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A comparison of the keyword and semantic-context method for forward and backward recall of vocabulary items

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A COMPARISON OF THE KEYWORD
AND SEMANTIC-CONTEXT METHOD
FOR FORWARD AND BACKWARD RECALL
OF VOCABULARY ITEMS

Thesis

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UNIVERSITY OF DAYTON

In Partial Fulfillment of the Requirements for

The Degree

Master of Arts in Psychology

By

Fitore Musmurati

UNIVERSITY OF DAYTON

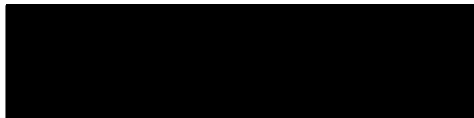
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OF VOCABULARY ITEMS

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ABSTRACT

A COMPARISON OF THE KEYWORD AND SEMANTIC-CONTEXT METHOD FOR FORWARD AND BACKWARD RECALL OF VOCABULARY ITEMS

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This study examined two methods for learning low frequency English vocabulary words: the keyword method and the semantic-context method. Mean proportion definition and word recall was measured through a forward and backward memory test respectively. College students (n=46) learned 44 vocabulary words using either the keyword or the semantic-context method. There was a main effect for method in that participants using the keyword method recalled more words and definitions than those using the semantic-context method. In addition, there was a main effect for test type showing that correct responses were higher on the forward than backward recall. There was a significant Method x Test Type interaction; the difference in word recall between the keyword and semantic-context condition was greater for the forward than the backward test. Thus, when it comes to learning vocabulary that consists of concrete nouns, the keyword method is the most useful method but only for a small set of words.

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INTRODUCTION

A COMPARISON OF THE KEYWORD AND SEMANTIC-CONTEXT METHOD FOR FORWARD AND BACKWARD RECALL OF VOCABULARY ITEMS

Students encounter vocabulary words very frequently in academic settings and need to learn new vocabulary words either in their native language or in another language. Thus, studies have examined various instructional methods aimed at remembering new vocabulary words. Besides remembering vocabulary words and their definitions, instructional methods for vocabulary learning have also focused on using the words in writing and understanding the word when it is encountered in context (McDaniel & Tillman, 1987).

Research indicates that vocabulary learning occurs typically during reading, which means that new vocabulary words are likely to be encountered in text (Nagy, Herman, & Anderson, 1985). Hence, research has focused on understanding what types of learning strategies are most effective in promoting vocabulary learning and under what conditions (Nagy et al., 1985). Two instructional methods commonly used in learning vocabulary words in another language or in one's own native language are the keyword method and the semantic-context method (Pressley, Levin, & Delaney, 1982). These strategies have been examined separately in their effectiveness in promoting vocabulary learning as well as comparing which is more effective in helping remember new vocabulary words.

The keyword method and the semantic-context method

The keyword method involves two steps for learning a vocabulary item. The first step involves generating a keyword, which is an English word that sounds or looks similar to the vocabulary word. The keyword then serves as a link between the unfamiliar word and its definition. For example, to learn the word **bullace**, which means **plum**, one could use the keyword **bull**. The second step would involve using visual imagery to imagine an interaction between the keyword and its definition: for example, a **bull** stepping on **plums** or eating plums (Pressley, Levin, & Delaney, 1982). The use of a keyword is not limited to learning words only in one's native language; one can use it in learning words in a foreign language as well. For example, to learn that the Spanish word **carta** means a **letter**, one might generate the keyword **cart**. In this case, an interactive image could involve imaging using a **cart** to deliver a letter.

The semantic-context method on the other hand, involves seeing the vocabulary words in context such as a text passage or in a few sentences. In this case, the learner has to infer the meaning of the vocabulary word based on the context in which the vocabulary word appears. This would be the case in academic situations such as when students read a textbook or a novel and encounter new vocabulary words. However, in the laboratory, a learner might have to infer the meaning of the word after seeing it in a context or see the definition of the vocabulary word and use it in a sentence. The learner might have to judge whether the vocabulary word is correctly used in a sentence after being shown the definition. Thus, there are various ways of employing the semantic-context method for learning vocabulary (McDaniel & Tillman, 1987; Pressley, Levin, & Miller, 1982).

Seeing words in context is important when learning vocabulary words in one's native language or in a second language (Bolger, Balass, Landen, & Perfetti, 2008). For example, the Instance-Based Resonance Framework states that seeing a vocabulary word in multiple varied contexts leads to a more decontextualized knowledge of the word's meaning. For example, one might encounter a vocabulary word in various sentences where each sentence reinforces the meaning of the word in a different way. When the learner comes across the same word again, it is likely that he or she will not find the word in the same original context; hence, it is important to reinforce the meaning of vocabulary words using various contexts such as through various sentences. Decontextualization leads to successful learning of the word because the learner is not constrained by learning the word in one specific context; as a result, the learner should be able to use and understand the word independent of the original context in which the word was encountered (Bolger et al. 2008).

Research on effectiveness of the keyword and semantic context-method

In academic settings, since students in fact must learn many words in context (e.g. reading challenging texts, unfamiliar textbooks, and articles) one might assume that the semantic-context method would be more effective in promoting vocabulary learning than the keyword method. However, research consistently shows that this is not the case, at least when examining performance in the short-term such as immediate testing as well as on most types of memory tests, where the effectiveness of the keyword method has been proven to be more effective than the semantic-context method (McDaniel & Pressley, 1989).

McDaniel and Pressley (1989) for example showed that even in situations where the semantic-context method should be superior, the keyword method emerges as the superior instructional method. McDaniel and Pressley had participants learn 45 vocabulary words and their definitions and afterwards participants saw 15 of the 45 words embedded in a story. The researchers assumed that because additional context learning took place, such as seeing some of the vocabulary words in a story, the semantic-context group would benefit due to encoding of the word through multiple contexts. However, their results showed that participants in the keyword method recalled more definitions than the context or control condition. In addition, the keyword method increased definitional knowledge and recall seen by the performance of learners in the cued recall test. Even though the participants in the context method saw all 45-vocabulary words used in three separate sentences prior to reading the story, there was no additional benefit over seeing only the definitional information (the keyword group) prior to reading the story.

Depending on the type of memory test given, the keyword method is not always superior to the semantic-context method. For example, in a study by McDaniel and Tillman (1987), participants in the keyword method recalled significantly more definitions than the semantic-context group when cued with the vocabulary items. However, on a free recall test, there were no differences in the number of words recalled between the keyword and context group.

McDaniel and Tillman (1987) had participants learn 60 English words and afterwards tested participants using free recall, which involved first free recalling any vocabulary words and/or their meanings followed by a cued recall test. The superior

performance on cued recall by the keyword participants suggests that the keyword method is effective in strengthening the associative link between the vocabulary word and its definition. However, this advantage may be limited to forward cued recall tests, as free recall showed no such advantage for the keyword method. Learners using the context method may do poorly on cued recall because this method of learning does not strengthen the associative link between the vocabulary word and its definition during acquisition or the learning phase because the focus is on inferring the meaning of the vocabulary word. Free recall tests however, depend less on remembering the associative link because a learner is not constrained by having to remember the vocabulary-definition link. Instead, in most cases they can recall only the vocabulary words or simply recall the definition if that is all they can remember. In this case, the semantic-context group does equally well compared to the keyword group because the context method does not explicitly focus the learner's attention on the vocabulary-definition link to the same degree as the keyword method.

Additional research also supports the idea that the keyword method is more effective in strengthening the link between the vocabulary word and its definition. The poor performance by context participants is likely to be seen on memory tests that emphasize the associative link between the word and its definition such as cued recall tests (forward or backward). For example, Pressley, Levin, Kuiper, Bryant, and Michener (1982) showed that participants in the keyword condition showed the best performance in a cued-recall test relative to other context methods. However, in the free recall of words, there were no differences between the keyword condition and the other learning conditions such as the context method or a no-strategy control condition. Thus, the study

provides further support that cued-recall tests emphasize the link between the word and its definition to a greater degree relative to free recall tests.

Thus, each type of memory test suggests the type of situations that may be helpful for different vocabulary learning goals. For instance, cued recall tests are similar to situations or tasks where one has to recognize the meaning of a word when reading a passage. On the other hand, free recall tests are similar to situations where one has to write an essay using any vocabulary words available in memory without necessarily having to remember the associative link explicitly.

The type of memory test given may be important in qualifying under what conditions a specific learning method is generally most effective. Most of the research to date has focused on forward recall and has shown that the keyword method is generally more effective than the semantic-context method in the learning of vocabulary words (that are concrete nouns). It is important to establish whether the same pattern holds in the backward recall tests because an effective learning method should show that learners are able to give definitions as well as give the vocabulary words regardless of which direction recall is tested. If one is to regard a learning method as maximally helpful, its effectiveness should be demonstrated with various tests (Pressley & Levin, 1981).

Studies examining backward recall

Research on backward recall has compared the keyword method only to no-strategy control conditions. No studies have looked at vocabulary recall using backward recall tests between the keyword method and the semantic-context method. Nonetheless, if the keyword method is effective at strengthening the associative link between the vocabulary word and its definition, we should see similar results in backward recall tests.

This is because the keyword method is a more powerful method for strengthening the associative link relative to other methods.

However, in backward recall, the effectiveness of the keyword method might be reduced relative to other learning methods because the link that is strengthened is only between the keyword and the definition rather than the vocabulary word and the keyword. This is especially because with the keyword method, the participant uses interactive visual imagery to link the keyword with the definition, as for example, imagining a **bull** (the keyword) stepping on plums (the definition) when one is trying to learn the vocabulary word **bullace**. Thus, when one is trying to recall the vocabulary word, as is the case in backward recall, one may recall the keyword (e.g. bull) because the link that is strong is between the keyword and the definition since the keyword is part of the structure containing the visual image relating the definition with the keyword. Thus, one is still able to recall the image of **bull** stepping on plums, but the vocabulary word **bullace** might not necessarily be retrieved from the keyword bull since there is no direct mnemonic route from the definition back to the vocabulary word (Pressley, Levin, Hall, Miller, & Berry, 1980).

Pressley, Levin, Hall, Miller, & Berry (1980) wanted to know if the keyword method is as superior to other methods in backward recall as it is on forward recall. Participants learned 24 Spanish vocabulary words. In addition, they examined other control strategies compared to the keyword method such as a keyword-repetition control, no keyword-no strategy control or a keyword-no strategy control. The **keyword-repetition** control group learned the foreign word-keyword association in stage 1 and then in stage 2 they created an interactive image followed by repeating the foreign word

and its translation to themselves. The **no keyword-no strategy** control group had to remember each word and its meaning. Lastly, **the keyword-no strategy** control group simply had to remember the word and its meaning but was not given instructions on what to do with the keywords, in order to see whether direct instruction is needed to remember the vocabulary-definition association. The researchers included the keyword repetition as a condition in the study to see whether repeating vocabulary words in addition to using the standard keyword method would help in remembering the vocabulary words. The reason for using these various control strategies was to reduce the retrieval demands due to backward recall. For example, the authors assumed that if participants used verbal repetition, as was the case in the keyword-repetition group, then they would process the whole vocabulary word-definition link through more focused attention. This should aid vocabulary recall more in the backward than forward recall due to retrieval demands of the former. Finally, the no keyword-no strategy control was included in the study because students often learn vocabulary words in any way they like when they are in academic situations (Pressley et al. 1980).

As predicted, results showed that on forward recall, participants in the keyword method recalled more words than the other keyword control groups. Repetition did not strengthen the associative link because neither the forward nor the backward recall was improved relative to the standard keyword method. Based on the responses made on backward recall, the keyword method group was able to generate the keywords from the definitions but not the vocabulary words, suggesting that interactive imagery strengthens only the link between the keyword and the definition. Thus, the keyword method is

effective in promoting definition recall as is evident in forward recall but is not as helpful in promoting vocabulary recall such as in backward recall.

Pressley and Levin (1981) obtained similar results when they examined backward recall of low frequency English vocabulary words using the keyword method versus a free strategy control group. Consistent with prior research, no differences were found in recall of vocabulary words for the keyword and the control groups on backward recall. Liberal scoring where the recall of keywords was accepted as a valid response showed that despite the free strategy learners being exposed to a keyword, only keyword learners recalled keywords when cued with the definitions. This showed that direct instruction of using interactive imagery between the keyword and the definition is necessary if one is to remember the association rather than merely being shown the associated keywords.

However, Pressley and Levin (1981) hypothesized that the low frequency of the vocabulary words might have affected recall because the vocabulary words were old English words that learners are unlikely to encounter. Thus, a second experiment included a prefamiliarization phase where participants had to learn each vocabulary word so that they could produce it when given the first syllable. In addition, participants practiced as part of the second experiment by recalling the vocabulary words when shown the associated keyword. Unlike the results on experiment one; keyword participants recalled more vocabulary words than did the control participants suggesting that the keyword method benefited from the subtask practice which helped integrate the vocabulary responses in memory. Thus, practice is needed to strengthen the link between the keyword and the vocabulary word since the keyword method strengthens only the link from the keyword to the definition via interactive imagery.

The Proposed Study

Previous studies have shown differences in vocabulary word recall depending on the memory test given. For example, the keyword method is superior to the semantic-context method on immediate cued recall tests whereas on free recall tests, there are no differences in recall between the two learning methods. However, there is no research looking at the keyword method versus the semantic-context method on backward recall tests. It is not clear whether the keyword method would be better than the semantic-context method on backward recall tests. This is especially because as prior research indicates, backward recall tests place greater retrieval demands on the participants. Thus, there is no direct mnemonic route that leads the learners from the keyword to the vocabulary word. This is similar to what is required in free recall tasks where participants also experience greater retrieval demands relative to cued recall tasks. For example, for both backward and free recall, participants need to go from a familiar definition or meaning to something unfamiliar (new word). Since research shows no differences in free recall as a function of learning method, similar results ~~were~~ might be expected for backward recall.

The purpose of the current study was to examine whether this pattern in forward recall also extends to backward recall of vocabulary words. For example, no difference in recall on backward recall tests as a function of learning method used, would suggest that the superiority of the keyword method is limited to forward recall tests. It is important to establish whether the same pattern holds because successful vocabulary learning should encompass the ability to generate the definition when given the

vocabulary word as well as being able to generate the vocabulary word when given the definition.

In this study, two types of instructional strategies were examined: the keyword method and the semantic-context method. Participants learned 44 low frequency English vocabulary items and their definitions. Participants in the context method saw vocabulary words in three sentences, whereas, those in the keyword method used interactive imagery. Participants were given a forward as well as a backward recall test after the learning phase of the vocabulary words.

Pressley and Levin (1981) concluded that for backward recall, the keyword method group benefited from subtask practice where the participants recalled the vocabulary words when shown the associated keyword. However, the current study did not employ subtask practice in order to more faithfully mimic the real academic situations where students do not get the chance to practice vocabulary words extensively.

Consistent with prior research, it was predicted that the link between the vocabulary word and its definition would be strengthened with interactive imagery, which should help the keyword group on the forward recall test. Thus, it was predicted that on the forward recall test, the keyword group would recall more definitions than the semantic-context group. However, it was predicted that there would be no difference in vocabulary recall between the two methods on the backward recall test specifically due to retrieval demands of backward recall tests (Pressley, Levin, & Miller, 1982)

METHOD

Participants

Participants in this experiment were University of Dayton undergraduates from introductory psychology courses. Only native speakers of English were eligible to participate in this experiment. There were two conditions with a sample size of 46 participants with 23 participants randomly assigned to each condition.

Materials

Materials for this study consisted of 44 low frequency English words with associated keywords and the definitions (e.g. bullace-bull-plum) as well as a list of 44 words used in a 3-sentence context where each vocabulary word appeared twice in three sentences (See Appendices A and B) . The list of vocabulary words and the sentences were taken from another study (see McDaniel & Tillman, 1987). In addition, the researcher computer featuring a PowerPoint presentation was used to presented the stimuli on a computer featuring a PowerPoint presentation. A backward and forward recall test on a sheet of paper was given to participants testing their memory for the vocabulary words (See Appendix C).

Procedure

This study employed two conditions: a keyword group and a semantic-context group. The researcher tested participants individually and informed them at the start of the experiment that they would be tested on a backward as well as forward recall. Specifically, participants were informed that for some words they would

be shown the definition and would have to recall the vocabulary word, whereas for other words, they would be given the vocabulary word and they would have to recall the definition. Participants signed a consent form and at the end were debriefed about the purpose of the experiment.

For the keyword condition, the PowerPoint slides displayed each of the 44 English words along with the keywords, and definitions displayed horizontally. For example, on each slide for each new item, the vocabulary word appeared on the far left, the keyword appeared on the center of the screen and the definition appeared on the far right. The slide appeared for 20 seconds followed by a subsequent slide where only the vocabulary word and its definition appeared in the same positions as on the first slide for five seconds.

There were four practice trials followed by 44 actual study trials. Each trial consisted of a slide containing the vocabulary word, the keyword and the definition. The researcher instructed the participants in the keyword group to study the words as follows: “First look at the vocabulary word and pronounce it. Then look at the keyword and try to relate it to the vocabulary word by noticing the similarity in sound or appearance. Then form an interactive image between the keyword and the definition”. For example, each trial consisted of connecting the unfamiliar word with the keyword phonologically (step 1, e.g. **bullace** sounds like **bull**) as well as creating the interactive image between the keyword and the definition (step 2, e.g. bull stepping on plums). Lastly, participants made the connection between the vocabulary word and the definition (e.g., **bullace** means **plum**). For each trial, participants generated their own interactive image even though the keywords were provided. To ensure that they were able to generate the interactive

imagery, participants practiced doing this during the practice trials. In addition, participants described aloud the imagery they used.

Just as with the keyword group, the semantic-context group performed four practice trials followed by 44 trials, where they saw the vocabulary words and their definitions in sentences. Each trial consisted of a slide containing a 3-sentence context where the vocabulary word appeared twice (e.g. “Although there were other kinds of fruit to eat, Nancy ate only the **bullace**. It grew on the wild damson tree, and she liked the purple color. Her domestic plum tree at home didn’t produce **bullace** like this”). After reading the sentences aloud, participants were asked to infer aloud the meaning of the word (e.g. “What does **bullace** mean?”). After spending 20 seconds reading and trying to infer the meaning of the vocabulary word, regardless of whether the participant had correctly inferred the meaning or not, the vocabulary word and the definition appeared on the next slide for five seconds. The vocabulary word appeared on the far left and the definition on the far right just as for the second slide in the keyword group.

After studying the list of words, participants in each group received a backward and forward recall memory test. For the backward test, participants saw the definition and wrote in the vocabulary word on a sheet of paper. For the forward recall test, participants were shown the vocabulary word and had to write in the definition.

Twenty-two of the 44 vocabulary words were tested using backward recall whereas the remaining of the vocabulary words’ definitions were tested using forward recall. The order in which the forward and backward recall tests were given was counterbalanced, as was the assignment of vocabulary items to the backward and forward test conditions.

RESULTS

Proportion correct recall on the forward and-backward recall tests was the dependent variable¹. Mean proportion word and definition recall as a function of learning method (with original raw scores) is summarized in Table 1.

Table 1. Mean Proportion Recall of Vocabulary Words and Definitions as a Function of Learning Method and Test Type

Type of Test	The Keyword Method	The Semantic-Context Method
	<i>M (SD)</i>	<i>M (SD)</i>
Backward	.23 (.20)	.13(.08)
Forward (Conservative)	.55 (.25)	.32(.19)

¹ An *Arcsine transformation* was used for all scores because word recall was very low in the backward test. However, none of the analyses using arcsine transformed scores differed from the analyses using the raw scores reported here.

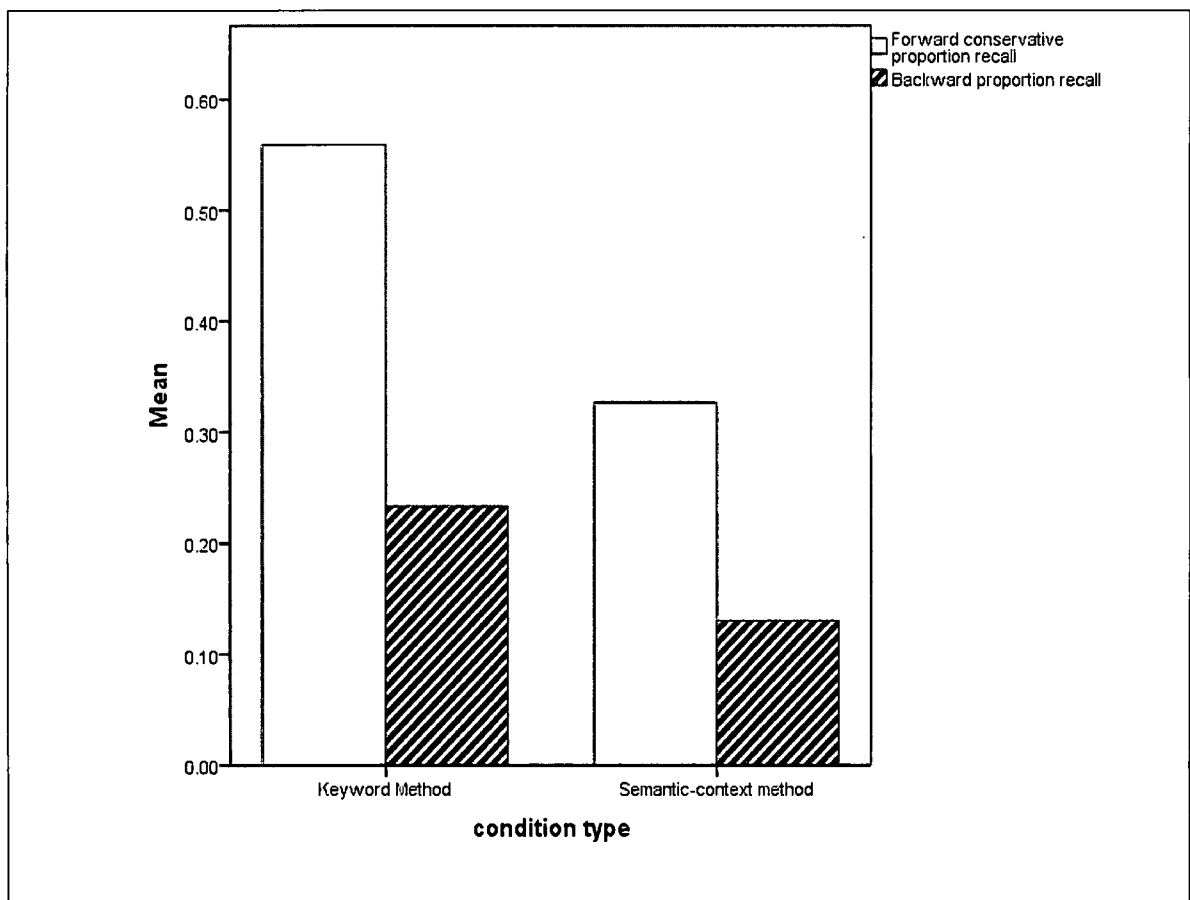
Responses on the backward test were scored conservatively only, meaning that only those responses that matched the actual vocabulary word were accepted as correct. The reason for this was that since the vocabulary words were difficult to remember in the sense that they resembled foreign vocabulary words, all participants either recalled the vocabulary words correctly or recalled keywords (e.g. for the word “bullace” , participants either were able to recall it correctly or were only able to generate the keyword “bull”).

On the forward recall test, responses were scored conservatively and liberally. Liberal responses were those that did not match the exact wording of the original definition. A response was considered correct if it contained a noun that is part of the definition or a synonym of the definition; or, the response referred to the same object or the same activity. For example, a response such as “playing cards” was acceptable for the actual definition “card game”. However, a response such as ‘cards’ or ‘a game’ was not acceptable. This is because the response does not refer to the same specific object or activity, that is, the response “cards” does not describe the same activity as does “playing cards” or “card game”. Since the keyword method yielded the greatest definition recall when compared to the semantic-context method regardless of how responses were scored, liberal scores were not used in the final analysis so that there would be a consistency in scoring (how the backward recall was scored).

A 2x2 mixed ANOVA was conducted with proportion (raw) scores. There was a main effect for test type, such that the mean proportion of correctly recalled vocabulary words was significantly greater for forward ($M = .44$) than definitions recalled on backward recall ($M = .18$), $F(1, 44) = 87.698, p < .001$, partial $\eta^2 = .666$. In addition, there

was a main effect for method, with participants recalling significantly more vocabulary words using the keyword method ($M=.39$) than semantic-context ($M=.22$), $F(1, 44) = 11.262$, $p=.002$, partial $\eta^2=.204$. Finally, there was an interaction of Method x Test type (See Figure 1); the difference in vocabulary recall between the keyword and semantic-context method was significantly greater for the forward test than the backward test; $F(1, 44) = 5.481$, $p=.024$, partial $\eta^2=.111$.

Figure 1. Interaction of Learning Method (Keyword vs. Semantic-Context) and Test Type (Forward vs. Backward recall)



Since the interaction was significant, the researcher conducted an analysis of simple effects. Thus, the analysis examined if the simple effect of method was significant for forward and backward recall. In addition, the analysis was done to see if the effect of test type was significant for the keyword method and semantic-context method.

The simple effect of method was significant for forward recall, $F(1, 44) = 12.353$, $p = .001$, partial $\eta^2 = .219$). Thus, for forward recall, the keyword group significantly recalled more definitions ($M = .55$) than the semantic-context group ($M = .32$). Likewise, the simple effect of method was significant for backward recall $F(1, 44) = 4.887$, $p = .032$, partial $\eta^2 = .100$, with the keyword group significantly recalling more vocabulary words ($M = .23$) than the semantic-context group ($M = .13$).

In addition, the simple effects of test type were also examined. The simple effect of test type was significant for the keyword method, $F(1, 22) = 50.931$, $p < .001$, partial $\eta^2 = .698$. Thus, for the keyword method, participants significantly recalled more definitions on the forward recall test ($M = .55$) than they did on the backward recall test ($M = .23$). In addition, the simple effect of test type was also significant for the semantic-context method, $F(1, 22) = 37.670$, $p < .001$, partial $\eta^2 = .631$. Thus, for the semantic context method, participants recalled more definitions on the forward recall test ($M = .32$) than the backward recall test ($M = .13$).

DISCUSSION

Previous studies have shown differences in vocabulary word recall depending on the type of memory test given. For example, the keyword method is superior to the semantic-context method on immediate cued recall tests (McDaniel & Tillman, 1987). However, there is no research comparing these two conditions on backward recall tests. Hence, the purpose of the present study was to examine whether the superiority of the keyword method extends to backward recall tests when compared with the semantic-context method.

The results showed that participants in the keyword method condition recalled more vocabulary words or definitions correctly than did participants in the semantic-context condition regardless of the type of test that was given. This suggests that even in situations where retrieval demands are great such as on a backward recall tests, the keyword method emerges as the more beneficial learning method. The retrieval demands on backward recall tests deal with the participant having to retrieve from memory an unfamiliar new word from a familiar definition or meaning.

Some of the results were consistent with the predictions made prior to the execution of the experiment. For instance, as predicted, more vocabulary words were recalled by the keyword group than the semantic-context group on forward recall tests. This is consistent with prior research (Pressley, Levin, Kuiper, et al. 1982), showing that the keyword method is the most effective method in cued-recall tests. Some of the results however were not consistent with the predictions.

For instance, it was predicted that on backward recall tests, there would be no difference in vocabulary word recall between the keyword method and the semantic-context method. In fact, the results show otherwise, because participants in the keyword method recalled significantly more words compared to the semantic-context method.

The reason for the prediction that there would be no difference in backward recall between the keyword and the semantic-context method was based on prior research. For instance, McDaniel and Tillman (1987) showed that on free recall tests, there is no difference in recall between the keyword and the semantic-context method. Even though these researchers did not look at backward recall, I predicted that similar to what is required in free recall tasks where the participants experience greater retrieval demands relative to cued recall tests; the same situation is faced in backward recall. That is, for both backward and free recall, participants need to go from a familiar definition or meaning to something unfamiliar (new word). Therefore, since research showed no differences in free recall as a function of learning method, similar results were expected for backward recall tests. In addition, in backward recall, Pressley, Levin, Hall, Miller, & Berry (1980) failed to show that the keyword method was superior to other methods such as the keyword-repetition control, no keyword-no strategy control or a keyword-no strategy control.

Nonetheless, the semantic-context group recalled more items in the forward recall test than in the backward recall test showing that, the backward recall test places greater demands on memory retrieval. The same pattern was seen by a smaller mean recall for the keyword method on backward than in the forward recall test. One possibility for the lack of differences in mean recall between the two learning methods on

the backward recall test could be that the sentences in the semantic-context method were not maximally helpful in guiding the participants toward understanding the vocabulary words that were embedded within the sentences. Another possibility is that 25 seconds to read the sentences was not sufficient processing time for the participants. This reasoning is especially plausible since a few of the participants were able to read the sentences but ran out of time when inferring some of the words. However, they were still shown the definitions of the vocabulary words which should have somewhat helped with associating the word and its definition.

Limitations and Future Directions

Some of the limitations of the study might be the number of stimuli that were used. For instance, participants learned only 44 words; however, in academic settings it is likely that they would be learning many words throughout the year. If this is the case, then, we do not know that the keyword method would still be useful when it comes to learning a larger set of vocabulary words. One reason for this is that for some vocabulary words it is easier to generate keywords than for others simply because of the nature of the words. Pressley, Levin, and Delaney (1982) addressed this issue by stating that the keyword method might be useful only for those items for which one is able to generate similar sounding words. Thus, the current study supports the idea that the keyword method is useful for learning concrete words; however, it might not be as useful for learning abstract words. A second issue is also the fact that when one conducts a study, there is a predetermined list of vocabulary words and keywords that one chooses purposefully so that the keyword resembles the vocabulary words. Thus, ecological validity is reduced in such cases because in real academic settings there are random

vocabulary words a person encounters or has to learn rather than a predetermined set. In this case, the usefulness of the keyword method is reduced.

In addition, the processing time of 25 seconds might have too much time for the keyword group and not a sufficient time for the semantic-context method, even though efforts were put into piloting and ensuring that both groups were equated when it came to having equal time. For instance, during piloting, participants in the keyword condition took all the 25 seconds when going through the procedure. In addition, during piloting, participants in the semantic-context method were able to read and infer the sentences in 25 seconds sufficiently. Overall, the processing time is a small limitation given that most participants found the 25 seconds sufficient to read the sentences and infer the meaning. However, a bigger issue is the degree to which the semantic-context method provided varied context. The instance-based resonance framework states that in order to learn vocabulary words effectively, one has to see a word in multiple varied contexts because a more decontextualized knowledge of the word's meaning is needed (Bolger, Balass, Landen, & Perfetti, 2008). In this case, learning the vocabulary words in different ways reinforces the meaning due to seeing the vocabulary words in various different sentences. The sentences used in the current study might not have been effective in this regard. Therefore, it might account for lack of differences in vocabulary recall in the backward test between the keyword and the semantic-context method.

Future research might do more extensive piloting in examining what is sufficient in terms of time for processing of the words since obviously some people might read at a slower rate than others, hence, 25 seconds might be insufficient for them. In addition, it might be important to see whether the semantic-context method is more useful than

simply using repetition or another variation of a control condition. It is also possible that if participants practice more extensively on how to infer the meaning of the vocabulary words from context, we would end up seeing improved recall performance on memory tests. In this study, participants practiced in the beginning on only a few examples; thus, it is possible that if they had practiced more it would have been useful during the actual trials. In fact, McDaniel and Tillman (1987) posited that with an “elaborate instructional phase” (such as examples and practice) or even providing a list of roots, prefixes, and suffixes which the authors considered as “internal” context, the semantic-context method might actually improve word recall. However, as some authors have pointed out (McDaniel & Pressley, 1984; Hogben & Lawson, 1994), learners are assumed to have experience or be more familiar with context analysis (inferring word meanings from context) than with using keywords at least because context is common in naturalistic vocabulary learning.

The implications of the study are that the keyword method might be more useful when trying to learning new (concrete) vocabulary words than trying to infer the meaning of words solely based on the context in which those words appear. It also supports previous research in that the keyword method strengthens the associative link between the vocabulary word and the definition whereas the semantic-context method does not. In addition, if a learning method is to be regarded as maximally helpful, its effectiveness should be demonstrated in various testing method, and the results of this study show that the keyword method is effective with various testing methods. That is, despite backward tests placing greater retrieval demands on memory, participants who used the keyword method recalled more vocabulary words than the semantic-context method. This is

similar to what McDaniel and Tillman (1987) considered constituting as an effective learning method. That is, they posited that vocabulary learning entails the acquisition of many overlapping skills such as being able to recall the meaning of the presented word, but also being able to give the meaning when one sees it in either text or some other presented form. Thus, a learning method is especially useful if its use extends beyond just one context but can be used in any conceivable learning situation.

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APPENDIX A

Stimuli for the Keyword condition

Forty-four vocabulary words, the keyword and the definitions used during study phase

1. MASSE—sounds like MASS and means a **pool shot**
2. CARLIN—sounds like CAR and means an **old woman**
3. COTTER—sounds like COT and means a **tenant farmer**
4. DOGGER—sounds like DOG and means a **boat**
5. ANGELICA—sounds like ANGEL and means **sweet wine**
6. BUSKIN—sounds like BUS and means a **boot**
7. DOLLOP—sounds like DOLL and means **serving of ice cream**
8. GODEVIL—sounds like GOD and means a **logging sled**
9. JARVEY—sounds like JAR and means a **driver**
10. EYAS—sounds like EYE and means a **hawk**
11. COWRY—sounds like COW and means **seashell**
12. FACER—sounds like FACE and means a **metal smoother**
13. PIGGIN—sounds like PIG and means a **small pail**
14. CATKIN—sounds like CAT and means **flowers**
15. CLAYMORE—sounds like CLAY and means a **sword**
16. HENBANE—sounds like HEN and means a **plant**
17. LAWING—sounds like LAW and means a **bill**
18. LOGGIA—sounds like LOG and means **balcony**
19. COONCAN—sounds like COON and means a **card game**
20. MANCHET—sounds like MAN and means **bread**
21. CORDITE—sounds like CORE and means an **explosive**
22. CASERN—sounds like CASE and means **barracks**
23. COSTARD—sounds like CUSTARD and means **apple**
24. JABIRU—sounds like JAB and means a **flamingo**
25. PANDORE—sounds like PAN and means a **stringed instrument**
26. WINDLING—sounds like WIND and means a **straw**
27. JACOBUS—sounds like JACK and means a **gold coin**
28. CANGUE—sounds like CAN and means a **torture device**
29. KOLACKY—sounds like COLA and means **pastry**
30. ANTIAR—sounds like ANT and means **poison**

31. TARN—sounds like TAR and means **lake**
32. HAMATE—sounds like HAM and means **bone**
33. GRAMPUS—sounds like GRAMPA and means **dolphin**
34. CABRETTA—sounds like CAB and means **soft leather**
35. JAMBEAU—sounds like JAM and means **armor**
36. COLLIER—sounds like COLLIE and means a **coal miner**
37. INTERNUNCIO—sounds like INTERN and means a **messenger**
38. GASKIN—sounds like GAS and means a **leg muscle**
39. CORNICHE—sounds like CORN and means a **road**
40. HANDSEL—sounds like HAND and means a **payment**
41. RATINE—sounds like RAT and means a **fabric**
42. FANFOLD—sounds like FAN and means a **tablet of sheets**
43. BRACERE—sounds like BRACE and means an **alien farmworker**
44. FLAMEN—sounds like FLAME and means a **priest**

APPENDIX B

Stimuli for the Semantic-context condition

Initial study of 44 words in 3-sentence contexts for the **Semantic-context method condition**

1. The pool shark decided to try either a **masse** or a bank shot. He had to try something fancy, as his ball was blocked by another ball. Holding his cue straight up, he hit the cue ball from above, using the **masse**.
2. The **carlin** lay in her bed waiting for her daughter to visit. The **carlin** was in a nursing home. She was unable to care for herself.
3. A **cotter** must turn part of the crop he produces over to the owner of the land. This arrangement was once commonplace, but today not many **cotters** are left. Most in the agricultural business manage to buy their own land.
4. The fisherman on the **dogger** had many poles and nets. He was bringing in bigger catches now that he had the proper craft. He had bought the **dogger** a Dutchman who had gotten out of the fishing business.
5. We chose the **angelica** instead of the chablis for dinner. Something less dry fit best with the flavorful fish. **Angelica** is made at many vineyards now.
6. It was not surprising to see her wearing **buskins**. With snow on the ground, everybody was wearing **buskins**. Hers were laced up tight to keep her feet warm.
7. The **dollop** of ice cream was balanced on the cone until the girl tilted it. It fell to the ground with a plop. The girl then returned to the freezer to replace the **dollop** with another.
8. The timber was loaded on the **godevil**. The **godevil** was then pulled to the mill. It

was then loaded and taken back for more logs.

9. The man told the **jarvey** he was in a hurry. To go faster, he whipped the horse, but it didn't help much. Unfortunately, the **jarvey** was fired rather than the horse.
10. The **eyas** circled slowly above. It would dive at the command of its master. The **eyas** had been tamed as a nestling.
11. The tribesmen used **cowries** to pay their gambling debts. If they owed a lot, they would probably go to the beach to gather some **cowries**. It is hard to believe the abandoned home of a snail could be so sought after.
12. If there's one tool he is good with it's the **facer**. With it, he achieves smooth surfaces on even very rough metal. The **facer** doesn't use that much power.
13. He only needed a little water, so he took a **piggin** to the well. The handle wobbled, so he splashed some water out. Water also leaked out of the **piggin** where the wood had rotted.
14. The girl picked up a **catkin** from under her willow tree. She thought it was pretty, though it had no petals. She put the **catkin** in a vase on a table.
15. The **claymore** sparkled in the sun as the man practiced swinging it. He could effectively thrust it at a target. His great strength allowed him to easily slash with the **claymore**.
16. The hikers were interested in the foreign vegetation, especially **henbane**. They came across some **henbane** on the ground in the forest. Its appearance was as unpleasant as its odor.
17. George insisted upon paying the **lawing**. The tavern was moderately priced, so he figured he could cover it. He decided to drink less in the future, when he saw that the **lawing** was \$35.00 with no tip.
18. We leaned over the **loggia** during the play. It was on the second floor of the theater. The **loggia** was open to the stage below.
19. At lunch, we play **cooncan**. It's relaxing, and we can play it while we're eating. We switched from bridge to **cooncan** when one our bridge players dropped out.
20. After slicing the **manchet**, the man buttered each piece. It was so good that he ate the entire loaf. He wouldn't soon be able to buy another **manchet**, and would have to settle for biscuits.

21. The arsonist fused the bomb with **cordite**. He knew **cordite** would burn well, being made in part of nitroglycerin. The strand was made long enough to give extra time to escape from the building.
22. The troops were confined to their **casern** because of the bad weather outside. Although newly built, there were a few leaks in the roof. Also, the troops got bored because the **casern** only had beds in it.
23. When I was in England, I tasted a **costard**. I even picked several **costards** off a tree and sliced them up to make a pie. They're big, red, and crisp like the ones in the States, but much juicier.
24. They spotted a **jabiru** in flight while hiking through the marsh. The children wondered if it were delivering a baby. The **jabiru** is seen often in the tropics.
25. We urged the professor to play the **pandore** in class. He first had to tighten and tune the old strings. Finally, he played as we sang to the **pandore's** sound.
26. The boy carried the **windling** to the barn. There was plenty of it drying in the field, so he didn't bother getting what he dropped. He used the **windling** to make a soft place for the horses to sleep.
27. In past centuries, a **jacobus** was common currency in England. Today, we print paper money. If you found a **jacobus** today, you would be very rich.
28. The Chinese emperor ordered the **cangues** to be put on all of his political prisoners. The weight and constraint caused by the **cangue** caused one man to collapse. The pain was most on the men's necks and wrists.
29. The kids went to the bakery for some **kolackies**. They were supposed to be for after Sunday brunch. Each **kolacky** was so light and buttery, though, they ate them on the spot.
30. The warriors dipped their arrows in the **antiar**. Should they only scratch their prey it would still fall dead. The men had to be careful not to kill themselves by getting **antiar** on them.
31. Hiking in the mountains yesterday we came upon a **tarn**. The water in the **tarn** was very cold since it came from the high altitude springs. Nevertheless we decided to go for a swim.
32. The tennis player broke his **hamate** when he fell on his arm. It would be a while before he could play well again. The doctor put a cast on the player's wrist to help the **hamate** mend.

33. We saw a playful **grampus** when deep-sea fishing. We had seen them do tricks before at Sea World. We thought the **grampus** might be signaling a friend with his shrill whistles.
34. It is hard to believe that **cabretta** comes from wooly sheep. It is used to make expensive purses and shoes. Compared to other leathers, **cabretta** is very, very soft.
35. During jousting, the knight's **jambeau** protected his skin from injury. It got dented, however, and wouldn't fit his leg well. Instead of having the whole suit refurbished, he just had the **jambeau** straightened.
36. In the past, it was risky to be a **collier** in Kentucky. Now there are very few cave-ins or explosions, and the **collier** is safer. Even so, it isn't pleasant to breathe black dust and get coated with it.
37. The bishop was waiting for the **internuncio**. He was coming from the Vatican. Finally, the **internuncio** arrived with news about the new appointments.
38. When we saw the horse fall in the race, we knew it had to be the **gaskin**. Every time the vet has looked at that horse's leg, the **gaskin** has looked funny. The vet prescribed rest and heat for it.
39. The car crept along the **corniche**, since if it left the road it would be a 1000-foot drop. Another car approached ahead on the **corniche**. Fortunately, there was room for the two cars to pass.
40. The couple gave their daughter a **handsel** as she left for college. She never took the necklace from around her neck, as a remembrance of her parents. That **handsel** truly brought good things to the one who wore it.
41. The woman wanted a sweater to keep her warm. She chose one made of **ratine**, for its textured look. The loose weave of **ratine** made the sweater thick and warm.
42. The clerk wrote the amount in the **fanfold**. He then tore out a sheet and gave it to the customer. It was easiest to keep a record of all transactions in the **fanfold**.
43. The **bracero** could find no employment in his native Mexico. He was now working legally in the U.S. He, like other **braceros**, traveled to the locations where the crops were ready.
44. In ancient Rome there was a **flamen** associated with each different deity. Caesar knew who the **flamen** of the God of War was. Caesar regularly visited this man to receive his blessing.

APPENDIX C

Memory Tests

Forward recall test

Please write in the definition for each vocabulary word to the best of your ability. If you cannot remember a definition for a word, leave it blank.

Set A

1. MASSE _____
2. CARLIN _____
3. COTTER _____
4. DOGGER _____
5. ANGELICA _____
6. BUSKIN _____
7. DOLLOP _____
8. GODEVIL _____
9. JARVEY _____
10. EYAS _____
11. COWRY _____
12. FACER _____
13. PIGGIN _____

14. CATKIN _____
15. CLAYMORE _____
16. HENBANE _____
17. LAWING _____
18. LOGGIA _____
19. COONCAN _____
20. MANCHET _____
21. CORDITE _____
22. CASERN _____

Forward recall test

Please write in the definition for each vocabulary word to the best of your ability. If you cannot remember a definition for a word, leave it blank.

Set B

1. COSTARD _____
2. JABIRU _____
3. PANDORE _____
4. WINDLING _____
5. JACOBUS _____
6. CANGUE _____
7. KOLACKY _____
8. ANTIAR _____
9. TARN _____
10. HAMATE _____
11. GRAMPUS _____
12. CABRETTA _____
13. JAMBEAU _____
14. COLLIER _____
15. INTERNUNCIO _____
16. GASKIN _____

17. CORNICHE _____

18. HANDSEL _____

19. RATINE _____

20. FANFOLD _____

21. BRACERE _____

22. FLAMEN _____

Backward recall test

Please write in the vocabulary word for each definition to the best of your ability.

If you cannot remember a word for a definition, leave it blank.

Set A

1. pool shot _____
2. old woman _____
3. tenant farmer _____
4. boat _____
5. sweet wine _____
6. boot _____
7. a serving of ice cream _____
8. logging sled _____
9. driver _____
10. hawk _____
11. seashell _____
12. metal smother _____
13. small pail _____
14. flowers _____
15. sword _____
16. plant _____
17. bill _____

18. balcony _____

19. card game _____

20. bread _____

21. explosive _____

22. barracks _____

Backward recall test

Please write in the vocabulary word for each definition to the best of your ability.

If you cannot remember a word for a definition, leave it blank.

Set B

1. apple _____
2. flamingo _____
3. stringed instrument _____
4. straw _____
5. gold coin _____
6. torture device _____
7. pastry _____
8. poison _____
9. lake _____
10. bone _____
11. dolphin _____
12. soft leather _____
13. armor _____
14. coal miner _____
15. messenger _____
16. leg muscle _____

17. road _____

18. payment _____

19. fabric _____

20. tablet of sheets _____

21. alien farmworker _____

22. priest _____

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