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The Effectiveness of Imagery Interventions on the Vocabulary Learning of

Second Grade Students

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### **Abstract**

This study investigated the impact of imagery interventions on the vocabulary acquisition abilities of second grade students. Participants were randomly assigned to three different conditions: word only, dual coding, and image creation. Students were measured on the amount of words they successfully acquired. While no significance was shown between the interventions across word categories, a significant difference was found between the image creation and word only interventions within the science terms category. Students reported that the imagery interventions facilitated the ease with which they learned the words. This has implications as to the successful presentation of vocabulary in the classroom.

**Keywords:** vocabulary acquisition; vocabulary interventions; dual coding; imagery; early elementary children

## The Effectiveness of Imagery Interventions on the Vocabulary Learning of Second Grade Students

### **Overview**

Reading comprehension is a skill which requires a student to recognize words in text and understand their meanings. Vocabulary knowledge enables young students to read proficiently and grasp the material. While there are a variety of methods for enhancing reading comprehension, text simply cannot be understood without knowledge of the words it contains. Vocabulary instruction helps students understand the meaning of words, and is crucial if students are to learn content from their school curricula. Not only does vocabulary enable more proficient reading, but the more reading a student does, the better his/her vocabulary.

Two main avenues of research with regards to vocabulary and reading comprehension will be explored in this paper: the instruction of isolated vocabulary words, and the enhancement of text comprehension through the imagery associated with the vocabulary. This is a preliminary study that links these two areas in an effort to suggest ways to enhance the effectiveness of classroom vocabulary instruction.

### **Background**

#### **Reading Comprehension**

Reading comprehension is the process of constructing and reconstructing meaning from printed material (Miller, 1993). This meaning emerges from the interactions that occur between reader and text, and between the knowledge, skill, and motivation of the reader (Aarnoutse &

Schellings, 2003). Reading comprehension is an interactive process, which requires an individual to access his/her prior knowledge.

Reading comprehension requires not only the skills associated with reading such as accurate and fluent word recognition, but also the knowledge of syntax and vocabulary (Goldenberg, 2008). Snow (1999) explains that productive reading comprehension can be considered in terms of three factors: concept and vocabulary development, ability to understand the linguistic structures of the text, and metacognitive control of comprehension. Knowledge of vocabulary is very important for young readers as it enables them to read proficiently and comprehend the material. There are many different methods for enhancing reading comprehension, one of which is through vocabulary development.

### **Reading Comprehension and Vocabulary**

Vocabulary instruction and reading comprehension are intertwined. Enhancing the development and growth of the vocabularies of children enables them to better comprehend what they read, as struggling readers' comprehension improves with vocabulary instruction (Rupley, 2005). Furthermore, Cunningham and Stanovich (1997) have shown that knowledge of vocabulary assessed in the first grade predicts over 30% of reading comprehension variance in the 11<sup>th</sup> grade.

Not only are these two constructs related, but there is a unique reciprocal relationship between reading comprehension and vocabulary. Vocabulary knowledge is a significant predictor of comprehension, as knowing the meaning of the words in a text is necessary for understanding it (Braze, Tabor, Shankweiler, & Mencl, 2007). While a good vocabulary base is needed to comprehend the text one reads, the more reading an individual does, the better his/her vocabulary becomes. Vocabulary and reading comprehension '...share a nurturing relationship,

each supporting the growth and development of the other' (Rupley, 2005, p. 203). It has also been found that vocabulary growth and development of reading comprehension are mutually reinforcing between the second and sixth grade (Aarnoutse & van Leeuwe, 1998).

### **Dual Coding**

Whereas the idea that vocabulary instruction is essential to young learners is commonly accepted, the ways in which interventions are implemented vary. There are a variety of techniques based upon different theoretical accounts which can aid students in their development of word knowledge and reading comprehension, one of which is the dual coding theory. The dual coding theory suggests a link between vocabulary presentation and reading comprehension, and as such is used to frame the design of a vocabulary intervention in the present study.

Paivio's dual coding theory offers the most comprehensive account of the relation between imagery and verbal processes. This theory posits that cognition consists of two separate, but interconnected and interacting mental systems: a verbal system for language and a nonverbal system for imagery. These systems are only partially connected and can function independently or in an integrated fashion.

Dual coding theory assumes that information stored in two codes is better comprehended and remembered than that which is stored in one code. This is because when information is encoded verbally and nonverbally '...the information is elaborated, promoting increased comprehension and a strengthened memory trace' (Sadoski, Goetz, & Fritz, 1993, p. 291). There is an additive effect of dually coded information, in that knowledge stored this way is remembered twice as well. The ratio, however, is modified by factors such as readability, context effects, and/or context familiarity (Sadoski, et al., 1993).

Dual coding theory applies to reading as it explains the comprehension of words, phrases, and sentences in different contexts. The self-generated images a reader forms may ‘...constrain and specify the set of subsequent probable wordings by nonverbal means, and also expands the episode inferentially’ (Sadoski & Paivio, 1994, p.587). Imagery helps reduce the uncertainty when shaping meaning from reading a text. The images evoked depend upon a particular individual’s past experiences and the situation that is described to them. This model also allows for flexibility in responses to novel situations, as meaning is determined by both the term and its connections to nonverbal world knowledge. Sadoski and Paivio (1994) offer an eloquent explanation in that ‘...for language to make sense, it is necessary for it to be both semantically and syntactically systematic and to conform to the nonverbal world in some imaginable way’ (p. 590).

### **Imagery**

When examining vocabulary interventions and techniques to facilitate the comprehension of reading passages, it is important to discuss research on the formation of images by students. The creation of images while one reads text serves as an aid to understanding and remembering (Sadoski, Goetz, & Kangiser, 1988). Individuals asked to create mental images of events described in sentences learn two to three times as much as those who just read the sentences aloud (Anderson, 1971). As shown by the previous section, images serve as one of the codes in the dual coding theory; however, the importance of imagery and its strong research base warrants its own detailed discussion.

There is a close relationship between imagery and reading comprehension, as the understanding of sentences, paragraphs, and passages is increased when mental images are formed (Anderson & Kulhavy, 1972; Pressley, 1976). Imagery can aid readers in making

inferences and organizing information. It has also been shown to be related to the perceptual, affective, and experiential components of prior knowledge that affect the readers' responses to text (Long, Winograd, & Bridge, 1989).

Various studies by Sadoski (1983, 1985) which examined the recall of entire stories by children in grades 3 to 5 found that there were relationships '...among reporting an image of the story's climax, the theme retelling score, and total retelling score' (Sadoski & Paivio, 1994, p. 593). This is most likely because imagery serves as a way to recollect the story as a whole. Due to these findings, it is apparent that the more imagery that is associated with a particular vocabulary word or text, the better the comprehensibility.

Imagery training or inducement can influence performance on reading tasks as well (Sadoski, 1998). It has been shown that students who are induced via pre learning instructions to generate either verbal or imaginal schemas outperform subjects who are not (Levin, Davidson, Wolff, & Citron, 1973). Teaching children to construct mental images as they read has also been shown to enhance their abilities to make inferences, predictions, and to remember what has been read (Gambrell, 1983; Pressley, 1976). In the current study, in one condition, students are instructed to create images to help them remember vocabulary words. In another condition, they are provided with the image by the researchers.

## **Present Study**

### **Rationale**

While the idea that vocabulary is essential to young readers is commonly accepted, the types of interventions implemented vary. Research often fails to directly establish the relationship between a theory and its implementation in the classroom. There are a variety of

instructional techniques based upon different theoretical accounts, one of which is Paivio's aforementioned dual coding theory. This theory posits that information is processed along two distinct channels: verbal and visual. Research has shown that memory for verbal information is enhanced if the information is also presented visually, either real or imagined (Anderson & Bower, 1973). A comparison of imagery interventions will be made in this study to determine which is the most efficient for classroom use.

The present study focuses on three different interventions for presenting vocabulary to second grade learners: a dual coding method, in which an index card with a picture depicting the word is presented to the participants; an image creation method, in which the participants are told to create an image of the word in their heads and to draw the picture on paper; and the verbal presentation of a word. The purpose of this study is to investigate the practical significance of imagery interventions in facilitating the vocabulary learning of second grade students.

Stahl and Fairbanks (1986) cited the need for researchers to examine the depth of processing experimentally in relation to vocabulary instruction. The interventions used in the present study increase the depth at which the vocabulary is processed, by adding an imaginal component, and linking the verbal code to the visual code. Using this framework, the image creation method would be the intervention which is processed at the deepest level as the participant must become active in the process of forming an image and drawing it on paper. The dual coding method would also require deep processing. However, since the picture is provided, it does not reach the depth of processing of the image creation intervention. The shallowest level of processing would occur in the word only presentation, as students are presented with a word in the verbal pathway.

## Hypotheses

It was hypothesized that when students are instructed via imagery interventions, they would demonstrate better mastery of the vocabulary than when presented with only the word, because including both a verbal context and imagery creates a highly effective combination for learning vocabulary (Sadoski, 2005). Therefore, students should demonstrate higher levels of vocabulary acquisition after the dual coding and image creation interventions compared with the word only intervention.

Based on the research, the specific questions to be investigated by this study are as follows:

1. Does the depth at which the students process the words influence acquisition of the vocabulary?
2. Are the imagery interventions more effective than the word only intervention, being that imagery activates both codes?
3. Is the image creation intervention more effective than the dual coding intervention, as the information is processed at a deeper level, or is dual coding more beneficial as students are provided with the picture?
4. Do student responses garnered from the discussion corroborate the quantitative results?

## Method

### Participants

Fifteen second grade students from a private elementary school in West Hempstead, New York participated in this study. The sample of individuals consisted of six females between seven and eight ( $M = 7;8$ ) and nine males also between seven and eight ( $M = 7;5$ ). The class was 100% Caucasian and all were competent speakers of Hebrew and English.

## Measures

**Pretest and Selection of Words.** Students were given a vocabulary pretest, including three sections of 10 words, dealing with animals and habitats, musical instruments, and science terms. Students were instructed to write the definition of the word on the lines provided. A definition was only considered correct if it made a clear distinction between the word in question and the other words in the category.

Thirty nouns were selected, and from those, twenty-one were taught to the students, seven from each group. Nouns were chosen that were at a level above the students' current grade, and were also selected based upon the likelihood that they facilitated mental imagery. They were selected from the Animal Habitats bulletin board set (Eureka, 2001), as well as the websites of the Dallas Symphony Orchestra Association (2006) and Edventures (n.d). The words that were retained are shown in Figure 1 below.

Animals and Habitats	Musical Instruments	Science Terms
<ol style="list-style-type: none"> <li>1. Caribou</li> <li>2. Hippopotamus</li> <li>3. Macaw</li> <li>4. Prairie</li> <li>5. Rhinoceros</li> <li>6. Savanna</li> <li>7. Toucan</li> </ol>	<ol style="list-style-type: none"> <li>1. Castanets</li> <li>2. Cello</li> <li>3. Harp</li> <li>4. Harpsichord</li> <li>5. Oboe</li> <li>6. Piccolo</li> <li>7. Trombone</li> </ol>	<ol style="list-style-type: none"> <li>1. Cotyledon</li> <li>2. Dry Cells</li> <li>3. Filament</li> <li>4. Fungus</li> <li>5. Funnel</li> <li>6. Greenhouse</li> <li>7. Microscope</li> </ol>

*Figure 1.* Words from each category that were instructed during the interventions.

**Definitions presented.** Definitions adapted from Merriam-Webster's Collegiate Dictionary (1996), Dallas Symphony Orchestra Association (2006), and Edventures (n.d.) were

given. Definitions were simplified to provide a clear understanding of the word suitable for second grade students.

**Selection of Pictures.** The pictures used for the dual coding intervention were found through a Google image search and taken from the Dallas Symphony Orchestra Association website (Dallas Symphony Orchestra Association, 2006). The pictures chosen were those that depicted the definitions clearly and were easy to see.

**Prior Vocabulary Knowledge.** The *Peabody Picture Vocabulary Test-III, Form B* (PPVT-III, Dunn & Dunn, 1997) was used to measure the students' vocabulary knowledge prior to the interventions. This is a norm-referenced measure of receptive vocabulary and a screening measure for verbal ability (Coyne, McCoach, Loftus, Zipoli, & Kapp, in press). It is an individually administered, norm-referenced, wide-range test (Dunn & Dunn, 1997). The test shows a median internal consistency of .95, and median test-retest reliability of .92 (Pearson, 2006).

**Vocabulary Comprehension.** Twenty four hours following the instruction of each of the three groups of seven new vocabulary words, students were assessed as to their comprehension of the words taught by an experimenter designed vocabulary test. These tests were similar to Cloze tests in that they consisted of simple stories with blanks in place of the vocabulary words instructed. Five vocabulary words were used in each story, but all seven words that the students were instructed on for each section were presented in the word box. This required students to not only remember the definitions of the vocabulary words they were taught, but also to have selected the specific words that made sense in the context of the story. The stories were reviewed by a first grade teacher unaware of the specific nature of the study to make sure that the

difficulty level of each of the stories was similar. See Appendix A for a sample comprehension test.

**Small Group Discussion.** The researcher asked students in their groups to describe what methods they used when attempting to learn and remember the vocabulary words that were presented to them. This was used as a fidelity check. In other words, the researcher was able to gauge whether or not the participants were using the intervention method to which they were assigned, or whether they were using their own strategies to help them remember the vocabulary words. This also gave a sense of what the students felt worked best for them in terms of memorization and learning. All responses were recorded by the researcher in a notebook while the students were speaking. See Appendix B for the questions used.

### **Interventions**

Three different interventions were utilized in this study to manipulate the amount of imagery the students used when learning the vocabulary words. There was a dual coding intervention, in which the vocabulary word was paired with an image; an image creation intervention, in which the students were responsible for creating their own image and drawing it; and finally a word only intervention, in which no imagery was used. A training condition was implemented at the beginning of the study to familiarize the students with the tasks.

**Training condition.** Before each intervention was carried out by the researcher, a training condition was conducted using the word 'dog.' Each group was instructed via the intervention they were assigned to on the first day of experimentation. For example, on the first day, the students assigned to dual coding were shown a picture of a dog; the image creation treatment participants were told to come up with an image of a dog in their minds and to draw it; and the word only treatment participants heard the word dog repeated a second time.

**Word Only Presentation.** For the word only treatment, a variation of the procedure used in a 1978 study by Hargis and Gickling (as presented in Sadoski, 2005) was used. In this study, the researcher first presented the participants with the word written on a 4”X 6” flash card. Second, the researcher pronounced the word. Third, the researcher provided a sentence containing the word. Fourth, the researcher gave the participants the definition of the word, and fifth and finally, the researcher repeated the word.

**Dual Coding Presentation.** For the dual coding intervention, the aforementioned procedure was carried out. However, instead of repeating the word, as in step five, the researcher presented a picture of the word.

**Image Creation Presentation.** The procedure used for the dual coding presentation was repeated; however, instead of showing a picture, the researcher instructed the student to create a mental image of the word and to draw it on a sheet of 8 ½” X 11” paper. The decision to have the participant draw the word was made to make the process active and to check to see that indeed an image was created in response to the word.

These three groups were shown the word, heard the word, had it presented in a sentence, given a definition, and underwent the step specific to each intervention in the same sequence in order to equalize the treatments. See Figure 2 for the format in which each intervention was carried out.

<b>Word Only Intervention</b>	<b>Dual Coding Intervention</b>	<b>Image Creation Intervention</b>
<ol style="list-style-type: none"> <li>1. Participant presented with word on flash card</li> <li>2. Word pronounced</li> <li>3. Word used in a sentence</li> <li>4. Definition of word given</li> <li><b>5. Word repeated</b></li> </ol>	<ol style="list-style-type: none"> <li>1. Participant presented with word on flash card</li> <li>2. Word pronounced</li> <li>3. Word used in a sentence</li> <li>4. Definition of word given</li> <li><b>5. Picture presented on flash card</b></li> </ol>	<ol style="list-style-type: none"> <li>1. Participant presented with word on flash card</li> <li>2. Word pronounced</li> <li>3. Word used in a sentence</li> <li>4. Definition of word given</li> <li><b>5. Student instructed to create a mental image and draw it on paper</b></li> </ol>

*Figure 2.* Format of the interventions used in the study.

### **Procedure**

A Latin square experimental design was used for the present study. Students were asked to verbally assent to take part in the study, and if they did, were given an informed consent form to have their parents fill out. Once the informed consents were received from the participants, the experimenter began pretesting.

Students were assigned numbers 1 to 15, and were informed that they would use this number throughout the experiment to identify themselves. They were to write their number on the top of every sheet they handed back to the experimenter. The second grade teacher and the researcher were not able to match the student to his/her code number, protecting the students' confidentiality and anonymity.

Students were then given the 30 question vocabulary definition pretest. Students were given 25 minutes to complete the pretest. The researcher read the passage one time saying 'blank' wherever a space was left open to fill in words. This was done to be certain that every participant understood the story and was able to go through it at least once.

The results of the quizzes were analyzed and from these words, 21 were selected, seven from each section, each of which 80% or more of students were unfamiliar with. These words were considered those which the students had not currently mastered, and were taught to them in the intervention conditions.

The *Peabody Picture Vocabulary Test-III* (PPVT-III, Dunn & Dunn, 1997) was administered to each student the week following the pretest. This was used to assess the participants' initial vocabulary knowledge abilities. Students were removed from the classroom one by one for approximately 12 to 15 minutes to complete this assessment.

After the initial testing, students' numbers were picked out of a hat to randomly assign them to three groups of five. Following the assignment to groups, on the first day of experimentation, words one through seven were instructed. Group A was trained using the word only presentation script, and was taught the seven words by this intervention method. Group B was trained using the dual coding presentation script, and was instructed on the meanings of the seven vocabulary words via this intervention method. Group C underwent training and the intervention using the image creation presentation. While each group went through training and the intervention, the other groups continued with their normal classroom activities. Each group was removed from the rest of the class for at most 20 minutes.

On the second day of experimentation, which occurred 24 hours after the initial instruction of words one to seven, students were tested on their vocabulary knowledge of this first septuplet of words using the experimenter designed vocabulary test. The test required students to select five of the seven words to fill in the blanks of a passage. The entire class was tested at the same time and was given 15 minutes to complete this test. Then, each group of

students was questioned, group by group, as to the methods they used during the last class and what helped them remember the definitions.

The instruction of words, comprehension tests, and small group discussion were repeated an additional two times over the following two weeks. Each group of students was exposed to each intervention. See Appendix C for the sequence of the interventions for each of the groups corresponding to the vocabulary words instructed. Figure 3 below summarizes the procedure used.

<b>Procedure Used</b>
<ul style="list-style-type: none"> <li>▪ Verbal assent from students</li> <li>▪ Informed consent</li> <li>▪ Assignment of numbers to students</li> <li>▪ Vocabulary pretest</li> <li>▪ Selection of words</li> <li>▪ PPVT-IIIB</li> <li>▪ Random assignment of students to Groups A, B, and C</li> <li>▪ Instruction of words 1-7</li> <li>▪ Vocabulary outcome measure 1 and small group discussions</li> <li>▪ Instruction of words 8-14</li> <li>▪ Vocabulary outcome measure 2 and small group discussions</li> <li>▪ Instruction of words 15-21</li> <li>▪ Vocabulary outcome measure 3 and small group discussions</li> </ul>

*Figure 3.* Procedure used during the study.

### **Statistical Analyses**

Statistical analysis enabled researchers to determine how effective the three interventions were in improving the participants' reading comprehension. To handle the missing data, the scores for the outcome measures of the students present in the group for that particular category and intervention were averaged. This value was entered as the missing participants score. This

was a reasonable way to approach the missing data as it was the mean of all other students undergoing the same combination of category and treatment.

To test if group placement affected the results of the vocabulary outcome measures, a one-way ANOVA was carried out. In order to examine the possible significance of chronological age, the median was computed. Chronological age was dummy coded to reflect those below the median and those at and above the median, and a one-way ANOVA was conducted. To examine whether initial vocabulary ability influenced the outcome measures, the same procedure was carried out.

To examine any effects due to the interventions the students used across the word categories, a repeated measures of analysis was carried out. Finally, data was separated by category of words, to examine if there were any interesting trends within each category, and an additional three one-way ANOVAs were carried out. This determined which intervention worked the best within each word category.

## **Results**

### **Results by Grouping of Students**

Results were not statistically significant  $F(2,12) = 2.732$   $p = .105$ . This shows that random assignment equalized the groups.

### **Results by Chronological Age**

The median of the students' chronological ages was 91 months. Those below 91 were dummy coded as 0 and those at or above the median were dummy coded as 1. Differences were not significant  $F(1,13) = 3.455$   $p = .086$ .

### Results by Initial Ability

PPVT age equivalency was used as a measure of initial ability. The median PPVT score was 94 months of age. Those below the median were dummy coded as 0, and those at or above the median were dummy coded as 1. Once again, differences were not statistically significant  $F(1,13) = .290$   $p = .599$ .

### Results by Intervention Type

There was no statistically significant difference between the interventions  $F(2,24) = .170$ ,  $p = .845$ . However, it is interesting to note that the mean of the dual coding group was 4.00 words correct, which was higher than the image creation group ( $M = 3.58$ ) and word only group ( $M = 3.50$ ), but the difference was not statistically significant.

### Results within each Word Category

**Animals and Habitats.** The first one-way ANOVA examining the differences between the three interventions for the animals and habitats category did not demonstrate significant differences between them  $F(2,12) = .894$ ,  $p = .435$ .

**Musical Instruments.** The second one-way ANOVA, examining the differences between the three interventions within the musical instrument words, did not show a significant difference either  $F(2,12) = .968$ ,  $p = .408$ .

**Science Terms.** The third one-way ANOVA examining the differences between the three interventions within the science terms, demonstrated a significant difference  $F(2,12) = 6.500$ ,  $p = .012$ . Tukey post hoc analysis showed that the difference between the word only intervention and the image creation intervention was significant ( $p = .012$ ). Those in the image creation intervention acquired a significantly greater amount of vocabulary words ( $M = 4.50$ ) compared with the students who used the word only intervention ( $M = 2.50$ ).

### **Results of Small Group Discussions**

Small group discussions were used to examine the methods the students used when learning the vocabulary more closely. They also served as a check for fidelity to the treatments.

While those in the dual coding treatment did not perform the best, participants mentioned how much the pictures helped them during the small group discussion. One student who underwent the dual coding intervention for animals and habitats said in reference to the hippopotamus, 'I just remembered fat because of the picture.' Another student said 'I liked the drawings.' While some explicitly mentioned the use of pictures, other students in the dual coding treatment group said 'The test helped me remember the words' and 'I just remembered them.'

In discussion with students about the image creation intervention, one commented, 'If I draw it, it might not come out how it looks. Seeing pictures helps me.' For this student, the image creation approach to word learning is difficult. The presentation of a picture, as in the dual coding intervention, is best for facilitating learning, demonstrating that imagery is beneficial, when it is created for the student. Another student said, 'If I get my pictures back it's easier. If not, it's not easier.' Another one said 'Drawing pictures is better because you don't need anything else, because you can memorize it.'

### **Discussion**

No significant differences were found for the interventions across all of the word categories. This may be because of the small sample size and difficulty in getting the students to remain on task. In the future a larger sample should be sought.

Within each category, no significant differences were found for the animal and habitat words or the musical instrument terms. However, within the science terms category, the

vocabulary outcome measure showed a significant difference between the image creation intervention participants and those in the word only intervention. This demonstrates that the creation of images facilitated vocabulary acquisition within this category of words. This was also the intervention which allowed for the deepest level of processing.

The reason why the image creation intervention produced a difference in the science terms category, but not in the animals and habitats or musical instruments categories, is not clear. Perhaps the science terms presented more of a challenge to the students, making them rely on the vocabulary learning intervention strategies more.

The small group discussions also demonstrated that the participants found imagery to be useful. Most of the students said that the interventions that used images, image creation and/or dual coding, had been the most helpful in aiding them with the memorization of the vocabulary words. They explained that being able to visually see the words helped them remember the meanings.

It is interesting to note, that while the image creation intervention was significantly more effective than word only for the science terms, many students described the former method as being difficult. Some said that being presented with a picture of the word, as per the dual coding intervention, was the most helpful, because being presented with the picture was easier than coming up with their own images. Many students mentioned that the image creation intervention would have been more helpful if they were allowed to keep the pictures they drew or were given examples of types of pictures they were supposed to draw.

With regards to the results by initial vocabulary ability, it is interesting to note that low ability students and high ability students scored comparably on the vocabulary tests. Perhaps the interventions mediated this, as they helped the lower vocabulary ability students score just as

well as their higher vocabulary ability peers. However, further analysis would need to be conducted to determine if this was the case.

### **Limitations**

It is important to note that this study was conducted on a convenience sample of second grade students from a private school. As such, results may not generalize to different populations. The sample was also extremely small. The type of students in the school was also very unique. Instruction is disseminated in two different languages, and as such, the students have a great deal of practice learning vocabulary words.

Another limitation is the number of words that were instructed. Being that only seven words from each category were chosen, this may have created a ceiling effect. Memorization of only seven definitions may have been too easy a task for several of the students. Perhaps if more words had been instructed, a greater variation in the results would have been witnessed.

Another limitation was the individual differences of the participants, which included their prior knowledge and abilities. In terms of prior knowledge, vocabulary words which centered on content familiar to certain participants may have been more easily remembered by them. Also, Paul (1989) has found that children acquire a great deal of their knowledge from direct experiences. Some children may have had many experiences and learned numerous words, whereas others may not have had the same opportunities or learned the labels for their experiences. The administration of the PPVT-III was able to counter this limitation to an extent by ascertaining the degree of the participant's prior vocabulary knowledge. The use of words which 80% or more of the students were unfamiliar with, also removed some of influence of individual differences, as it was less likely that the students had experienced the words before.

Finally, the results of this study may not apply to vocabulary words from all disciplines and content areas. Requiring students to create their own images may not be possible in all situations. As per the dual coding theory, visual imagery may not work as effectively for abstract words. The concreteness of the vocabulary on which one is instructed plays a major role in the ability of students to create imagery and to learn it. Further research must be done to determine when imagery interventions are valuable and when they are not.

### **Future Research**

Future research should aim to determine how the interventions used in this pilot study would differentially affect students of different genders or ethnicities. Research should also aim to assess the image evoking ability of various types of words and texts. This would enable curriculum designers to implement interventions in content areas in which little to no imagery is evoked by the reading materials.

In replication of this study, effort should be taken to increase the sample size, as well as the representativeness of the sample. If a larger, more diverse sample is used, each of the groups would be more evenly mixed, and as such the results would be more generalizable to the population as a whole.

It would also be worthwhile to investigate ways in which instructors can teach second grade students to create images on their own. For example, what types of methods would help students learn to create imagery? Would simple instruction to picture the text be helpful, as per the image creation intervention? This may present a problem for such young students, and for students who are completely unfamiliar with the meaning of the term they are trying to represent. Also, how can an educator effectively stress the importance of this strategy? The composition of the images used should also be investigated. For example, does the amount of detail present in

the picture alter its effectiveness in facilitating recall and comprehension? If so, what attributes of the picture should be emphasized?

### **Educational Implications**

A large vocabulary base is strongly related to reading comprehension and school achievement (Beck, McKeown, & Kucan, 2002). Less able readers and students with poor vocabulary tend to read books with simpler levels of vocabulary and are exposed to fewer words, further perpetuating the vicious cycle. Instruction in vocabulary as early as preschool, utilizing the interventions described by this study, would be extremely beneficial.

This study has implications regarding the way to organize instruction, specifically in terms of the presentation of vocabulary. With an understanding of how students best learn new vocabulary, we can develop ways to enhance reading comprehension. We can also design interventions to target those with reading disabilities or English language learners. By providing students with effective interventions early on, we are putting them on the correct path to be skilled lifelong readers.

In this study, students reported that the imagery interventions were more effective than the word only condition. For the science terms category, the image creation intervention also produced a statistically significant difference on the outcome measures. These preliminary findings warrant further examination.

Finally, by devising interventions which prove to be educationally valuable, teachers now have options when designing instruction with the goal of enabling students to learn new vocabulary, as well as to generalize this knowledge to improvement in reading comprehension. There is also hope that by making students more aware of dual coding and image creation

techniques and their benefits for learning, they can take this knowledge, and when exposed to new vocabulary, will use these strategies on their own.

### **Concluding Remarks**

It is imperative for young readers to be capable of learning vocabulary and to comprehend the material they read. Such skills enable them to be lifelong learners, readers, and achievers. While there was no statistically significant difference between the three interventions across the categories, a difference was shown favoring the image creation intervention in the science terms category. During the small group discussions students also reported that imagery facilitated the ease with which they remembered the vocabulary words.

Many limitations confounded the results such as the small sample size, use of a convenience sample, individual differences, among others. Confounding variables, even with all of the precautions taken, are likely to arise using a second grade sample under specific time constraints. Even with these outside influences, the students reported learning a great deal and seemed to enjoy the exercises and strategies they were taught. The end result was also clear; vocabulary strategies influence learning. The participants went from not recognizing the words to being able to supply them on an outcome measure. The students will hopefully remember the interventions they underwent and will be able to apply the techniques used in their own academic endeavors.

Despite the type of intervention that is implemented, teachers must remember to stress the importance of vocabulary learning and reading comprehension strategies early on, both to further assist those who are doing well in continuing to learn and to bridge the achievement gap between students.

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**Appendix A**

## Sample Vocabulary Comprehension Test

**Science Terms**

Select the words from the word bank that best fill in the blanks. There are seven words to choose from, but only five blanks. Each word can only be used once.

<b>cotyledon</b>	<b>dry cells</b>	<b>filament</b>	<b>fungus</b>	<b>funnel</b>	<b>greenhouse</b>	<b>microscope</b>
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Henry wanted to grow some plants for his glass \_\_\_\_\_ in his backyard.

First, he spread out all of the seeds that he had, in order to look for any damages on them. He took out a \_\_\_\_\_, which is a wonderful tool for seeing small objects which are too tiny for the eye to see. He picked out all of the healthy looking seeds and planted them in the ground. He then decided to hang a heat lamp in the corner in case the air got too cold for the growing seeds. He took out two \_\_\_\_\_ and put them into the lamp to give it power to turn on. Once this was done, he took a bucket of water and poured it into a \_\_\_\_\_ to direct the water downward in a small stream across the soil. After waiting a couple of weeks, he finally saw a green \_\_\_\_\_ sprouting from the dirt. This signaled that one of his plants had begun to grow. He was very excited.

**Answers:** greenhouse, microscope, dry cells, funnel, cotyledon

## **Appendix B**

### Small Group Discussion Questions

- 1) Did you like the vocabulary game we played?
- 2) How did you remember the words? What did I tell you to do? Did you use any other specific method? Did you do anything else to remember the words?
- 3) Do you think you will remember these words?
- 4) What else may help you remember these words?

**Appendix C**

Intervention Received by Group for Each Category

	<b>Animals and Habitats</b>	<b>Musical Instruments</b>	<b>Science Terms</b>
<b>Group A</b>	Word Only	Dual Coding	Image Creation
<b>Group B</b>	Image Creation	Word Only	Dual Coding
<b>Group C</b>	Dual Coding	Image Creation	Word Only