreement between assessors. Their common scale for scoring written output was as follows: Ten points per sentence x 10 Sentence Groups=100%. Article or spelling errors -1; Preposition errors, -2; Verb tense errors, -3; Total Correct: Grammar/Syntax=5 points; Correct Semantics/Meaning communicated=5 points. Naturally words presented with neither Semantic Field structure nor bilingual glosses took longer (almost twice as long) for students to organize, as shown for Groups C and B below, respectively. Average times taken to produce example sentences varied from about ten to seventeen minutes.

#### **Study Group Averages While Learning:**

##### **A. Unit 1-2 Bilingual, Pre-Organized Glosses:** (NA=Not Applicable for pre-organized word groups)

<u>Ave. Time to Organize</u>	<u>Time to Produce</u>	<u>SFKA Org Accuracy</u>	<u>POP Accuracy Rates</u>
NA	12.24'	NA	85.38%

When using a pre-organized condition in which the 50 target words were presented with bilingual glosses, students averaged just 12.24' to produce ten sentence examples using them. Their accuracy on sentences produced was 85.38%, the best of all three methods for production while learning, but second best on the post-test that required learners to organize these target words into proper Semantic Fields.

##### **B. Unit 1-3 Bilingualized Gloss, Unsorted Treatments:**

<u>Ave. Time to Organize</u>	<u>Time to Produce</u>	<u>SFKA Org Accuracy</u>	<u>POP Accuracy Rates</u>
21.86'	16.72'	95.74%	80.32%

When using a random, glossed treatment, students averaged 21.85' to organize these 50 target words, and 16.72' to produce sentences using them. Their accuracy in organizing them was best using this

method at 95.74%, whereas accuracy in using them correctly in sentences was 80.32%. These provide two measures of structural ability, the first of semantic organizational ability, and the latter being a combined measure of both their syntactical and productive vocabulary ability, as shown in whole sentence use. As expected, *they could organize words under appropriate Semantic Field categories an average of 16 minutes faster using this method versus without glosses, organizing them with 5% better accuracy than when met in an unglossed condition.* Averaging these two organizational measures together, we could say that the Random Bilingualized condition produced an average total organizational score of 88.05%.

**C. Unit 1-1 Random Control Group (L2 Only): (Both Unglossed & Unstructured)**

<u>Ave. Time to Organize</u>	<u>Time to Produce</u>	<u>SFKA Org Accuracy</u>	<u>POP Accuracy Rates</u>
37.39'	10.64'	90.67%	81.28%

**D. Total Overall Averages When Learning:**

- 1) Average Time to Organize: 29.30'
- 2) Average Time to Produce: 16.63'
- 3) Average Accuracy in Organizing into Semantic Fields: 90.67%
- 4) Average Accuracy in Pushed Output Production: 82.12%

Under the Control Treatment, students met new words in a random condition (meaning both unstructured and unglossed), receiving 50 target words listed only in the target language. Semantic Field Keywords were given as an aid to their language organizing task. In this condition learners took an average of 37.39' to organize all 50 words under proper Semantic Field categories, doing so in an average of 9.46' with 90.67% accuracy. Their "Pushed Output Production" (POP) rate of accuracy was 81.28%, and all productive scores were checked by two native teachers, with 98% agreement on productive ratings. While taking twice as long as expected to organize these words, two learners failed to even produce any sentences. Nevertheless, on average this method was the second best for both total organizational accuracy as well as "Pushed Output Productive" accuracy. This can be attributed to the much greater amount of cognitive

processing and time required when using this method, expected results in keeping with the so-called “Depth of Processing Hypothesis” ( Craik & Lockhart, 1972; Craik & Tulving, 1975; Author, 2005).

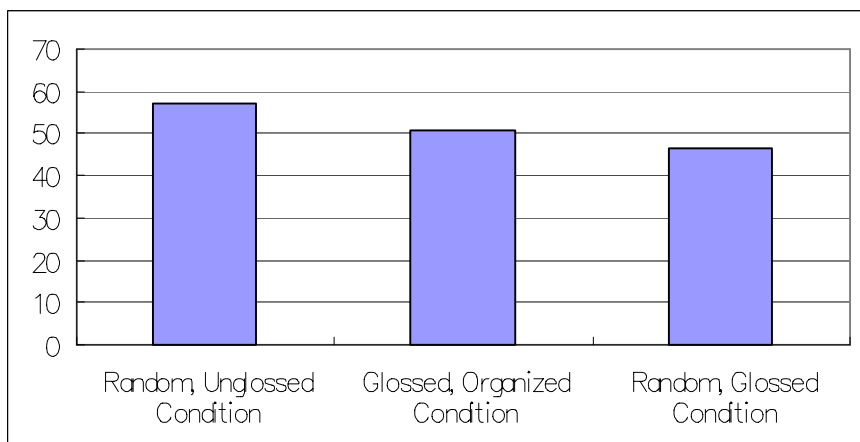
### 7) Individual Scores and Group Averages on Post-Tests of Vocabulary Learning Retention

Students used all three methods to learn 150 target words, presented in groups of 50 words per method. These were the results on a post-test of retention given at the end of one month of instruction and practice. The average time taken for students to organize target terms under all 30 semantic field categories (ten fields were used per instructional treatment) was 64.28 minutes, done with only 51.48% accuracy, showing how difficult and unfamiliar the level of these words was for the majority of these students. When comparing the post-test results of retention for each of the three learning methods used, averages were as follows (See Table 4 for more complete details).

**Table 1: Overall Average Retention Results on Post-Test:**

Unit 1-1	Unit 1-2	Unit 1-3	Accuracy	Average TTO**
57.33%	50.56%	46.56%	51.48%	64.28'
1 <sup>st</sup> (Best)	2 <sup>nd</sup> Best	3 <sup>rd</sup> Best	Total Average	
<b>Random, Unglossed Condition</b>	<b>Glossed, Organized Condition</b>	<b>Random, Glossed Condition</b>	for Organizing target terms into Semantic Fields	TTO=Time to organize terms
Most Processing	Least DLP	Medium DLP		
Required (DLP*)	Required	Required		
No Gloss/Structure	Glosses and (Structure aid	Gloss/No Structure		
Best Retention	Retention)	Weakest		

\*DLP=Depth of Lexical Processing, cognitive or communicative elaboration required



**Figure 1: Graph Comparing Overall Average Retention Results on Post-Test**

**Retention results**—as shown in the above graph were best for the fifty words learned in Unit 1-1, when using a “Random, Unglossed Condition,” at 57.33% retention. This must be attributed to the fact that exposure to new terms with neither structure nor glossing assistance provided forces students to do the most cognitive processing on their own. The second best method resulting in 50.56% retention proved to be a “Glossed, Pre- organized Condition, which required the least amount of independent processing. Yet contrary to a uniform interpretation of the Depth of Processing Hypothesis, less processing did not result in the lowest level of retention. To understand why, one must examine the third treatment method.

The lowest level of retention, at 46.56% for Unit 1-3 terms, was obtained when students were learning new terms using a “Random, Glossed Condition.” Such a treatment would require a medium amount of processing, since words were not pre-organized, but only glossed. This condition resulted in the weakest amount of retention, one can surmise, because the learning was not correctly sequenced for such language learners, who were below a junior high level of vocabulary or reading comprehension proficiency (averaging U.S. 4.5 grade level, Table 4). Naturally having so many unknown words to learn and organize would result in a frustration level of reading if these terms had been met in reading contexts, instead of in learning lists, since 99% of the words should ideally be already known for independent, extensive reading, where not more than 1/20 or 5% of a text’s target words should be new in order to keep comprehension tasks below a frustration level (Ekwall, 1976; Author, 1994; Nation, 2001). Bilingual glossing seems to

have been an unnecessary crutch in this case, keeping students from more deeply processing new word meanings on their own, a very necessary and important step in SLVA, as shown by this study.

### 8) Statistical Analysis of Results

The range of difference in average retention for these three methods of learning new vocabulary was quite sizeable, and the same students were exposed to all three methods to learn fifty words each (shown in Table 4 Post-tests), resulting in a fairly extensive test with good internal controls and broader implications for vocabulary instruction than many shorter tests can give. *Specifically, these results support the Depth of [Lexical] Processing Hypothesis, showing that when more independent lexical processing is required, more target terms tend to be retained.*

Statistically, the difference in retention between Treatments A and B was significant at  $p < .05$ , and also between Treatments A and C, at  $p < .001$ . In other words, target terms learned in a “Random, Unglossed Condition” were retained at a significantly higher rate than either those learned using a “Glossed, Organized Condition,” or when using a “Random, Glossed Condition.” When comparing learning treatments B and C, both were glossed, but terms learned via Treatment B, a “Glossed, Organized Condition” were retained better (50.56%) than those learned under Treatment C (46.56%), when glossed terms were presented randomly, although for these higher level students the difference was not significant.

**Table 2: ANNOVA for Three Vocabulary Learning Conditions**

<b>1-R FACTOR 1</b>	<b>df</b>	<b>MS</b>	<b>df</b>	<b>MS</b>			
Factorial Analysis (l. sta)	Effect	Effect	Ave Error	Ave Error	F	p-value	
<b>1</b>		<b>2</b>	<b>534.2963</b>	<b>34</b>	<b>57.66885</b>	<b>9.264904</b>	<b>0.000614</b>
F(2,34)=9.26; p<.0006							
<b>LEARNING</b>	<b>Average:</b>						
<b>CONDITION:</b>							
Random, Unglossed Condition	57.33333						
Glossed, Organized Condition	50.55556						
Random, Glossed Condition	46.55556						
LSD Test.Variables Var. 1 (l. sta)							
<b>Conditions:</b>	R FACTOR 1per Treatment	A	B	C			
<b>Degree of Significance</b>		Glossed, Organized Condition	Random, Glossed Condition	Random, Unglossed Condition			

<b>Averages:</b>	50.55556	46.55556	57.33333
Random, Unglossed	0.011336	0.000154	
Glossed, Organized		0.123322	

\* Using Fischer's Least Significant Difference Test

## 9) Discussion

A. Treatment A Group (Bilingualized, Pre-Organized Glosses)—Under this learning condition students were given both full L1 glossing, with a Keyword acting as an L2 overall definition or simpler synonym, and organizational assistance with all target terms pre-organized by Semantic Field Keyword Groups.

B. Treatment B Group (Bilingualized Gloss, Unsorted Treatment)—Learners were given full L1 glossing of target terms on random lists, but with no pre-organized categories. One would expect the effects of increased cognitive processing required to be shown in the results, or of improved structuring of the L2 lexicon, as physically pre-organized words should be reflected in better organization and memory retention by the L2 mental lexicons of learners when using this latter approach. In order to examine whether this expected hypothesis would apply to these Japanese college engineering freshmen, this study was done.

C. Random Control Group C--In this L2 Only Condition, words were given with neither L1 nor L2 glossing nor prior organizational help, mirroring the purely incidental exposure typical of Extensive Reading. The Keywords of ten Semantic Field Groups were given, however, to save time and avoid any possible confusion over which was the simplest core concept Keyword. Although words presented randomly only in the target language would require the greatest amount of cognitive and lexical processing, including accessing their meanings, archiving or recording them, and then associating them into appropriate Semantic Field Groups, this study aimed to find out if other factors may be more important in learning foreign language vocabulary than simply using a larger number of steps or greater depth of cognitive processing.

Other highly important vocabulary learning factors that appear to influence and facilitate SLVA as suggested by this study include: 1) type of glosses available, 2) degree of prior organization of target

vocabulary, 3) degree of productive activation required, and 4) amount of socially interactive or communicative activation required. This latter category would include having students use a variety of real language tasks in which target vocabulary had to be recycled, such as in writing questions, oral interviewing, retelling, dramatic skits, story-boarding, illustrating target terms using manual or computer art, etc. Contrary to what one might normally expect, clearly the most effective means of vocabulary learning for these Japanese engineering students was the method that required the greatest depth of lexical processing (DLP). When 50 words were presented randomly, with neither bilingual glosses nor any structure being given (only simpler Keywords), learners were forced to process them on their own, before they could put them into proper Semantic Field categories. Yet this “Random, Unglossed Treatment” had the highest average retention among all methods used, at 57.33%.

Second highest average retention was for the “Pre-Organized, Glossed Treatment” at 50.55%, showing that when learners are given a “Semantic Field Network” structure, it does appear to aid them in their learning and long-term retention. Third and lowest in terms of effectiveness (at 46.55%) among these three methods used was the “Random Glossed Treatment,” in which words were presented bilingually, but in no particular order. This is somewhat counter-intuitive and surprising, since many ESL/EFL teachers especially in Asia think that their learners need to be given most new words or sentences in translation to be able to learn them. What these findings seem to show is that for intermediate and more advanced learners at least, (such as these Japanese college engineering students), *minimal organization provided by simpler common concepts and Semantic Field Keywords may be best* (as the author recommended in previous studies, Author 2004a, 2004b). This is because *when greater mental effort is required, more active learning and retention tend to take place, once again supporting the Deeper Lexical Processing Hypothesis* (Author, 2005). This Depth-of-Processing (DOP) hypothesis ( Craik & Lockhart, 1972) states that “‘deeper’ analysis of a stimulus (with ‘depth’ referring to a greater degree of semantic involvement [or elaboration]) leads to better long-term memory retention” (Segler, Pain, and Sorace, 2001, p. 2).

These findings need to be more widely recognized in countries where passive learning using an over-abundance of the old-fashioned “Translation Method” (or *yaku doku* in Japanese) is still far too dominant, probably largely accounting for these countries’ lower average TOEFL scores and limited

vocabulary levels (Author, 1996, 1997, 2002d, 2003d). The main problem with most traditional English instruction in Japan has been the use of the so-called *yakudoku* or 'Grammar-Translation method," which means reading English with direct translation into Japanese after each sentence. This of course prevents the student from ever having to think, much less speak naturally in English.

Most college teachers in Japan, whether native English speakers or Japanese have by now recognized the educational fallacies of this old, outdated direct 'Grammar-Translation' linguistic method. Yet they continue to inherit students graduating from Japanese junior and senior high schools, where teachers are still generally quite traditional in their approach to English language education, described by Wharton (1986: 19) "Very little time was spent in using the language for free communication of student thoughts, a limitation which virtually guaranteed that the students would have tremendous difficulty ever using the target language for anything but more tedious translation. Thankfully, 'grammar translation' is no longer the method of choice for the learning of English in more progressive Japanese public schools. While better public schools have finally moved on to a more modern communicative method, often even employing native teachers for at least a weekly class of "Live English" for most students, methods of presenting and studying vocabulary have still been very slow to change. Clearer direction is needed.

#### **10) Conclusions and Areas for Further Research**

Based on the findings above, it can now be asserted that those language learners in this study who exhibited more systematic vocabulary learning behaviors were also more likely to be more highly structured learners, whose L2 mental lexicons would in turn tend to be more well-organized. We may conclude that due to more disciplined study, thought and retention patterns (things well-organized tend to be better remembered, as we all know), more highly structured learners would also tend to become more proficient at a faster pace. When we compare these learners' aspects of vocabulary size, depth of processing and degree of organization with their pre- and post-vocabulary levels these conclusions appear to be well-supported. In other words, more highly proficient learners were also those who reported using more VLS, had a larger vocabulary size, processed new target vocabulary more deeply and thoroughly, and

also reported using a greater quantity and quality of electronic dictionary functions (reported in detail in related studies by Author, 2004a, 2004b, 2004c).

A future agenda for SLVA researchers should specifically and thoroughly address such questions of applied linguistics as these, as well as the research questions mentioned above:

- 1) How can we better teach and assess each of these essential aspects of vocabulary knowledge?
- 2) How can learners better organize their SLVA and VLS so that better retention will take place, and in turn better receptive understanding and productive use will be fostered?
- 3) How can the innovations of CALL be used to help maximize this process of SLVA? (Author, 2005a)
- 4) Do language learners in general who more deeply process new terms with more systematic and highly structured habits of vocabulary learning--as measured by instruments such as Vocabulary Knowledge Scales (Author, 2005d), Depth of Lexical Processing Scales (Author, 2005a), and Vocabulary Learning Strategies Taxonomies and Typologies (Author, 2005c)--have correspondingly higher rates of a) TL vocabulary learning, b) retrieving, and c) speed of recall, as was shown to be the case in this limited study of upper intermediate proficiency level engineering students? If so, how can we use CALL to better mimic, mirror and reflect these most effective strategies (VLS) to other language learners, to help them likewise improve their SLVA by using similarly successful systematic approaches and strategies to vocabulary learning?

### **11) Pedagogical Implications and Recommendations**

Implications for language and vocabulary learning from this study include the following:

- 1) Students seem to benefit most from a format in which they first are shown how to associate new words by using pre-organized sets of words. While such an approach can help them to rapidly expand their receptive vocabulary, as studies by Crow (1986a, 1986b), Quigley (1986), and the Author (2004) have shown, other approaches are needed to strengthen learners' productive use of these words. Although Finkbeiner and Nicol (2003) claim to have found some degree of "semantic interference effect both during the encoding of information into memory & during the retrieval of information in translation" (Online Abstract), their learners were translating words in both directions, which was not encouraged in this study that rather emphasized learning to organize, remember and use target words within related word groups

organized under common Semantic Field Keywords. These definitely seem to greatly help language learners to better structure and retain new terms within their own mental lexicons.

2) Rather than pre-organizing all words into Semantic Sets that are just studied in a rote fashion, students need activities in which they must manipulate and reformulate target words by reorganizing them, and elaborate upon them in sentences of their own, which they should be encouraged to use in both written and oral expression, such as by using pair interviews in the “Pushed Output Production” method advocated here and elsewhere (Author, 2004), to better improve understanding and long-term retention of target terms.

3) Rapid access to bilingual and/or monolingual glosses by the use of electronic dictionaries (EDs, used by about half (47.62% of these students) greatly enhances the speed at which students can process, organize, study and learn new terms. Much time is saved that they can use more productively in both senses, giving them added chances to actively use target terms in written statements, stories or questions for oral interviews with conversation partners. Ten out of twenty-one or 47.62% of these students were using electronic dictionaries when first surveyed at the start of this course. This showed a marked improvement in the use of electronic dictionaries over the past two years, when similar studies (by Author, 2001a, 2001b, 2001c; 2002a, 2002b) at the same school showed only 14% of students at this level using such devices. Further study of this group of Japanese college students’ use of various text and electronic lexicons compared their relative benefits to these engineering EFL students for gaining skill in receptive understanding as compared with productive use (see Author, 2005c for results).

4) All eight of the essential cognitive phases included in the author’s Depth of Lexical Processing Scale (Author 2005a) have also been incorporated into a more detailed Survey of Electronic Dictionary Use (Author, 2005d) as well, which can assist both learners and researchers in better monitoring students’ vocabulary learning when using computerized devices. Online computer adaptive testing (CAT) should include how well each of these computerized lexical processing functions are being used or found useful to learners, how long they spend employing particular features for individual study versus communicative use, as well as how enjoyable and effective their use is in terms of long-term retention and both receptive and productive vocabulary development.

Good vocabulary tests, as Schmitt (2000: 171) characterizes them, are those that can give us a good amount and quality of vocabulary “knowledge information in a time-efficient and verifiable manner.”

*The three tools discussed just above in this overview can help to provide a more three-dimensional view of the development of L2 vocabulary knowledge of new word forms, meanings and uses, as learners grow both in their receptive understanding and productive usability of new target terms. More refined and CALL-enhanced assessment tools are needed to assess learners' growth in quantity, quality and degree of structure in their L2 mental lexicon and degree of systematic use of vocabulary learning strategies, skills and tools.*

Bottom line conclusions and vocabulary learning principles can now be proposed for further research. Pedagogical and research implications for Second Language Vocabulary Acquisition that flow from examining these assessment and instructional tools include the following major principles:

1. More rapid receptive vocabulary development can take place if groups of words with similar meanings are learned together and related by the Semantic Field Keyword Approach (Author, 2004b).

2. Better development of productive vocabulary requires activation, which may be helped by employing methods such as pushed output generation using groups of semantically related words together.

3. The more thoroughly learners process new TL words, phrases and language patterns--through each of these major phases of lexical processing--the more fully will target terms be learned in their three major aspects of *form, use and meaning* (Nation, 2001; Chapelle, 2001). This in turn can help bring about more complete and effective SLVA in both quantitative terms/size as well as qualitatively in terms of degree of lexical organization and richness. In other words, the quality of a language learner's vocabulary learning seems to depend heavily on these factors: a) *Degree or depth of lexical processing*, b) *Number and quality of vocabulary learning strategies used*, and c) *Degree of organization* of both L1 and L2 mental lexicons (how well-structured they are). In addition, logical extensions from each of these major phases of lexical processing follow.

***The degree of exposure to, training and practice in using enough of these essential phases and strategies of vocabulary learning determines to a large extent the rate, quantity and quality of one's Second Language Vocabulary Acquisition.*** More focused attention and assessment given to mastering the most crucial high-frequency vocabulary as early as possible will result in *better text coverage* and *more effective incidental learning from context* as well (Coady, 1997; Nation & Newton, 1997). *More rapid access to target terms and auto-archiving and review thereof*, which bilingualized and computerized

dictionaries can help to provide (Coll, 2002; Author, 2002a, 2002b; 2003a, 2003b), *will help to confirm or correct learners' guesses earlier, enabling quicker learning time and better retention rates*. Using more disciplined physical or electronic recording practices to archive new terms can help to fix them more rapidly in learners' minds, as can the use of multimedia to help provide memorable illustrations, cues, links or hooks to fix them in short-term memory. Better analysis and activation are required to improve learners' understanding of word origins, parts of speech, and proper patterns of appropriate use. One's *degree of activation* largely determines how well one's productive vocabulary develops. *Quality of review techniques or media functions used by a learner, largely determine both their speed and percentage of retrieval* of new target terms and language forms. Reaction and retrieval times can be improved by giving *more recent and frequent encounters* with target terms, helping to reactivate them by building further memory traces. Along with recycling and review techniques to improve recognition and prediction skills, *reassessing of learning must be done regularly with frequent individual feedback to maximize motivation and acquisition*. More highly structured language learners do seem to be better models for lower proficiency level learners, and therefore their patterns of CALL device use along with more effective patterns of vocabulary learning strategy use and organization need to be better analyzed (as in Author 2005a & 2005b) and taught to less successful learners to help them improve likewise. Word Count: 8,000

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**Table 3: Individual Scores Per Group While Learning**

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>B</b>	<b>D</b>
<b>Speed</b>	<b>Speed</b>	<b>Accuracy</b>	<b>Accuracy</b>	<b>Speed</b>	<b>Accuracy</b>
<b>Unit 1-3</b>		<b>Random, Bilingual</b>		<b>*Unit 1-2</b>	<b>Glossed/Pre-Organized</b>
<b>Time to Organize</b>	<b>Time to Produce</b>	<b>Organizing in Semantic Fields</b>	<b>Pushed Output Production</b>	<b>Time to Produce</b>	(*No need to time or measure organizing)
8.5	21.5	94	82	12	91
19	14	100	87	10	
18	16	98	93	8.5	
16.5	18.5	96	76	18	92
45	0	92	0	9.5	68
19	13	100	92	10	NA
16.5	20	94	79	12	76
NA	NA	NA	NA	14	82
12	19	90	92	13.5	97
21.5	28.4	98	66	9.75	98
NA	NA	NA	NA	16	
NA	NA	NA	NA	17	84
30	17	96	77	10.3	93
NA	NA	NA	NA	14	
12	18	96	84	13.6	70

25	15	86	86	8.5	80
19	15	94	91	17.5	90
40	12.5	97	82	10.5	88
21.75	11.3	98	78	12	88
18	30	96	95	11	NA
20.5	14.5	94	89	14	84
35	15	100	82	9.5	85
18	19	100	95	10.3	NA
<b>Averages:</b>					
21.86'	16.72'	95.74%	80.32%	12.24'	85.38%
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>		
<b>Time to Organize</b>	<b>Time to Produce</b>	<b>Organizing in Semantic Fields</b>	<b>Pushed Output Production</b>		
<b>Unit 1-1</b>	<b>Random,</b>	<b>Unglossed</b>	<b>Condition</b>		
30	8	92	88		
30	10	100	91		
35.5	16.5	90	92		
38	12	100	86		
50	10	73	98		
41.5	NA	86	0		
38	6	90	90		
37	10	90	90		
46	NA	96	0		
16	9.75	99	83		
35	10	68	90		
30	20	100	94		
45	5	98	95		
45	10	88	88		
39	6	92	87		
41	15	84	98		
40	14	94	96		
36	8	92	97		
<b>Unit 1-1</b>	<b>Averages</b>				
37.39'	10.64'	90.67%	81.28%		
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>		
<b>TOTAL</b>	<b>Averages:</b>	<b>Accuracy in</b>	<b>Accuracy</b>		
<b>Time to Organize</b>	<b>Time to Produce</b>	<b>Organizing in Semantic Fields</b>	<b>In Pushed Output Production</b>		
29.30'	16.63'	90.67%	82.12%		

Table 4: Post-Test Results of Vocabulary Retention:

Measured via Ability to Organize into Appropriate Semantic Field Categories

Random,	Glossed,	Random,	L2 Use &	Processing	Pre-Test	Post-Post
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Unglossed Condition	Organized Condition	Glossed Condition	Lexical Accuracy	Speed (in # of Minutes)	Vocabulary Level (Gates C)**	Vocabulary Level (Gates K)**
			<b>TOTAL</b>			
<b>Unit 1-1</b>	<b>Unit 1-2</b>	<b>Unit 1-3</b>	<b>Ave Org*</b>	<b>TTO**</b>		
80	72	66	72.67	54	5.6	4.5
38	58	40	45.33	60	4.9	
72	68	70	70	49	4.9	7
50	36	36	40.67	75	3.8	5.5
78	60	60	66	62	6	4.6
44	48	34	42	73	4.2	7.3
60	50	38	49.33	54	4.2	5.1
64	62	66	64	84	3.7	6.1
62	48	38	49.33	61	4.2	5.2
50	44	38	44	66	4.9	5
62	52	50	54.67	75	4.9	6.3
54	56	48	52.67	54	4.7	5.6
58	46	34	46	73	4.4	
58	42	40	46.67	63	4.7	5.4
46	34	38	39.33	54	4.2	6.1
76	72	60	69.33	71	4.2	4.6
54	26	30	36.67	65	4.2	4.8
26	36	52	38	64	4.2	6.1
<b>Averages:</b>					4.5	5.2
57.33%	50.56%	46.56%	51.48%	64.28'	4.4	5
1 <sup>st</sup> (Best)	2 <sup>nd</sup> Best	3 <sup>rd</sup> Best	TOTAL		4.2	5
<b>Unit 1-1</b>	<b>Unit 1-2</b>	<b>Unit 1-3</b>	<b>Ave Org*</b>	<b>TTO**</b>	4.4	5.3
<b>Random, Unglossed Condition</b>	<b>Glossed, Organized Condition</b>	<b>Random, Glossed Condition</b>	<b>Overall Averages</b>			
Most DLP	Least DLP	Medium DLP				
Required	Required	Required			<b>4.5</b>	<b>5.41</b>
	Glossed					
No Gloss/Structure	(Structure Aids in Retention)	Gloss/No Structure			<b>Average</b>	
Strongest		Weakest			<b>Vocabulary Levels: Pre</b>	<b>Vocabulary Post-Test</b>

\*Ave Org=Average percent correct for an individual student when organizing new TL vocabulary into fields under simpler common Keywords. \*\*TTO=Time to Organize into correct Semantic Field Sets

Glossed=L1 Translations given for both Keywords and target words

\*\* Gates McGinite Standardized Reading Tests (1972-2000) were used for both pre- and post-tests.