The Effect Teaching Methods Have on the Learning of New Vocabulary for 7th Grade Students

Jennifer J. Young

The College at Brockport

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The Effect Teaching Methods have on the Learning of New Vocabulary for 7th Grade Students.

by

Jennifer J. Young
August, 1, 2006

A thesis submitted to the
Department of Education and Human Development of the
State University of New York College at Brockport
In partial fulfillment for the degree of
Masters of Science in Education
The Effect Teaching Methods have on the Learning of New Vocabulary for 7th Grade Students.

by

Jennifer J. Young

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Abstract

This study was conducted to help the author meet the instructional needs of 7th grade students in a Life Science classroom. The author used two different vocabulary instruction styles and collected data on 25 students. The first style of instruction had students complete a worksheet using the vocabulary words and then a quiz was given. The second style of instruction had the students defining the vocabulary in their own words, drawing a picture to illustrate the words, and using an antonym & synonym activity. Data was collect on student worksheets and quizzes. The results were compiled and analyzed for trends in the style of instruction and student performance. At the completion of the study, there were trends, but the results were not statistically significant. Students who performed low on the first strategy, tended to perform better on the second style. However, the data was not conclusive, and the author feels that additional research needs to be conducted before modifications are made in teaching styles.
Chapter 1: Introduction

Problem Statement

Today's teachers are constantly working to address the unique and challenging needs of each individual student that walks through their door. In recent years, the diversity of students that teachers see has been on the rise. The reason for this rise is twofold. The government has implemented new legislation with the No Child Left Behind Act that results in a wide variety of student performance levels in one classroom (David & Caprarpo, 2001). The second reason for this increase in student diversity is the ever-changing socioeconomic background of the students that enter our classrooms (David & Caprarpo, 2001). Our country is a much more culturally and economically diverse one, which results in a shift in the population of students from homogenous to heterogeneous. The constant demand results in overstressed educators who often turn to the best fit and current trends in education rather than turning to research for answers. This is the situation that is pushed even further by administrators who step into the classroom for a moment and then expect changes to be implemented from that snapshot in time.

Significance of the Problem

Current state mandates focus on increasing student literacy. New York State closely follows how well schools equip their students with reading and writing skills and closely watches for test results to be evaluated. Student success in school has been directly linked to their success in the world. Students who perceive school as a
negative experience will be less likely to further their education after completion of high school. As testing increases in schools, students are constantly aware of their successes and failures. Students perceive their test scores as a portrayal of how successful they will be and constant evaluation and low test scores leave students feeling frustrated and discouraged. Today, we have seen a drive in the workforce for high skilled employees. This makes it essential that students continue their education after high school if they want to advance their standard of living. Therefore the question becomes how can we adapt or change conventional methods of vocabulary instruction so that students that are not being served by today’s vocabulary educational methods can join those that are and therefore all students can learn?

Purpose

This research study compared two vocabulary instruction strategies in a 7th grade living environment science course. The rationale was that students were learning science vocabulary and often were feeling overwhelmed with the volume. As a result students were unable to comprehend the vocabulary and key concepts within a unit. This study examines two different scientific vocabulary instruction methods for 7th grade students.

Rationale

Test scores and student performance are closely linked to the students understanding of key vocabulary terms. Science is not excluded from this careful
Science students are also expected to show a proficiency in their content area. Students are currently being tested in grades four and eight and also on the Regent’s tests. Student success is directly correlated with the ability of students to decode and understand key terminology. In a subject that has a vocabulary load equal or greater than that of a foreign language, the approach teachers take in vocabulary instruction becomes critical (Groves, 1995). Science teachers especially need to be purposeful in their approach and type of instruction. Students who understand the terminology will be much more able to comprehend abstract concepts. The vocabulary in a typical science classroom is extensive, and if students are not given opportunities to practice, they will quickly become overwhelmed and frustrated.

**Summary**

The questions that I will address in this research study are:

1. Is strategy #1, traditional worksheets and instruction which include matching and fill in the blank activities, an effective approach to vocabulary instruction?

2. Is strategy #2, alternative worksheet, instruction, and group work which include student definitions, pictures and an antonym & synonym activity, an effective approach to vocabulary instruction?

3. Do student-learning styles impact how they learn vocabulary?

To analyze the effectiveness of strategy #1 and strategy #2, the researcher used varied instructional methods, including multiply learning styles and cooperative learning.
The challenges that teachers face in the classrooms are increasing as the demands from students, parents, administrators, communities, and the state increase. Students are very complex individuals and their needs vary greatly. As schools work to address the needs of every individual, the role of teachers is continuously being transformed. Expectations for teachers are changing and the role teachers play is evolving. As this evolution occurs, teachers need to understand their roles and how to meet the different challenges that are presented to them.
Chapter 2: Literature Review

*What are the challenges that educators face in the classroom?*

Teaching is no longer a solitary experience. There have been a lot of changes that teachers have had to adjust to. These changes range from state expectations to changes in the appearance of the student body. Pre-March and Post-March curriculum are phrases passed through the walls of our schools at an alarming rate as teachers struggle to teach students the overwhelming amount of material they need for the next round of State exams. There is a high need for teachers to be able to meet the diverse needs of their students. This diversity in the classroom is referred to as cultural pluralism and is defined as the ability for a population to maintain their individual identity while sharing equitably in a larger structure; such are political, economic, or social (Ovando & Collier, 1998). Cultural pluralism is not something that will simply go away if ignored, in fact Fuchs, Fuchs, Mathes & Simmons, (1997) found that teachers who ignored or failed to build a classroom community started to classify students on achievement potential, which often negatively impacts the performance of the students. There are two main strategies that can be used to help teachers with this sometimes-daunting task. The first is to establish a classroom community. A classroom community gives students a place where they can develop their own abilities and allows classroom instruction for learning. The second strategy is a language art focus. This strategy focuses on the use of group discussion as a way to bridge the cultural diversity of the classroom. The strategies above are important tools that every teacher can use to help build the instructional environment of his/her
classroom. There are many challenges that occur with teaching in the diverse setting of today's schools.

According to Vander Ark (2006), roughly one third of high school graduates continue on to college. He credits this to low student expectations, lack of consistency in school curriculum, and the ever-changing school administration. There are changes as well in the work place. Students are no longer graduating from high school with enough knowledge and skills to be in high demand in the workplace. The workplace has evolved and has basic expectations that employees are critical thinkers, decision makers and problem solvers. Sixteen-hundred schools have begun the transformation process to address these issues and more. They have adopted a curriculum that focuses on rigorous, college-preparatory academics, relevance to students’ lives and interests, and relationships between students and teachers (Vander Ark, 2006). This transformation seems to be occurring across the country in large and small schools enrolling students of all economic and demographic backgrounds.

Each district ultimately is responsible for the curriculum philosophy their school adopts. As districts adopt missions that equip students for college and a challenging curriculum to support this, they must provide necessary support to teachers. The teachers must have a vast knowledge to draw upon in differentiated instruction and various teaching methods. The bottom line is that if the school doesn't improve, it will be replaced. Vander Ark (2006) gives a list of five different strategies that districts can adapt to direct school improvement. They include:

1. Provide differentiated support to schools based on performance levels
2. Be flexible with budgets to account for different schools' needs and demands
3. Use resources that support the standards, for example teaching and assessment, data and information systems for planning
4. Create a better understanding of college awareness with guidance and academic support
5. Get the community involved and encourage public-private partnerships

Ultimately, the bottom line is that schools need to focus on preparing the maximum number of students for college work. As schools move toward this goal, there will be a shift in student performance to meet the higher expectations of the schools. (Vander Ark, 2006)

We cannot ignore the wide level of capabilities of the students that walk through the doors of our classrooms. This variance includes students with differing academic, social and behavioral skills. Teachers appear to be the best school resource for identifying students who have at risk behaviors as early as first grade (Lane, 2003). In addition to identifying students who need more support, teachers are being asked to provide evidence based intervention to prevent learning and behavior problems (Lane & Menzies, 2005). Lane & Menzies (2005) conducted a study that looked at a two-tiered support system. The first tier consisted of primary intervention, typically occurring within the classroom in the form of differentiated instruction. The secondary intervention was in the form of smaller classrooms with more direct instruction. The study involved 86 students of various ages, first through sixth grades, who were a part of a multilevel intervention system. Teachers who participated in the study nominated up to three students for each of four different categories. The
categories included: academic concerns only, behavioral concerns only, academic and behavioral concerns and typical performance. Table 1 illustrates the breakdown of these three categories.
Table 1

*An overview of concerns* (adapted from Lane & Menzies, 2005)

<table>
<thead>
<tr>
<th>Type of Concern</th>
<th>Description of Concern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Concern</td>
<td>Students had trouble with reading and written expression:</td>
</tr>
<tr>
<td></td>
<td>- Slow oral reading</td>
</tr>
<tr>
<td></td>
<td>- Difficulty sounding out new words</td>
</tr>
<tr>
<td></td>
<td>- Limited literal comprehension of text</td>
</tr>
<tr>
<td></td>
<td>- Poor recognition of common sight words</td>
</tr>
<tr>
<td></td>
<td>- Trouble constructing paragraphs using proper grammar</td>
</tr>
<tr>
<td></td>
<td>- Difficulty generating writing topics</td>
</tr>
<tr>
<td>Behavioral Concern</td>
<td>Students exhibited inappropriate behavior including:</td>
</tr>
<tr>
<td></td>
<td>- Disrupting others</td>
</tr>
<tr>
<td></td>
<td>- Defying teachers</td>
</tr>
<tr>
<td></td>
<td>- Arguing</td>
</tr>
<tr>
<td></td>
<td>- Being off task</td>
</tr>
<tr>
<td></td>
<td>- Interrupting others</td>
</tr>
<tr>
<td></td>
<td>- Being aggressive</td>
</tr>
<tr>
<td></td>
<td>- Deliberately annoying others</td>
</tr>
<tr>
<td>Academic and Behavioral</td>
<td>Students who exhibited a combination of characteristics from academic concerns and behavioral concerns.</td>
</tr>
<tr>
<td>Concerns</td>
<td></td>
</tr>
<tr>
<td>Typical Performance</td>
<td>Students were selected randomly from each classroom that was average to near average in academic and behavioral categories.</td>
</tr>
</tbody>
</table>
The study results showed that teachers are a reliable source of information when attempting to discriminate between students with and without academic and behavioral concerns. Through the two tier intervention program, students that were identified as having academic or behavioral problems showed a significant increase in scores when compared to the typical performance students. Also, with the proper program, students can perform at much higher levels. These results suggest that teachers should rely heavily on what classroom performance is telling them about their students.

With the variety of students that teachers work with in their lifetime, there are specific expectations that teachers form regarding student performance, classroom behavior, and the social skills of the students. Lane, Wehby, and Cooley (2006) conducted a study that examined teacher expectations of students at different grade levels. The study looked at 717 students from elementary, middle and high school classrooms. Some of the target areas that teachers were looking at included following directions, ability to ask for additional help, ignoring peer distractions, and managing conflicts between peers and adults. In addition teachers of all grades looked for students that are able to demonstrate self-control and cooperation. Students who failed to meet these expectations had a greater risk of undesirable outcomes in and out of school. The two primary objectives of the Lane, Wehby, and Cooley (2006) study were: a) to replicate previous study’s results examining teacher expectations through looking at grade level relationships and type of program to teacher perceptions of
student behavior and; b) to extend the question to see if high risk schools and low risk schools placed the same degree of importance on different student behaviors.

The researchers administered a survey that was anonymously completed. Forty-three schools in the district took part in the survey, which contained two sections. The first section asked teachers to rate 30 different student’s social skills; the second section collected data regarding teacher demographics. Through a series of ANOVAs, the data indicated some trends among grade levels. Middle and elementary schools’ general education and special education teachers seem to have similar expectations for students. The high school special education teachers place a higher level of importance on self-control than the general education teachers. Overall, the majority of elementary and middle school teachers identified 10 skills as critical for success in school. These skills focused on self-control and cooperation. The high school teachers rated 7 skills as critical (self-control and cooperation). Conversely, the skills teachers felt were not important for success included the ability to introduce themselves to new people and the ability to give compliments to the opposite sex as not being important to student success. The final results of the study also showed that the teachers’ expectations for student self-control and assertion skills were higher for high-risk schools. This study led to some interesting data in relation to teacher expectations of students and behavioral norms. The study indicated that students who did not meet teacher expectations were more likely to underachieve academically and struggle with social relationships.
What is the best research based approach to science instruction?

The United States is not the first country to struggle with the large quantity of science material that students need to understand. Korea has had seven curriculum reforms since 1949. Each reform has reflected the education trends of its time period. Lee (1999) examined the most recent science curriculum in Korea and compared it to the previous four reformed science curriculums. He found that the previous curriculum contained a vast amount of content area that needed to be covered and that it was very difficult for teachers to link material across grade levels. The new curriculum that was developed has attempted to take these difficulties into account. The curriculum pared the science content down to bare necessities and, based on the cognitive conflict model (see figure 1), teachers are now working with the students to develop an inquiry based teaching strategy. The conflict model works to explain how different concepts are related to each other in four ways; through prior knowledge and misconceptions, through knowledge gained by instruction, through the environment that may be well explained from prior or existing knowledge, and through the different conflicts that are a part of gaining new knowledge.
Figure 1.

*The conflict model (Kwon 1989).*

![Conflict Model Diagram](image)

Figure 1 is divided into two parts, the upper level represents cognitive development and the lower level represents the environment. Lee (1989) suggests that as cognitive structure is exchanged with science concepts, the student will shift through the chart. C1 represents students’ prior knowledge and misconceptions. C2 represents science concepts learned. R1 represents the environmental concepts directly related to C1 and R2 represents environmental concepts directly linked to C2. The conflicts represented in the model show how the different thoughts can be categorized and then used to teach. This model allows for teachers to predict the weaknesses in student’s thoughts and then to address these challenges as they teach.

There are a number of different methods that have been developed to work through the model in figure 1. Kwon (1989) suggested three different models of
conceptual change: concept expanding, commutative, and revolutionary. Concept expanding change occurs when the old concept is more specific than the new concept. This type of concept is one that occurs typically with expanding variables. Commutative change occurs when the new concept is no more specific than the old concept. The term conceptual change is not applicable because there is no change in understanding. This lack of change is because the two concepts are at equilibrium and the understanding of one concept does not change the understanding of the second concept. Revolutionary concept change is the key type of change in the cognitive conflict model. This change results in the maximum cognitive conflict, which will play a key role in instruction. Each of these three models helps teachers develop student understanding while using an inquiry based approach to science education.

There have been numerous models introduced that have attempted to answer the questions on how to best meet the needs of students and how to work through student misconceptions to increase the learning effectiveness of a teaching method. Appleton (1990) presented a learning model that was based on the Piagetian ideas of equilibrium, assimilation, disequilibrium and accommodation. The model was analyzed to see what different teaching strategies could be gleaned, specifically when looking at teacher interventions, which could facilitate students’ learning. The interventions that are a part of this model look to build upon student preexisting knowledge of a particular content area. These interventions are then applied to other teaching approaches. This includes but is not limited to: interactive approach and generative learning teaching model. The interactive teaching model approach is
composed of 5 key steps. These steps are preparation, exploration, children’s questions, specific investigations, and finally reflection. The focus of this model is child-centered exploration with teacher insight. The generative learning teaching model approach focuses on conflicts students have with preexisting knowledge that is incorrect and uses this conflict to generate a change in student understanding. The Generative Learning Teaching Model approach relies a great deal on the skill of the teacher in implementing a number of steps: preliminary, focus, challenge, and application. The Generative Learning Teaching Model has conception points that follows the beliefs of inquiry based education closely.

Teaching inquiry based science is not a new concept, however it is a difficult task to completely achieve in the classroom. Flick (2003) looked at scaffolding as instructional support. The term scaffolding in this context refers to the students’ knowledge as the temporary support for the introduction of new ideas. This relates to the Figure 1 presented by Kwon (1989). Scaffolding helps students comprehend the relationships between concepts by applying science knowledge to pose testable questions, manipulating materials, gathering data, evaluating relevance, and making conclusions based on these ideas (Flick, 2003). Some of the key elements of scaffolding instruction (Flick, 2003, adapted from Palincsar, 1986) include:

- Selection of task that teaches a skill that develops in the learner
- Evaluate task for difficulties it will present to learner
- Structure opportunities for student participation
- Render the task accessible to learner
- Accentuate critical features of task
• Organize task for presentation
• Identify and represent appropriate approaches to the task
• Identify and represent approximations of successful completion
• Elicit and sustain interest
• Design assessments to calibrate the level of difficulty
• Provide learner with feedback on her production and on correct production
• Adjust levels of instructional support toward gradual withdrawal

Through this approach to instruction with using scaffolding, the implications are really based either on new content or on cognitive skills. Students are able to develop cognitively, with structured practice within a subject matter, as a result of scaffolding techniques. This approach is a way to take the ideas of Kwon and apply them more directly to teaching science curriculum.

According to the NRC (2000) standards, inquiry engages students in a level of learning that goes beyond hands-on experiences and gives students the opportunity to actively engage in the process of making sense of scientific ideas. The actual process of inquiry based teaching varies with the level of teacher insight and student ownership. The different levels of inquiry based learning were more clearly defined by Tafoya, Sunal, and Knecht (1980) into 4 levels of inquiry based teaching. They are confirmation activities, structured-inquiry activities, guided-inquiry activities, and open-inquiry activities. Confirmation activities require students to verify concepts through a given procedure. Structured-inquiry activities provide students with a guiding question and procedure to follow. Guided-inquiry activities provide students with a guiding question and suggested materials; however, the students design and
direct the investigation. Open-inquiry activities require students to generate their own research question and design their own investigation.

Teaching inquiry based science does not start with the middle or high school learner. This type of instruction must start with the early learner in order to train the student to ask and answer questions, conduct investigations, and apply problem-solving skills to their lives (Lind, 1998). In early childhood instruction, children are given the tools to learn fundamental concepts and process skills. These concepts are the building blocks for the students’ future understanding of scientific concepts. This development starts at birth as the infant begins to explore the environment around him/her. It continues in preschool and kindergarten as children begin to apply the basics of science to their lives with observations and data collection as they attempt to answer simple questions. Science learning can be categorized into three main categories, naturalistic experience, informal learning experiences, and structured learning experiences (Lind, 1998). Naturalistic experiences are where the child controls the choice and action. This is typically spontaneous and does not have a lot of adult control. The adult guides but does not give direct instruction. Naturalistic experiences occur often in a child’s life as he/she is exploring the environment around him/her. Informal learning experiences are where the child controls the choice of the activity; however, the adult will intervene and add instruction. This type of experience would most often be used in those teachable moments. It is spontaneous, and often refers to something that just occurred in the child’s life or environment. Finally, structured learning experiences are where the learning experience gives the
teacher the most control. The adult chooses the activity and provides instruction as the activity is worked through. Structured learning experiences can occur in a number of ways; this includes the teacher deciding an individual student needs additional practice with an activity or assigning a group task to provide additional practice for a larger group. The emphasis on inquiry based instruction is not focused on children discovering everything for themselves; rather it is helping students relate new concepts with concepts previously learned and to experimental results so that children see how these concepts are related.

Wee, Fast, Shepardson, and Harbor (2004) examined how students perceived inquiry based lessons when compared to traditional instruction. In their study, they used 367 students and a series of pretest, posttests, and surveys. There was a number of interesting student responses. They are summarized below in Table 2. Some results were rather surprising in that students’ responses to specific questions varied little between past science responses (PE) and environmental inquiry based experiences (EE). An example of this would be that students in both cases felt they had very little control over what took place in the classroom (item 9). There were, however, some results that were expected. For instance, EE students felt teachers lectured less and required students to analyze their own data more.
Table 2

Student comments regarding instruction (Wee, Fast, Shephardson, Harbor, & Boone, 2004)

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Item Description</th>
<th>PE Percentage</th>
<th>EE Percentage</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Textbooks used</td>
<td>80</td>
<td>49</td>
<td>0.000</td>
</tr>
<tr>
<td>2</td>
<td>Learned information</td>
<td>86</td>
<td>85</td>
<td>0.447</td>
</tr>
<tr>
<td>3</td>
<td>Learned science facts</td>
<td>80</td>
<td>81</td>
<td>0.434</td>
</tr>
<tr>
<td>4</td>
<td>Learned from classmates</td>
<td>29</td>
<td>30</td>
<td>0.378</td>
</tr>
<tr>
<td>5</td>
<td>Learned how science is part of the real world</td>
<td>75</td>
<td>74</td>
<td>0.484</td>
</tr>
<tr>
<td>6</td>
<td>Learned that history is part of science</td>
<td>40</td>
<td>46</td>
<td>0.050</td>
</tr>
<tr>
<td>7</td>
<td>My teacher lectured</td>
<td>57</td>
<td>46</td>
<td>0.002</td>
</tr>
<tr>
<td>8</td>
<td>I had a say in deciding what we do in class</td>
<td>12</td>
<td>16</td>
<td>0.068</td>
</tr>
<tr>
<td>9</td>
<td>My teacher did demonstrations</td>
<td>55</td>
<td>55</td>
<td>0.497</td>
</tr>
<tr>
<td>10</td>
<td>I memorized information</td>
<td>53</td>
<td>37</td>
<td>0.000</td>
</tr>
<tr>
<td>11</td>
<td>I worked alone</td>
<td>49</td>
<td>34</td>
<td>0.000</td>
</tr>
<tr>
<td>12</td>
<td>I worked in groups</td>
<td>44</td>
<td>58</td>
<td>0.000</td>
</tr>
<tr>
<td>13</td>
<td>The class would have debates about science topics</td>
<td>18</td>
<td>24</td>
<td>0.025</td>
</tr>
<tr>
<td>14</td>
<td>Students respected one another</td>
<td>55</td>
<td>59</td>
<td>0.000</td>
</tr>
<tr>
<td>15</td>
<td>I completed multiple-choice tests</td>
<td>79</td>
<td>54</td>
<td>0.000</td>
</tr>
<tr>
<td>16</td>
<td>I completed true/false tests</td>
<td>69</td>
<td>45</td>
<td>0.000</td>
</tr>
<tr>
<td>17</td>
<td>I completed essay tests</td>
<td>55</td>
<td>46</td>
<td>0.000</td>
</tr>
<tr>
<td>18</td>
<td>I completed end of chapter tests</td>
<td>77</td>
<td>56</td>
<td>0.000</td>
</tr>
<tr>
<td>19</td>
<td>I completed laboratory experiments</td>
<td>57</td>
<td>59</td>
<td>0.360</td>
</tr>
<tr>
<td>20</td>
<td>Many different science topics were covered</td>
<td>71</td>
<td>73</td>
<td>0.364</td>
</tr>
<tr>
<td>21</td>
<td>Laboratory experiments would take a class period</td>
<td>45</td>
<td>47</td>
<td>0.293</td>
</tr>
<tr>
<td>22</td>
<td>Test questions had only one right answer</td>
<td>61</td>
<td>54</td>
<td>0.020</td>
</tr>
<tr>
<td>23</td>
<td>My teacher asks questions that had only one right answer</td>
<td>60</td>
<td>43</td>
<td>0.000</td>
</tr>
<tr>
<td>24</td>
<td>I analyzed data that I collected</td>
<td>43</td>
<td>54</td>
<td>0.001</td>
</tr>
<tr>
<td>25</td>
<td>I analyzed data my teacher gave me</td>
<td>41</td>
<td>36</td>
<td>0.080</td>
</tr>
<tr>
<td>26</td>
<td>Groups of students worked together to analyze data</td>
<td>44</td>
<td>52</td>
<td>0.020</td>
</tr>
<tr>
<td>27</td>
<td>I wrote my own lab reports</td>
<td>34</td>
<td>32</td>
<td>0.301</td>
</tr>
<tr>
<td>28</td>
<td>Groups of students wrote lab reports</td>
<td>31</td>
<td>38</td>
<td>0.036</td>
</tr>
<tr>
<td>29</td>
<td>I had to take the results of a laboratory and apply it to a new situation</td>
<td>25</td>
<td>38</td>
<td>0.000</td>
</tr>
</tbody>
</table>

This study showed that inquiry based education is effective in having students extend their knowledge through laboratories and data analysis. This has implications into the application of inquiry based instruction in all classrooms. Teachers need to be vigilant in their approach to inquiry instruction. As shown in Table 2, the results were
not always statistically significant. A possible explanation for this is that teachers
slipped into the familiar approach or used inquiry based instruction as a supplement
to the ‘traditional’ approach.

There is another tool that instructors have used that has been given very little
attention in this review, that tool is peer teaching. Peer teaching is an interactive way
to allow students to actively be involved in the learning process. Educators see this,
most often, when they ask students to work together in groups. Tessier (2004),
compared student performance when students where instructed by a teacher to student
performance when peer teaching was used. After the students had taught their
individual units and the professor had taught key lessons, Tessier examined test
scores from students in four different breakdowns. He looked at student averages on
his lesson, on lessons peer taught, lessons students taught to peers and lessons after
students had peer taught. His results showed that student’s performance increased
after they had peer taught and also, that students performed best on the material that
they individually taught. These two findings support inquiry based education. In
addition, this showed the importance of creating a classroom environment where
students are personally involved in the education process.

With the transition to inquiry based instruction, there must be a shift in the
approach of the instructors. Teachers must now be focused on creating a learning
environment that encourages children to experience science rather than be informed
of science. However, teachers must remember that each student brings into the
classroom, preconceived notions of scientific concepts that then must be molded by
allowing students to prove or disprove those concepts. In the process of discovery, new concepts are continuously being added to the child’s repertoire (Kinnear, 1994). In the instruction of biology, this understanding is difficult for a teacher to enhance. Often the concepts that a student is taught lack a depth of study that students will become knowledgeable in only after many additional years of study. This presents a challenge for teachers who are constantly asked the tough questions by students. Kinnear, (1994), suggests that teachers use concept maps to help students understand how concepts link together. Concept maps would also help students see the connections between prior knowledge and new content.

As the national standards have evolved to teaching challenging science content to students in elementary and secondary schools, teachers have not always been ready to meet this challenge. Liang (1996) introduced a new constructivist science curriculum model to help teachers meet this new demand. The new model asked students to change old beliefs into ideas that were intelligible or understandable, plausible, and fruitful to them. Liang involved one hundred and twenty one students who were enrolled in an introductory science course designed primarily for elementary educators in his study. The course the teachers were enrolled in was called Introductory to Scientific Inquiry and was a prerequisite for students working to gain certification in elementary education programs. The new model of instruction that Liang designed had teachers moving from center stage to more of a sideliner. This model of instruction caused some learners to become frustrated, but also received feedback such as “interesting, stimulating, and challenging” (Liang,
1996, p. 8). Most students enjoyed the lack of lecture, but with the more advanced and abstract concepts, they felt that the additional guidance would have added much needed insight into complex principles. The students also suggested that the course would benefit from the inclusion of a basic textbook or instruction that would provide students an understanding of basic concepts. Students could then refer back to the textbook as they dove into the more complex issues. The students also felt that this approach to instruction made the instructor more available to the students. However, instead of answering questions the students had, the instructor often answered with questions of his/her own. Another result of this differentiated instruction was the requirement of alternative assessment to demonstrate the different outcomes of the new learning model. The new learning model leads to increased discussion of the new concepts being learned. This approach leads to more self-reflection on the development of science concepts, which leads to more understanding and more positive peer interactions. The final findings of the study were closely tied to the attitudes and beliefs of the instructors and students that were participating. This study had some very interesting results that foreshadowed the introduction to inquiry based instruction. Some of the keys that instructors should be aware of are that first, students want guidance from teachers regarding background information and content, second that students enjoy the freedom to share ideas with their peers and thus increase their understanding of concepts, and finally, that the outcomes of inquiry based instruction rely heavily on the attitudes and educational philosophies of the students and teachers that are participating in the instruction.
Reading for understanding is a key approach for scientific instruction according to Ediger (1994). In his paper titled “Reading in Science” he highlights a common approach that student teachers under his supervision used in the classroom. This approach is guided reading and he shows that it not only improves student comprehension, but also limits student mistakes as they approach the reading for themselves. Prior to reading the text, the teacher would use a number of different methods to familiarize the students with the new words and concepts that they will be exposed to. The first step is to use visual or audiovisual materials to supplement students’ with background knowledge on the subject. This helps students by making the more abstract concepts more comprehensible. Students need to comprehend the text in order to ask questions and hypothesize. This is important, because reading for content is not the foundation of science learning, rather testing hypothesizes is what science instruction is focusing on. Teachers should always monitor student reading to watch for weaknesses in student comprehension. As students become more fluent science readers, they will become better equipped at higher levels of cognition. This is due to the increase in analytical formation of questions as students read different texts.

What is the best method of instruction for introducing science vocabulary?

The application of inquiry based teaching to the science classroom is not an easy task. The reason for this is that science is a very complex subject and inherently there are a many abstract, complex concepts that students need to understand. Davis
and Simmit (2003) state that complex system is not just all the information that is a part of concept, rather it is all the results of a concept. The resulting interactions of a concept are what make it complex. Science inherently is made up of numerous such complex theories.

With the complexity of this content area, there is a high level of complexity in science literature. Groves (1995) examined the vocabulary load in 4 different science textbooks. The results of this study showed that there is a very high level of expectations with science vocabulary development. In comparing science to first and second year foreign language courses, the foreign language courses have an expectation of 1,447 words (Rivers, 1975). Conversely, with the exception of an Earth Science textbook, the text examined by Groves (1995) had slightly to much higher vocabulary loads. (See Table 3)

Table 3

Comparison of vocabulary terms in textbooks (Adapted from Groves, 1995)

<table>
<thead>
<tr>
<th>Text</th>
<th>X-terms per page</th>
<th>Projected total terms</th>
</tr>
</thead>
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<tr>
<td>PSSC Physics</td>
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</tr>
<tr>
<td>BSCS “Green”</td>
<td>4.69</td>
<td>1,899</td>
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<tr>
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</tr>
<tr>
<td>Earth Science</td>
<td>4.45</td>
<td>992</td>
</tr>
</tbody>
</table>

Table 3 shows that science has a very high vocabulary expectation. Some have even stated that it could be considered its own language. Piercey (1982), went as far to state that in the upper grade curriculum, probably the most difficult of all the
languages are those of the various sciences. The previous statement tells us that science as a content area has a high demand on teachers to instruct students in vocabulary. As a result, often, teachers revert to a memorizing tactic rather than learning concepts through inquiry. Groves (1995) suggests that by reducing the focus on memorizing and instead using the vocabulary to guide the students toward understanding of science concepts that the vocabulary load expectations that teachers have of their students could be lessened.

There are a number of different teaching strategies that teachers can draw upon when introducing and teaching new vocabulary words. Gunning (1998) recommends the following actions to increase student comprehension: contextualize word meanings, establish relationships, and provide multiple exposure and usage of words. Contextualize word meanings means that you should use the words within real and meaningful content area text. Establish relationships with words by helping students discover how new words are related to each other and to words they already know. Provide multiple exposure and usage of words by promoting accessibility, active manipulation, and internalization. Examples of multiple exposures for science terminology are work analogies, associations, classifications, definition examples, same-meaning words, opposite-meaning words, word origins, word parts, context clues, and closure statements.

There are a number of different types of words that are a part of science vocabulary and there are a number of different approaches to instruction. The teaching of these complex words requires the teacher to be flexible in the approach
they use. Young (2005) states, concepts germane to science education bridge the gap between language of the content and the language of the students. Young (2005) sites a number of engaged word-meaning concept strategies to help students in their science and vocabulary and concept learning. These strategies include: vocabulary TV visualization, definition maps, personal clue cards, rate your words and semantic feature analysis. Vocabulary TV Visualization strategy helps students internalize vocabulary with mental images and interest. Definition map helps students’ link ideas to concepts and key vocabulary words. Personal clue cards help students use personal cues to help them store key terms in long-term memory. Rate your words has students using a prewriting activity to evaluate level of understanding of vocabulary words. Semantic feature analysis has students mapping key vocabulary words to encourage examination of relationships among associated words and concepts.

The more time that is taken to help students develop their understanding of the science language, the better students will understand the concepts of science. Montelongo, Berber-Jimenez, Hernandez, & Hosking (2006) have developed a process of teaching students text structure that enhances student comprehension of vocabulary. This activity has roots similar to the worksheets that are typical in most school settings. It is based on the strategy of having students complete given sentences with different vocabulary. The text structure however takes this task one step farther by incorporating topical sentences into the completion activity. The students then have to complete the sentences and then write a paragraph with the related sentences, showing their usage regarding a particular subject. This approach
could be useful in content areas that have high levels of vocabulary such as science. Teachers could use this activity to allow students to not only demonstrate word comprehension, but also content understanding.

Comprehension of concepts is the ultimate result of vocabulary instruction. "In the last 10 years, researchers have credited vocabulary knowledge as the single most important factor in reading comprehension." (Laflamme, 1997, p. 372) Rosenbaum (2001) suggested that vocabulary instruction should be an active process that engages students in elaboration of word knowledge, personalized strategies, and continuous long-term growth. The instruction of vocabulary should account for knowledge of content and lead to a deeper understanding of the words and contextual meanings. Rosenbaum (2001) also suggested that as students learn vocabulary words, comprehension of the word is not achieved until the student is able to demonstrate the broader sense of the word's meaning by using sentence structure or word classification.

There are a number of barriers that students struggle to overcome as they read through any text. The list is extensive; however, Vaughn & Edmonds (2006) have narrowed the list to 6 key areas: decoding words, fluency with reading, understanding the meanings, relating content to prior knowledge, applying comprehension strategies, and monitoring understanding.

There are many different approaches to addressing these key areas. Collaborative strategic reading (CSR) is one way that has been extensively reviewed for usage with older readers, but has also had positive results with learners as young
as 4th grade. The CSR approach uses graphic organizers and teacher think-alouds. The students begin by working in large class groups and then teachers divide students strategically into heterogeneous groups. Once students are divided and assigned roles, they collectively read and understand the text that is being covered. This gives the students an opportunity to model their word attack strategies while peers are sharing input on word comprehension. Vaughn et. al. (2006) concluded their study by stating that when instructors take the time to use research-proven strategies for increased student performance, there will be positive results.

Abstract vocabulary is difficult for all learners to comprehend, however this is particularly a challenge for students with learning disabilities. Mastropieri, Scruggs, & Fulk (2001) conducted a study that examined different techniques for increasing comprehension of vocabulary when applied to students with learning disabilities. The subjects for the study were 25 students from across the Midwest who had been classified with a learning disability by either local or national standards. The students were of normal intelligence levels. The vocabulary that the researchers used consisted of 8 concrete words, 8 abstract words and 2 additional words that fell into either category. The study was composed of three main stages; keyword conditions, rehearsal conditions, and tests. Students participated either in the keyword conditions phase or the rehearsal conditions phase. All students were a part of the test phase. During the keyword phase, students were introduced to 16 target vocabulary words and given 30 seconds to learn each word and associate a picture to the meaning. Students were then asked to describe the word and the interactive picture associated
with each word once. Students, who were selected to participate in the rehearsal conditions after being briefly introduced to the target words, were then given instruction in the 16 vocabulary words. Next these students were led through word drills, rapid paced questions, and corrective feedback. Because of the format of this phase of the experiment, even though the students received the same amount of time as those in the first phase, they actually had an additional minute to spend reviewing the words.

Following the experiment, students from both phases were given one minute to write out their heading on a paper and then were given an individual recall test on the 16 words. The results of the study showed that the students who had participated in the keyword condition outperformed the rehearsal condition students in comprehension and recall. These results lead to the conclusion that keyword instruction is best for students with disabilities.

There is no question regarding the importance of vocabulary development in the obtaining of content knowledge and the fluency of a student in terms of content area. The vocabulary development of students is an area focus for area content, area teachers, and is important for student comprehension of particular science content. A teacher must pay attention to the vocabulary load that he/she is expecting students to comprehend in a lesson, unit, and year of instruction. “Too many new vocabulary teams can be frustrating for learners and too few can make for boredom.” (Ediger, 2002, p. 2) In teaching vocabulary development, Ediger (2002) suggests eight steps of vocabulary instruction: word introduction, word usage, comprehension assessment,
word practice, peer instruction, student engagement, feedback, and self-assessment. With word introduction, students should see the word neatly written. They should be provided an opportunity to read the definition of the word and if the word is more abstract, given a visual to help students comprehend the meaning of the word. Word usage is where students should be given time to use the word in a context that they understand. This includes writing or illustrating the word’s definition. Comprehension assessment means that students will be assessed by an instructor for student comprehension. Some students will need additional exposure to the word; other students will comprehend the word fully at this point of instruction. Word practice is where students will be given time to use the word in meaningful ways. Teachers should watch for students to use the new vocabulary term with a previously learned concept. In peer instruction, students will be given opportunities to instruct their peers on proper word usage and meaning. Student engagement means that the teacher needs to observe pupil engagement. Students should be actively engaged in learning the new words in this stage of instruction. If students are not engaged, then the type of teacher instruction should be varied. Feedback means that students should be encouraged to ask questions regarding the words when there is a concept or word that still seems incomprehensible. Teachers should be gauging student understanding from the feedback that is given during this stage of instruction. Self-assessment is important because students should self assess how well they understand the vocabulary. This may be completed through a series of independent questions that the learner may ask himself or herself (p. 2-3).
Teachers should use the feedback received from students to gauge the format of further instruction and the information dispensed.

This review gave a broad overview to three questions that most educators struggle with in their daily lives as teachers. The three questions were: what are the challenges that educators face in the classroom?, what is the best researched based approach to science instruction?, and what are the best methods of instruction for introducing science vocabulary? The answers to the questions are not easy and are not straightforward. There are many different approaches to classroom management, and with the classroom environment changing so drastically every year, the answers to the questions of teaching with diversity will constantly evolve to meet the needs of the students. The basic goal of the educator, however, will not change. Educators work to have measurable impact on every student that walks through their classroom. One way that teachers address this problem is with the use of inquiry based instruction. This is particularly important with scientific instruction where so much of the content is based on scientific principles that are best learned by experience and discovery. Teachers use students' current knowledge and expand upon it by using scientific discovery through experiments and other hands-on type lessons. This is important with the understanding of scientific concepts, but students must also have an understanding of the key terms in order to obtain a full plethora of scientific knowledge. By combing vocabulary terms with the understanding of science concepts, students are able to take that knowledge a step further to dig into the more abstract basis of the knowledge. Educators approach vocabulary instruction in a
number of different ways. Some of the more successful approaches include the usage of word maps and having students peer teach the words they have newly acquired. Each of these questions seemed somewhat unrelated at the beginning of the research paper, however as each was addressed individually; it was found that they were interconnected. As one question was answered, slowly the answer for the second was tied into the first. As a result of the findings, the research that follows was an accumulation of this research and examined two different forms of vocabulary instruction and student performance with each.
Chapter 3: Applications and Evaluation

Introduction

The target group for this study was 7th grade life science students. The study had two main goals, first to develop a vocabulary instructional strategy that would increase student comprehension of scientific concepts, and secondly to develop an instructional strategy that would engage students more completely in learning new vocabulary terms.

Participants

The school district which data has been collected in was located in the finger lake region of New York State. The community has a population of 10,800 people. This population was predominately white, 83%, it also is compiled of about 10% Asian decent and the remainder is divided between black and Hispanic. Ninety-three percent of the population has a high school degree or higher, 52% has a bachelor’s degree or higher and 34% of the population has a graduate degree or higher. The mean household income in 2000 was $48,250 and the average house was valued at $127,800. The school has a student enrollment of 1,320 and the student body is predominantly white. The majority of this district’s graduating seniors plan on furthering their education. Student plans include attendance at a two or four year college. The average classroom size in this district is 14 students per teacher and the drop out rate for the last three years has been under 3%. The research in this study is based on the 7th grade population, which has a class size of 98 students. The majority
of the students are white, not Hispanic and two students have English as their second language. The grouping of the class is heterozygous and there are 5 students who have IEPs. The researcher who conducted this study is the 7th grade living environment teacher at the middle school where data was collected. The researcher was teaching while the data was being collected.

**Procedures of Study**

The first strategy is compiled of a 3-step process. The first step is word introduction, which occurred during instruction time. Students had been introduced to the terms and heard them used in a formal setting. The second step was independent practice. The students were assigned a worksheet to complete as homework. The worksheet listed the words and the definitions. Students correctly match the definitions to the words. The third step was a formal evaluation of the students understanding of the vocabulary terms that they practiced.

The second strategy also had 3 steps. The first step was very similar to the prior method. Students received an introduction to the vocabulary terms during instruction time. Students during the second phase of this trial were given a vocabulary worksheet that had a number of elements. The worksheet included the terms listed on the front. Students were asked to define the term in their own words, to draw a picture that illustrates the meaning of the term and to list an antonym and synonym for each word. (See appendix Figure A1) Step three in the second trial was a
formal evaluation of student understanding (See appendix Figure A2). Table 4 has compared the two different strategies.

<table>
<thead>
<tr>
<th>Steps</th>
<th>Strategy 1</th>
<th>Strategy 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>□ Introduction to terms in the classroom</td>
<td>□ Introduction to terms in the classroom</td>
</tr>
<tr>
<td></td>
<td>□ Hear correct terms and their meanings</td>
<td>□ Hear correct terms and their meanings</td>
</tr>
<tr>
<td></td>
<td>□ Complete a worksheet that lists the words and their definitions.</td>
<td>□ Complete a worksheet that lists the term</td>
</tr>
<tr>
<td></td>
<td>□ Students match the correct definition with the correct word</td>
<td>□ Students write out the definition, draw a picture to illustrate, and record an antonym and synonym for each word</td>
</tr>
<tr>
<td>Step 2</td>
<td>□ Formal assessment in the form of a quiz.</td>
<td>□ Formal assessment in the form of a quiz.</td>
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</tbody>
</table>

The students were graded on their success in completion of the vocabulary worksheets and also on their quiz scores. The instruction took place on two different units. The first strategy was used with instruction of photosynthesis. The second
strategy was implemented on a unit regarding the five kingdoms. The same instructor was used for implementation of both strategies. Also, the same 26 students were evaluated for both strategies and were given the same amount of instructional time. The variables in this trial included the student's preexisting knowledge of the units, the student’s motivation in learning and the variation in abstract concepts and terms in the topics that were used.

**Summary**

In comparing the two vocabulary instruction strategies, the author looked at the following comparisons: comparison of average grade on vocabulary worksheets and comparison of average grade on vocabulary quizzes.

The following hypotheses were tested:

**Hypothesis #1:**
There will be no statistical significant difference between the means of the overall averages of the average vocabulary worksheets.

**Hypothesis #2:**
There will be no statistical significant difference between the means of the overall averages of the average quizzes.

**Hypothesis #3:**
There will be no statistical difference between the means of the overall averages of the vocabulary worksheets and quizzes as a result of student learning styles.
Chapter 4: Results

Research Study Results

A compilation of the results for the averaging vocabulary strategy and the average quiz strategy (Table 5) appears below.

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<th>Voc % 1</th>
<th>Quiz 1</th>
<th>Quiz % 1</th>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>95.14%</td>
<td>78.53%</td>
<td>97.60%</td>
<td>75.11%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>33.3</td>
<td>95.14%</td>
<td>22.65385</td>
<td>78.53%</td>
<td>12.2</td>
<td>97.60%</td>
<td>13</td>
<td>75.11%</td>
</tr>
<tr>
<td>ST Dev</td>
<td>3.38477</td>
<td>8.06%</td>
<td>5.781292</td>
<td>19.27%</td>
<td>0.81035</td>
<td>5.40%</td>
<td>4.805552</td>
<td>26.70%</td>
</tr>
<tr>
<td>Mode</td>
<td>42</td>
<td>1</td>
<td>30</td>
<td>1</td>
<td>15</td>
<td>1</td>
<td>18</td>
<td>1</td>
</tr>
<tr>
<td>Z-Score</td>
<td>2.57</td>
<td>1.27</td>
<td>3.46</td>
<td>1.04</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The vocabulary worksheet average score does allow for the rejection of the null hypothesis #1, which stated that there would be no statistically significant difference between vocabulary averages. Comparison of quiz scores shows that there were differences in the average score, the mean, and there was a difference in the standard deviation. The average scores for vocabulary worksheet #1 were 95.14% compared to the average score of vocabulary worksheet #2, which was 97.60%. The standard deviation, which shows the variation in average scores, was much greater for vocabulary worksheet #1 at 3.39 than for vocabulary worksheet #2 at 0.81. Table 6 shows a comparison of the scores from vocabulary sheets 1 & 2. The z-score allows the two vocabulary worksheets to be compared, taking into account the different values for each. The results show us that even though the standard deviation was much greater for vocabulary worksheet #1, when the overall points are considered, the standard deviation is not an important factor in these results.

<table>
<thead>
<tr>
<th></th>
<th>Average Score</th>
<th>Mode</th>
<th>Standard Deviation</th>
<th>Z-Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocab #1</td>
<td>95.14%</td>
<td>100%</td>
<td>3.39</td>
<td>2.57</td>
</tr>
<tr>
<td>Vocab#2</td>
<td>97.60%</td>
<td>100%</td>
<td>0.81</td>
<td>3.46</td>
</tr>
</tbody>
</table>

The vocabulary quiz average scores do not allow for the rejection of the null hypothesis #2, which was that there would be no statistical significant difference in the average quiz scores.
Table 7

*Student results on quizzes*

<table>
<thead>
<tr>
<th></th>
<th>Average Score</th>
<th>Mode</th>
<th>Standard Deviation</th>
<th>Z-Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quiz #1</td>
<td>78.53%</td>
<td>100%</td>
<td>5.78</td>
<td>1.27</td>
</tr>
<tr>
<td>Quiz #2</td>
<td>75.11%</td>
<td>100%</td>
<td>4.81</td>
<td>1.04</td>
</tr>
</tbody>
</table>

Table 7 shows a comparison of the scores from vocabulary quizzes 1 & 2. The standard deviation in both quizzes was very high. As a result of the large standard deviation, the average scores of 78.53% and 75.11% with a difference of 3.42% is not a large variant. This shows that there was a wide variation in student performance on the quizzes, and as a result the minor variation in overall averages was not significant.

The average vocabulary worksheet and quiz grades do not show a statistical difference. As a result, null hypothesis #3 was not rejected. In other words, even though the second strategy allowed for students to use a variety of learning styles while working towards mastery of the vocabulary, there was no large difference in student performance.

In comparing the data from the different vocabulary strategies, even though there was not a large statistical difference, there were some differences. Table 8 below shows the comparison of the quiz and vocabulary scores for both strategies.
Table 8

Comparison of student performance and vocabulary strategies

<table>
<thead>
<tr>
<th></th>
<th>Vocabulary Strategy # 1</th>
<th>Vocabulary Strategy # 2</th>
<th>Quiz # 1</th>
<th>Quiz # 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Score</td>
<td>91.48%</td>
<td>93.85%</td>
<td>75.51%</td>
<td>72.22%</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>3.38</td>
<td>0.81</td>
<td>5.78</td>
<td>4.81</td>
</tr>
<tr>
<td>Z- Score</td>
<td>2.57</td>
<td>3.46</td>
<td>1.27</td>
<td>1.04</td>
</tr>
</tbody>
</table>

This chart demonstrates that there was a difference in the scores. The vocabulary strategy # 2 worksheet had a higher average than the first vocabulary instruction strategy. There is also a small standard deviation with these two comparisons. Most students in strategy #1 had a worksheet score between 83.42% and 99.46%. When you compare this to the results of strategy #2, which showed most students scored between 88.81% and 98.89%, the results show there was little change in the students at the top of the class. However, when you use this calculation, it shows that the students, who scored lower on the first strategy, had a slight increase in averages with the second strategy. This is also shown in figure 2 below.

Three students decreased their vocabulary average in strategy # 2; however fourteen students had an increase in their vocabulary averages in strategy # 2. This shows that the students who did poorly in the first vocabulary strategy, on average performed better with the second vocabulary strategy.
The quiz average scores were more difficult to compare because although the averages were very similar, the standard deviation varied greatly, as shown in Table 5. The average quiz score in strategy #1 was 78.53% and the standard deviation was 5.78. This illustrates that student scores varied greatly, however the majority of the students scored between 28.43 points and 16.87 points, with a 100% being 30 points. The quiz scores for strategy #2 showed similar trends. The average was 75.11% and
the standard deviation was 4.81, which resulted in scores that range from 17.8 points to 8.19 points, with 100% being 18 points. Both strategies showed a large variation in quiz results.

Figure 3 shows the overall trends when comparing quiz scores from strategy 1 & 2. The trends show that twelve students had a lower average with the second strategy in comparison to the first. Also, eight students had higher averages on the second strategy in comparison to the first and five students had no performance change associated with the change in vocabulary strategies. The quizzes show few trends when compared student to student.

Figure 3

*Comparison of Quiz average*
On closer inspection of the two vocabulary strategies, there appears to be a causal relationship between vocabulary strategy and student performance on vocabulary worksheets, as shown in Figure 4. However, that relationship cannot be carried through to student performance on the vocabulary quizzes. Figure 5 shows the differences between the quiz score averages. This chart illustrates the wide variance in scores when comparing student performance regarding the two different strategies.

Figure 4

Comparison of vocabulary scores
Figure 5

Comparison of quiz scores
Chapter 5: Conclusions and Recommendations

Discussion

The findings of this study show little statistically significant differences in the data between student performance and the instructional strategies of vocabulary. There were however causal trends that students performed better with strategy #2 when completing vocabulary worksheets. In addition, there was a causal relationship between student performance on vocabulary quizzes and the instructional strategies used. The results from vocabulary quizzes showed that there was a slight decrease in student performance with the implementation of strategy #2. The relationships however, were not conclusive and there should be additional data collected before an alteration is made in teaching strategies.

Action Plan

There are a number of steps that can be taken as a result of these findings. First, I would like to use the vocabulary instruction strategy #2 in an additional instructional unit. I would require half of the students to complete a traditional vocabulary approach and half of the students to complete the vocabulary instructional strategy #2. This would enable comparison of the two strategies to be completed within the same instructional unit instead of two different instructional units. Once again, the data collected would include scores on student worksheets and quizzes. The same instructor would be used to implement this next step. The researcher would implement, collect and analyze all data points. This action will be conducted prior to

46
the conclusion of the 2006-2007 school year. Secondly, the researcher would alter the instruction of vocabulary in strategy #2. The instructor would give students more time during class to apply the terms in a real world setting. Students were perplexed with the antonym and synonym application. The researcher would either spend more time defining this portion of the activity or eliminate this portion from the activity.

Summary

At this point in the research, the recommendation of the researcher is that additional data collection and analysis needs to occur prior to a change in the instructional method. Research should, however continue. The current findings and results have been shared with the building administration, the 7th grade team of teachers and the science department at the middle school. Those who have seen the results also feel strongly regarding the need for further research. During the 2006-2007 school year, the author will continue her studies on vocabulary instruction by implementing the changes mentioned previously in her instruction strategy. She will collect data on student performance through the entire school year and compare student success on the two strategies, vocabulary strategy #1 and #2. At this point, the researcher feels no additional strategies are required to continue this action research. Perhaps in the future, the need for additional strategies may arise and will be researched and implemented at that time.

In conclusion, when considering the dynamics of the classroom, a teacher should implement an instructional strategy that is most beneficial to the class. This
research concludes that both strategies, vocabulary instructional strategy #1 and #2, are valuable methods to increase student comprehension of key science vocabulary terms.
References


Appendix- Figure A-1

Name: _______    Date: ___
Science, Pd: _______

Vocabulary

Kingdoms

Directions

1. Fold this sheet lengthwise on the solid line.

2. Cut along the dotted lines.

3. Write the definition of each vocabulary term on the inside right when you lift the flap.

4. Draw a picture that helps you remember the term on the inside left when you lift the flap.

5. While folded, hole punch and place in your binder.

Vocabulary: Monera
Antonym:
Synonym:

Vocabulary: Protist
Antonym:
Synonym:

Vocabulary: Fungi
Antonym:
Synonym:

Vocabulary: Protozoa
Antonym:
Synonym:

Vocabulary: Algae
Antonym:
Synonym:

Vocabulary: Eukaryote
Antonym:
Synonym:

Vocabulary: Prokaryote
Antonym:
Synonym:

Vocabulary: Hyphae
Antonym:
Synonym:

Vocabulary: Virus
Antonym:
Synonym:
## Appendix – Figure A2

Subject/Period: Science - 

Name 

Assignment: Vocabulary Quiz

Date: 

<table>
<thead>
<tr>
<th>Kingdom</th>
<th>Organism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monera</td>
<td>An organism with complex cells, including nuclei and other organelles.</td>
</tr>
<tr>
<td>Protozoa</td>
<td>Branching threadlike filaments that form the bodies of many-celled fungi.</td>
</tr>
<tr>
<td>Protist</td>
<td>A single-celled or many-celled organism that contains chloroplast, but not root system and belongs to the Protist kingdom.</td>
</tr>
<tr>
<td>Fungi</td>
<td>A kingdom compiled of mostly many-celled organisms, which have a nucleus. They cannot move and have no chloroplast.</td>
</tr>
<tr>
<td>Algae</td>
<td>A piece of hereditary material with a coat of protein.</td>
</tr>
<tr>
<td>Eukaryote</td>
<td>An organism that does not have a nuclei or organelles.</td>
</tr>
<tr>
<td>Hyphae</td>
<td>A kingdom which contains mostly single-celled organisms that do not have a nuclei or organelles.</td>
</tr>
<tr>
<td>Virus</td>
<td>A kingdom which contains mostly single-celled organisms that have a nuclei and organelles.</td>
</tr>
<tr>
<td>Virus</td>
<td>A single celled anima-like organism belonging to the kingdom Protist.</td>
</tr>
</tbody>
</table>