The Effects of the Vocabulary Think Chart Strategy on Seventh-Grade Students’ Scientific Vocabulary Knowledge: A Mixed Method Study

Paloma Ferreira, Ed.D.
Literacy Coach
Literacy Symposium – University of Central Florida
April 11th 2014
Problem Statement

- National state of adolescent literacy in the U.S.
- Low scores in standardized reading assessments.
- Students vocabulary knowledge, especially in content area classes.
- The VTC provides a vehicle for developing content-specific vocabulary instruction.
Interest in the topic

- Research topic.
- Own experiences as a second language learner.
Theoretical Framework

- **Schema Theory (Anderson & Pearson, 1984)**
  - The VTC has the potential for activating prior knowledge.

- **Depth of Knowledge Theory (Craik and Lockhart, 1972)**
  - The VTC allows for students to interact with content-specific vocabulary.

- **Zone of Proximal Development (Vygotsky, 1978)**
  - The VTC can aid students who struggle with content-specific vocabulary.
# Vocabulary Think Chart

**Student Name:**  
**Date:**  
**Period:**  
**Chapter:**

<table>
<thead>
<tr>
<th>Questions</th>
<th>Answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What is the target word?</td>
<td></td>
</tr>
<tr>
<td>2. Do you recognize any part of the word, such as prefix, suffix, or root (based word)? What does each part mean?</td>
<td></td>
</tr>
<tr>
<td>3. What does the word remind you of? Can you give a semantically related word, an orthographically similar word, or a real-life vignette triggered by the word?</td>
<td></td>
</tr>
<tr>
<td>4. How is the word defined in the text? Can you paraphrase this definition?</td>
<td></td>
</tr>
<tr>
<td>5. Can you come up with a sentence in which the target word is used in the scientific sense?</td>
<td></td>
</tr>
<tr>
<td>6. This word is part of which larger science concept? What are some other words related to this larger concept?</td>
<td></td>
</tr>
</tbody>
</table>
Methodology

Participants

- Students
  - 89 seventh-grade Comprehensive Science II students 2012-2013.
  - Treatment Group (36 students)
    - 16 females/ 20 males
    - 2 students scored at level 1 in the FCAT
    - 13 students scored at level 2 in the FCAT
    - 16 students scored at level 3 in the FCAT
    - 1 student scored at level 4 in the FCAT
    - *The scores of 4 students was not available.
    - Twelve students in the treatment group had 504 plans.
Methodology

- Participants
  - Students 89 seventh-grade Comprehensive Science II students 2012-2013.
  - Control group (53 students)
    - 11 students scored at level 1 in the FCAT
    - 16 students scored at level 2 in the FCAT
    - 14 students scored at level 3 in the FCAT
    - 3 students scored at level 4 in the FCAT
    - * Researcher did not have access to all students’ scores. Five students did not have FCAT scores because they had just moved to Florida.
    - Seventeen students in the control group had 504 plans.
Methodology

Participants

- 55 participants were attending intensive reading courses at the time of the study.
- 17 students in the control group had 504 plans.
- 12 students in the treatment group had 504 plans.
Methodology

- Teachers
  - Treatment Teacher
    - 14 years of experience
    - Experience as a reading teacher
    - ESOL certified
  - Control Teacher
    - 15 years of experience teaching science
    - ESOL certified
Research Design

- Mixed Methods design
- Prior to the Treatment Phase:
  - Three day training with the Treatment Teacher on the use of the VTC.
    - Conducted by the researcher.
    - Began with a discussion of the Treatment Teacher’s views on science learning and vocabulary instruction.
    - Modeling the use of the VTC.
    - Supportive materials on each of the VTC layers was provided to the Treatment Teacher.
Research Design

- **Treatment Phase I**
  - One week long. Conducted by the Treatment Teacher with the treatment group.
  - The Treatment Teacher modeled the use of the VTC and guided participants in the use of the VTC.
Research Design

Treatment Phase II

- Five week long.
- The participants in the study used the VTC as a post-reading activity.
- No other vocabulary instructional strategies were used during the treatment phase of the study.
- The participants in the study had the option to work independently or in groups.
Instruments

- Pre- and Post Tests
  - A 37 multiple-choice test on the science-vocabulary terms taught during the treatment phase.
  - The instrument was a book test prepared by the Treatment Teacher, in accordance with the assessment school culture.
  - Test was evaluated by five different science teachers, using a three point scale chart.
  - Results showed an even score among raters that the instrument had validity.
Instruments

- Impartial Observers: Two reading experts conducted two observations, using an observation protocol.
- Field Notes: The researcher conducted five observations of the treatment group using an observation protocol.
- Classroom Artifacts: The researcher collected students’ completed VTC during the treatment.
Observation Protocol

Observer Name: 
Date: 
Class observed: 

Direction: Please check where appropriate and add comments where necessary.

<table>
<thead>
<tr>
<th>Components</th>
<th>1- Not appropriate</th>
<th>2- Fairly appropriate</th>
<th>3- Appropriate</th>
<th>5- Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphemic analysis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Semantic analysis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paraphrasing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sentence Generation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Larger Science Concept</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher provided meaningful examples for each part of the chart</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher provided an appropriate amount of examples for each part of the chart</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Observation Protocol

Please take the time to write down any observations, questions, and implications of this strategy to science vocabulary instruction.
## Quantitative Data Analysis

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td>16.48</td>
<td>5.003</td>
<td>27</td>
</tr>
<tr>
<td>Control</td>
<td>16.05</td>
<td>6.900</td>
<td>37</td>
</tr>
<tr>
<td>Total</td>
<td>16.23</td>
<td>6.130</td>
<td>64</td>
</tr>
<tr>
<td>Posttest</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td>20.41</td>
<td>4.758</td>
<td>27</td>
</tr>
<tr>
<td>Control</td>
<td>19.59</td>
<td>6.930</td>
<td>37</td>
</tr>
<tr>
<td>Total</td>
<td>19.94</td>
<td>6.079</td>
<td>64</td>
</tr>
</tbody>
</table>
Quantitative Data Analysis

Estimated Marginal Means of MEASURE_1

- Group: experimental
- Control

Estimated Marginal Means

<table>
<thead>
<tr>
<th>Test</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>16</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>20</td>
</tr>
</tbody>
</table>
Qualitative Data Analysis

- Impartial Observer – Phase I
  - Unfamiliar vocabulary.
  - Not enough meaningful examples.
  - Sporadic collaboration.
Qualitative Data Analysis

- Researcher Field Notes- Phase I
  - Inconsistencies between training sessions and classroom practices.
  - Some collaboration.
Qualitative Data Analysis

- Treatment Group Classroom Artifacts-Phase I
  - Students’ answers had strong similarities.
  - Many VTC incomplete.
<table>
<thead>
<tr>
<th>Questions</th>
<th>Answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What is the target word?</td>
<td>cost</td>
</tr>
<tr>
<td>2. Do you recognize any part of the word, such as prefix, suffix, or root (based word)? What does each part mean?</td>
<td>material in the world mold</td>
</tr>
<tr>
<td>3. What does the word remind you of? Can you give a semantically related word, an orthographically similar word, or a real-life vignette triggered by the word?</td>
<td>broken bone, friend, had, cast fossil mold, sister, broke arms</td>
</tr>
<tr>
<td>4. How is the word defined in the text? Can you paraphrase this definition?</td>
<td>A solid clay of the shape of an organism, formed when miners laid into a mold</td>
</tr>
<tr>
<td>5. Can you come up with a sentence in which the target word is used in the scientific sense?</td>
<td>the biochemistry created a cost of the fossil</td>
</tr>
<tr>
<td>6. This word is part of which larger science concept? What are some other words related to this larger concept?</td>
<td></td>
</tr>
</tbody>
</table>
Qualitative Data Analysis

- Impartial Observers- Phase II
  - Students followed the Treatment Teacher’s instruction on morphemic analysis.
  - Treatment Teacher struggled with implementing the VTC within her pedagogical framework.
  - Students started creating more complex sentences.
  - Treatment Teacher struggled with classroom management, and that it could have affected the use the VTC.
Data Analysis

- Researcher Field Notes – Phase II
  - Students struggled with morphemic analysis.
  - Students might not have received enough instruction on the VTC before the treatment phase began.
  - More complex and different sentences.
  - Classroom distractions might have influenced student progress.
Qualitative Data Analysis

- Treatment Group Classroom Artifacts – Phase II
  - Students highly dependent on the Treatment Teacher.
  - Students had less similar answers.
  - More complex sentences were developed by participants.
VTC Student Sample 2

<table>
<thead>
<tr>
<th>Questions</th>
<th>Answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. What is the target word?</td>
<td><strong>Extrusion</strong></td>
</tr>
<tr>
<td>2. Do you recognize any part of the word, such as prefix, suffix,</td>
<td>ex-out, outside, exit</td>
</tr>
<tr>
<td>or root (based word)? What does each part mean?</td>
<td>brudere-to thrust, push</td>
</tr>
<tr>
<td></td>
<td>*ion-process</td>
</tr>
<tr>
<td>3. What does the word remind you of?</td>
<td>extrusion, Intrusion, dinosaurs, extinct</td>
</tr>
<tr>
<td>Can you give a semantically related word, an orthographically</td>
<td>eruption</td>
</tr>
<tr>
<td>similar word, or a real-life vignette triggered by the word?</td>
<td>external, internal, extinct exit</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>4. How is the word defined in the text? Can you paraphrase this</td>
<td>An igneous rock layer created when lava flows onto earth’s surface and</td>
</tr>
<tr>
<td>definition?</td>
<td>hardens earth’s crust.</td>
</tr>
<tr>
<td>An igneous rock layer formed when lava flows onto earth’s surface and</td>
<td></td>
</tr>
<tr>
<td>hardens earth’s crust.</td>
<td></td>
</tr>
<tr>
<td>5. Can you come up with a sentence in which the target word is used in</td>
<td>A paleontologist was digging through an extrusion layer of igneous rock</td>
</tr>
<tr>
<td>the scientific sense?</td>
<td>at the base of a volcano</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>6. This word is part of which larger science concept? What are some</td>
<td>Earth’s science, Earth’s history, fossils, tectonic plates</td>
</tr>
<tr>
<td>other words related to this larger concept?</td>
<td></td>
</tr>
</tbody>
</table>
Discussion

- Participants needed additional time and practice with the VTC.
- Participants needed more feedback and guided practices.
- Participants needed opportunities to collaborate and exchange ideas about scientific vocabulary.
Study Results and Theoretical Framework

- **Schema Theory**
  - Students’ low experience with the VTC, insufficient guided practice, collaborative practice and independent practice made understanding the VTC very complex.

- **Depth of Knowledge Theory**
  - VTC required a high level of engagement between participants in the study and science-related vocabulary words.

- **Zone of Proximal Development Theory**
  - Useful for analyzing participants’ reaction to the VTC.
Limitations

- Sample selection.
- Treatment Teacher selection.
- Pre-and post tests not in alignment with the VTC.
- Not enough time to learn the VTC.
- Treatment Teacher’s views on vocabulary instruction and science learning.
- Researcher assumed an observer role in the study.
- Length of the study.
Future Research

- Larger sample of participants.
- Additional sources of information on students’ reading levels.
- Longer training for the Treatment Teacher and participants.
- Use of standardized assessment instrument.
- Use of assessment aligned with the VTC.
- VTC requires teachers to have a deep knowledge of morphological analysis, semantic analysis, sentence generation, paraphrasing and larger science term.
- A Treatment Teacher whose pedagogical framework fits with the VTC.
Thank you

- Questions
- Discussion