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Preservice Elementary Teachers Increase Descriptive Science Vocabulary by Making Descriptive Adjective Object Boxes

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Preservice Elementary Teachers Increase Descriptive Science Vocabulary by Making Descriptive Adjective Object Boxes

A Research Study Presented at the Annual Quest Symposium on Learning and Teaching (27th, Oswego, NY, Wednesday, April 18, 2007)

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**Abstract**
Descriptive vocabulary is needed for communication and mental processing of science observations. Elementary preservice teachers in a science methods class at a mid-sized public college in central New York State increased their descriptive vocabularies through a course assignment of making a descriptive adjective object box. This teaching material consists of a set of theme-related objects with corresponding cards housed in a box. The front of each card lists four descriptive adjectives that describe physical observations of one of the objects, with an image of the object on the reverse for self-checking. The student reads these descriptive words and attempts to locate the one object to which they all refer. Preservice teachers (N = 67; 8M, 59F; 3H, 2B, 1A, 61W) took identical pretests/posttests in which they wrote descriptive adjectives for four objects. During the intervention, they explored example boxes with activities and worked in pairs to create their own sets of materials. Participants increased words generated from 17.8 to 25.7 for the four objects. The grade level of words produced also increased from 2.9 to 3.8. Both increases were statistically significant with a very large effect size (1.84) for words generated and a medium effect size (0.35) for increase in grade level of vocabulary.
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Introduction

Importance of Descriptive Vocabulary in Science

Observation is the most primary of all science process skills because we acquire information about the world through our five senses. Vocabulary is important to the learning of science because we think in words: our observations cannot be mentally processed or communicated without descriptive vocabulary (Vygotsky, 1989).

Vocabulary is also important in reading science texts and articles. Groves (1995) replicated Yager’s (1983) study of science vocabulary in science textbooks with similar results indicating a focus on terminology in science that surpasses foreign language courses. Groves concluded that vocabulary must be used as a means of guiding students towards the attainment of science concepts.

Literature Review

Vocabulary is an essential part of understanding concepts in content areas, including science. Without a clear understanding of the meaning of new terms (e.g., “opaque,” “iridescent,” “impermeable”) students will experience difficulty and their interest in the subject will wane (Young, 2005). Science instructors must therefore find effective ways to teach vocabulary (Blachowicz & Fisher, 2002).

Gunning (1998) advises science teachers to use new vocabulary words in context, establish relationships between words and provide opportunities for multiple exposure and usage of new words. Frystak (1999) encourages science teachers to find engaging ways of presenting new vocabulary beyond writing definitions. Frystak suggests investigating root words, writing original sentences in context, and drawing illustrations. Young (2005) recommended visualizing the meanings of new words as sketches drawn inside a TV with synonyms and antonyms included. Words may also be semantically mapped to other words, and students are encouraged to develop a set of personal clue cards with simple definitions and associations marked on them. Young suggested that students rate vocabulary words on their level of understanding of them to help develop metacognitive abilities.

Descriptive adjective object boxes (Rule, 1999) may be used to increase students’ descriptive vocabularies (Rule, Barrera, & Stewart, 2004). A descriptive adjective object box is a set of teaching materials that consists of ten to twelve objects, each with a corresponding card, housed in a box (often a plastic shoebox). The front of a card lists four adjectives describing physical properties that may be applied together to only one of the objects in the box. The student reads the adjectives and determines the corresponding objects, learning new vocabulary words along the way. Work can be self-checked when the student examines the image of the correct object on the back side of the card.

Such descriptive adjective object boxes can be integrated into science lessons on various topics, such as the lesson on driftwood characteristics described by Rule, Young, and Fox (2003) or bird adaptations for habitat (Rule & Barrera, in review).

Descriptive adjective object boxes are an effective means of increasing student vocabulary because the hands-on nature of examining a variety of objects motivates learners and provides concrete examples of the new descriptive terms in context. When students work with a variety of descriptive
adjective object boxes, they are exposed to new examples of the vocabulary words multiple times. Teachers can reinforce this learning by discussing important new terms and their relationships, such as terms related to diaphaneity (e.g., opaque, translucent, transparent) or luster (e.g., vitreous, dull, pearly). Additionally, in this study, preservice teachers crafted their own descriptive adjective object boxes and therefore engaged in much consideration of possible words and practice with new terms.

In this study, we examine how activities centered on descriptive adjective object boxes, including making a new descriptive adjective object box with a partner, helped preservice elementary teachers improve their descriptive vocabularies.

Method

Participants

Sixty-seven elementary preservice teachers (8M, 59F; 3H, 2B, 1A, 61W) who were sophomores or juniors enrolled in a science methods class taught by one instructor (the first author) at a mid-sized public college in central New York State participated in the study.

Pretest/Posttest

On one of the first days of the semester, preservice teachers took the pretest in which they were supplied four items and asked to list as many adjectives describing observations of physical properties of the four items as possible. The four items were a wooden spindle, a green s-shaped Styrofoam pellet, a small gold-colored jingle bell, and a spherical multi-colored hollow plastic ornament. The objects are shown in Figure 1.

The descriptive adjectives listed by each participant were recorded on a spreadsheet for easy sorting and manipulation. Seven weeks later, after the intervention was complete, participants again took an identical posttest and results were recorded on a spreadsheet for analysis. A similar pretest/posttest was used in the study of third graders increasing their descriptive vocabularies by Rule, Barrera, and Stewart (2004).

Figure 1. Objects used for the pretest and posttest.

Intervention

During the intervention, participants worked in class for approximately three 80-minute sessions, exploring twelve descriptive adjective object boxes created by the instructor. Participants addressed the following while examining these sets of materials.

1. Discussion of how choice of theme for a set of materials can form a bridge between science and other content areas, for example, the theme may fit with children’s literature or the box may center on items from a historic period, culture, or geographic place.

2. How to choose safe (nothing sharp, dangerous, or toxic), appropriate (no tobacco, alcohol, sexual, violent-themed, or gambling-related), attractive (clean, durable, interesting) items that show a wide range of physical characteristics.

3. Categories of descriptive adjectives for possible use: color (maroon, beige,
chartreuse), shade (pastel, dark, pale),
degree of transparency (opaque,
translucent), luster (iridescent, pearly,
vitreous), geometric pattern (checked,
dotted, striped) irregular pattern (mottled,
freckled, marbled), texture (embossed,
vellovy, corrugated), regular geometric
shape (cylindrical, rectangular, faceted),
other shape (bulbous, oblong, flat), number
(double, whole, three-pointed), construction
(hollow, woven, perforated), condition
(truncated, chipped, cracked), angularity
(jagged, sharp, blocky), curvature (arched,
ripped, concave), arrangement (intersecting,
branching, crosshatched), other line and
surface (serrated, grooved, fluted),
composition (wooden plastic, glass),
tenacity (spongy, tough, elastic), porosity
(impermeable, porous, solid), and sound
(hissing, silent, jingling).
4. Descriptive adjective object box
activities:

Matching objects to images on the
backs of cards. Images may be photographs,
outlines, silhouettes, or drawings.

Identifying and naming the objects in
the box.

Using the process of elimination to
determine the corresponding object. Choose
a card and read the first descriptive
adjective. Find all the objects in the box
with this characteristic. Then read the
second descriptive adjective and eliminate
all those from the first group that do not
match this description. Continue until only
one object is left. Read all the adjectives
again and verify that they fit the chosen
object.

Attempting to pair each of the cards
with its corresponding object by reading and
applying the descriptive adjective clues, one
by one.

Playing “I Spy” or “I’m thinking
of...” Remove all of the objects from the
box. Put away the cards for this activity.
Think of a descriptive adjective that applies
to several of the objects. Say, “I spy an
object that is ______.” Have others guess the
object. If a guess is incorrect, add another
descriptive adjective clue until the correct
object is located.

Creating a chart to compare and
contrast two objects. Choose two objects
from the box. Use a chart to compare how
they are similar (comparison) and different
(contrast). Be sure to list the general
category for each physical observation. An
eexample chart is shown in Table 1.

Generating descriptive adjective
observations. Choose one object from the
box. Write as many descriptive adjective
observations of the object as possible. Read
the list to classmates and challenge them to
add to the list.

Table 1. Example chart of comparison and
contrast of two objects.

<table>
<thead>
<tr>
<th>General Category</th>
<th>First Object New Penny</th>
<th>Second Object Red Plastic Pushpin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>Both fit inside the palm of one’s hand; both are less than 3 centimeters in any direction</td>
<td></td>
</tr>
<tr>
<td>Cross-sectional Shape</td>
<td>Both are circular; both have a circular cross-section</td>
<td></td>
</tr>
<tr>
<td>Luster</td>
<td>Both have a glossy surface</td>
<td></td>
</tr>
<tr>
<td>Composition</td>
<td>Both contain metal</td>
<td></td>
</tr>
<tr>
<td>Angularity</td>
<td>The penny is round and smooth</td>
<td>The pushpin has a sharp, pointy tack</td>
</tr>
<tr>
<td>Decoration</td>
<td>The penny has embossed bust of Lincoln and writing</td>
<td>The pushpin is plain</td>
</tr>
<tr>
<td>Dimensionality</td>
<td>The penny is flat and almost two-dimensional</td>
<td>The pushpin is cylindrical and three-dimensional</td>
</tr>
<tr>
<td>Color</td>
<td>The penny is pinkish brown</td>
<td>The pushpin is bright red</td>
</tr>
</tbody>
</table>
Using a Venn diagram to explain similarities and differences between objects. Create a simple Venn diagram of two intersecting rings. Label each of the rings with a physical observation. Find three objects that can be placed on the diagram, one in each part. An example diagram is shown in Figure 2 from a ceramics-themed box.

Figure 2 Example Venn diagram

Writing a cinquain poem about an object. A cinquain poem is a structured poem with 5 lines. The first line consists of a single word, a noun, the object. The second line contains two descriptive adjectives. The third line is composed of three –ing gerunds that describe the object. The fourth line is a four-word phrase that tells the main message of the poem, while the fifth and final line is again a noun, a new word for the object. Figure 3 shows an object from a descriptive adjective object box focused on caterpillars that is the subject of the following cinquain poems.

Cat-toy,
Knitted, colorful,
Jingling, flinging, ripping,
Help! I have feelings.
Critter.

Caterpillar,
Bright, spongy,
Springing, eye-rattling, end-ringing,
Sensual and grabs attention.
Pet-toy.

After completing the exercises described above, preservice teachers worked together to create descriptive adjective object boxes of their own. The following instructions were given to preservice teachers, working in pairs. “Make a box of ten related objects that display a variety of physical attributes. Each object will have a corresponding card of four descriptive words, making a total of 40 different words on the cards. The reverse side of each card will identify the object to which the descriptive words refer, showing an image of the object. About half of the words will be familiar words, the other half will be new descriptive vocabulary terms that relate to the physical characteristics of the objects.”

A scoring rubric was supplied to the participants. It is shown in Table 2.

Results and Analysis

Word Generation Fluency Increase
On the pretest, students wrote a mean of 17.8 (s. d. = 4.1) different descriptive adjective words per person for the set of four objects; on the posttest, students increased the mean number of words written per person to 25.7 (s. d. = 4.5) different words for the set of four items. This improvement on the posttest was statistically significant (alpha = .05, F_critical = 3.9, F = 84.5, df = 1/132, p < 0.001), indicating the efficacy of the activities in
Table 2. Rubric for scoring descriptive adjective object boxes.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Yes</th>
<th>Partly</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>The items are housed in a plastic shoebox or similar box with both ends of the box labeled with the theme topic, &quot;Descriptive Adjectives,&quot; and the makers' names. The label should be word-processed or very neatly written and should be on a stick-on label or piece of paper that is covered by wide clear tape. Sloppy labels are not acceptable.</td>
<td>1</td>
<td>½</td>
<td>0</td>
</tr>
<tr>
<td>Ten objects are present and each object has a corresponding card.</td>
<td>1</td>
<td>½</td>
<td>0</td>
</tr>
<tr>
<td>The printing on the cards is word-processed. The cards are neat and durable. They are either laminated (no construction paper) or made of mat board (not poster board).</td>
<td>1</td>
<td>½</td>
<td>0</td>
</tr>
<tr>
<td>The objects are all related to a theme and include interesting/unusual objects.</td>
<td>1</td>
<td>½</td>
<td>0</td>
</tr>
<tr>
<td>The objects show a wide variety of physical characteristics and appropriate vocabulary (some familiar, some challenging) has been used.</td>
<td>1</td>
<td>½</td>
<td>0</td>
</tr>
<tr>
<td>The objects are attractive, safe, durable, and in good condition (unless the attributes specifically require damage such as &quot;cracked,&quot; &quot;weathered,&quot; &quot;pierced.&quot;)</td>
<td>1</td>
<td>½</td>
<td>0</td>
</tr>
<tr>
<td>All adjectives represent observations of physical properties observable with one of the five senses. No inferences or subjective judgments.</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>At least three senses (three of these: sight, tactile texture, sound, smell) are used in the descriptive adjectives for the set. Taste is not used for safety/sanitation reasons.</td>
<td>1</td>
<td>½</td>
<td>0</td>
</tr>
<tr>
<td>Images (drawings, silhouettes, photographs) of the objects are shown on the reverse of each card with the name of the object given.</td>
<td>1</td>
<td>½</td>
<td>0</td>
</tr>
<tr>
<td>More than two spelling or grammar errors are present.</td>
<td>-1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Assignment is turned in on time.</td>
<td>0</td>
<td>0</td>
<td>-1</td>
</tr>
<tr>
<td><strong>TOTAL out of 10 Possible Points</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

increasing productive descriptive vocabulary. Cohen’s effect size, \(d\), (1988), using pooled standard deviations as suggested by Rosnow and Rosenthal (1996) of pretest compared to posttest performance was 1.84, a very large effect size indicating that less than one quarter of the two sets of scores overlap.

**Improvement in Grade Level of Vocabulary**

The grade level of reading vocabulary was determined for each descriptive word supplied by participants on the pretest and posttest using the EDL core vocabularies in reading, mathematics, science, and social studies (Taylor et. al, 1979). Some words were not listed in this reference and so adjustments were made. If the word from the study contained a root word that was listed, then the grade level of the root word was used (e.g., for “ridged” the root word “ridge” was used). A few other words did not have root words listed and these were assigned a grade level of 12 (e.g., dowel-like, gouged, lathe-turned, opalescent). Additionally, the “Primer” level was assigned a grade level value of 0.5. Table 2 shows data related to grade levels of words for the pretest and posttest. The mean vocabulary grade level of words generated by participants on the pretest was 2.9 (s. d. = 2.2), meaning that the vocabulary level of these words approached the reading vocabulary of a student at the end of second grade. The mean vocabulary grade level of words on the posttest was 3.8 (s. d. = 2.8), almost an entire grade level higher. Because these are reading or recognition levels for words and not the actual grade levels for production of words, the levels of performance were actually higher. An analysis of variance indicated that the difference between pretest and posttest grade levels of words was statistically significant (\(alpha = 0.05, F_{critical} = 3.8, F = 84.7, df = 1/2913, p < 0.001\)). Cohen’s effect
size, \( d \), of pretest compared to posttest performance was 0.35, a medium effect size indicating that about three quarters of the two sets of scores overlap.

Table 2. Grade levels of words generated during the pretest and posttest.

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Number of Words Generated</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pretest</td>
</tr>
<tr>
<td>Primer (0.5)</td>
<td>44</td>
</tr>
<tr>
<td>1</td>
<td>233</td>
</tr>
<tr>
<td>2</td>
<td>380</td>
</tr>
<tr>
<td>3</td>
<td>263</td>
</tr>
<tr>
<td>4</td>
<td>75</td>
</tr>
<tr>
<td>5</td>
<td>49</td>
</tr>
<tr>
<td>6</td>
<td>76</td>
</tr>
<tr>
<td>7</td>
<td>17</td>
</tr>
<tr>
<td>8</td>
<td>13</td>
</tr>
<tr>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>11</td>
<td>3</td>
</tr>
<tr>
<td>12</td>
<td>17</td>
</tr>
<tr>
<td>Total Words</td>
<td>1192</td>
</tr>
</tbody>
</table>

Table 3 shows the most common vocabulary words used to describe the set of four objects, arranged according to frequency of occurrence on the pretest.

Of particular interest is the increase in the use of higher grade level words such as “iridescent,” “multi-colored,” “symmetrical,” and “porous.”

Table 4 shows words occurring less commonly on the pretest (zero to four occurrences), but more commonly on the posttest, with at least five occurrences on the posttest. Note the increase in words of higher grade levels such as “translucent,” “opaque,” “spherical,” “crinkled,” “transparent,” “mobile,” “elongate,” “textured,” and “flexible.”

<table>
<thead>
<tr>
<th>Word</th>
<th>Grade Level</th>
<th>Pretest Frequency</th>
<th>Posttest Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>round</td>
<td>2</td>
<td>59</td>
<td>43</td>
</tr>
<tr>
<td>shiny</td>
<td>2</td>
<td>58</td>
<td>58</td>
</tr>
<tr>
<td>smooth</td>
<td>3</td>
<td>56</td>
<td>56</td>
</tr>
<tr>
<td>hard</td>
<td>1</td>
<td>45</td>
<td>36</td>
</tr>
<tr>
<td>long</td>
<td>1</td>
<td>45</td>
<td>39</td>
</tr>
<tr>
<td>noisy</td>
<td>1</td>
<td>43</td>
<td>42</td>
</tr>
<tr>
<td>wood</td>
<td>2</td>
<td>42</td>
<td>51</td>
</tr>
<tr>
<td>soft</td>
<td>2</td>
<td>38</td>
<td>26</td>
</tr>
<tr>
<td>squishy</td>
<td>3</td>
<td>38</td>
<td>51</td>
</tr>
<tr>
<td>green</td>
<td>0.5</td>
<td>37</td>
<td>49</td>
</tr>
<tr>
<td>small</td>
<td>2</td>
<td>37</td>
<td>28</td>
</tr>
<tr>
<td>s-shaped</td>
<td>3</td>
<td>35</td>
<td>39</td>
</tr>
<tr>
<td>light</td>
<td>1</td>
<td>34</td>
<td>30</td>
</tr>
<tr>
<td>colorful</td>
<td>1</td>
<td>33</td>
<td>18</td>
</tr>
<tr>
<td>gold</td>
<td>2</td>
<td>32</td>
<td>35</td>
</tr>
<tr>
<td>reflective</td>
<td>5</td>
<td>26</td>
<td>40</td>
</tr>
<tr>
<td>hollow</td>
<td>3</td>
<td>22</td>
<td>51</td>
</tr>
<tr>
<td>plastic</td>
<td>6</td>
<td>21</td>
<td>37</td>
</tr>
<tr>
<td>curvy</td>
<td>4</td>
<td>20</td>
<td>14</td>
</tr>
<tr>
<td>metal</td>
<td>3</td>
<td>19</td>
<td>27</td>
</tr>
<tr>
<td>brown</td>
<td>1</td>
<td>18</td>
<td>15</td>
</tr>
<tr>
<td>bumpy</td>
<td>6</td>
<td>18</td>
<td>14</td>
</tr>
<tr>
<td>skinny</td>
<td>3</td>
<td>17</td>
<td>11</td>
</tr>
<tr>
<td>rolling</td>
<td>2</td>
<td>16</td>
<td>26</td>
</tr>
<tr>
<td>lightweight</td>
<td>3</td>
<td>15</td>
<td>18</td>
</tr>
<tr>
<td>metallic</td>
<td>3</td>
<td>15</td>
<td>31</td>
</tr>
<tr>
<td>bright</td>
<td>2</td>
<td>13</td>
<td>8</td>
</tr>
<tr>
<td>iridescent</td>
<td>12</td>
<td>13</td>
<td>32</td>
</tr>
<tr>
<td>circular</td>
<td>6</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>multi-colored</td>
<td>8</td>
<td>12</td>
<td>30</td>
</tr>
<tr>
<td>solid</td>
<td>5</td>
<td>12</td>
<td>23</td>
</tr>
<tr>
<td>tan</td>
<td>4</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>curved</td>
<td>4</td>
<td>11</td>
<td>18</td>
</tr>
<tr>
<td>golden</td>
<td>2</td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td>rough</td>
<td>4</td>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td>thin</td>
<td>3</td>
<td>11</td>
<td>23</td>
</tr>
<tr>
<td>breakable</td>
<td>2</td>
<td>10</td>
<td>23</td>
</tr>
<tr>
<td>symmetrical</td>
<td>10</td>
<td>10</td>
<td>23</td>
</tr>
<tr>
<td>light green</td>
<td>1</td>
<td>10</td>
<td>5</td>
</tr>
</tbody>
</table>
Table 3 Continued.

<table>
<thead>
<tr>
<th>Word</th>
<th>Grade Level</th>
<th>Pretest Frequency</th>
<th>Posttest Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>bouncing</td>
<td>2</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>jingling</td>
<td>4</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>see-through</td>
<td>2</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>fragile</td>
<td>7</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>grooved</td>
<td>7</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>ringing</td>
<td>2</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>crunchy</td>
<td>6</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>grainy</td>
<td>3</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>porous</td>
<td>9</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td>bendable</td>
<td>3</td>
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<td>14</td>
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<td>0.5</td>
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<td>dull</td>
<td>4</td>
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<td>6</td>
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<tr>
<td>rigid</td>
<td>6</td>
<td>5</td>
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<td>shimmery</td>
<td>5</td>
<td>5</td>
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<td>wavy</td>
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</table>

Table 4. Words that occurred with low frequency on the pretest and greater frequency on the posttest.

<table>
<thead>
<tr>
<th>Word</th>
<th>Grade Level</th>
<th>Pretest Frequency</th>
<th>Posttest Frequency</th>
</tr>
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<tbody>
<tr>
<td>translucent</td>
<td>11</td>
<td>3</td>
<td>23</td>
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<tr>
<td>hang-able</td>
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<td>1</td>
<td>14</td>
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<td>foamy</td>
<td>5</td>
<td>2</td>
<td>13</td>
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<tr>
<td>pearly</td>
<td>4</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>cracked</td>
<td>3</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>carved</td>
<td>3</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>decorated</td>
<td>4</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>opaque</td>
<td>10</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>spherical</td>
<td>7</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>crinkled</td>
<td>12</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>open</td>
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<td>2</td>
<td>9</td>
</tr>
<tr>
<td>rounded</td>
<td>2</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>transparent</td>
<td>6</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>x-shaped</td>
<td>3</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>mobile</td>
<td>7</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>patterned</td>
<td>4</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>tiny</td>
<td>2</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>detailed</td>
<td>5</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>elongate</td>
<td>10</td>
<td>1</td>
<td>7</td>
</tr>
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<td>indented</td>
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<td>0</td>
<td>7</td>
</tr>
<tr>
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<td>3</td>
<td>7</td>
</tr>
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<td>3</td>
<td>1</td>
<td>7</td>
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<td>6</td>
</tr>
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<td>airy</td>
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<td>2</td>
<td>5</td>
</tr>
<tr>
<td>dented</td>
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<td>1</td>
<td>5</td>
</tr>
<tr>
<td>flexible</td>
<td>8</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>four-pieced</td>
<td>2</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>n-inched</td>
<td>3</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>ridged</td>
<td>4</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>self-standing</td>
<td>4</td>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 5 shows words that occurred one to four times on the posttest, but not on the pretest. Many of these words are of higher grade levels such as “asymmetric,” “concave,” “dowel-like,” “gouged,” “holographic,” “lathe-turned,” “lustrous,” “malleable,” “opalescent,” “squiggly,” “striated,” “turquoise,” “upright,” and “wispy.”

**Descriptive Adjective Object Boxes**

Preservice teacher descriptive adjective object boxes were, in general, well made with appropriate choices of objects and adjectives. Nine example object boxes made by preservice teachers are shown in Appendix 1.

**Relationship of Results to Other Studies**

The positive results of this study are mirrored by the increase in third graders’ descriptive vocabularies in a study by Rule, Barrera, and Stewart (2004) and by other third graders studying bird adaptations in a study by Rule and Barrera (in review). In the latter study, three different approaches to technology and thinking skill integration in science were compared; students who used descriptive adjective object boxes had the largest vocabulary gains.
Table 5. Words appearing on the posttest one to four times but not on the pretest.

<table>
<thead>
<tr>
<th>abnormal</th>
<th>gaping</th>
<th>notched</th>
<th>squiggly</th>
</tr>
</thead>
<tbody>
<tr>
<td>absorbent</td>
<td>gleaming</td>
<td>one-holed</td>
<td>sticky</td>
</tr>
<tr>
<td>aged</td>
<td>glittery</td>
<td>marked</td>
<td>stretchy</td>
</tr>
<tr>
<td>asymmetric</td>
<td>globe-like</td>
<td>miniature</td>
<td>striated</td>
</tr>
<tr>
<td>attachable</td>
<td>gold-yellow</td>
<td>mint-green</td>
<td>striped</td>
</tr>
<tr>
<td>chipped</td>
<td>gouged</td>
<td>molded</td>
<td>thin-walled</td>
</tr>
<tr>
<td>clinking</td>
<td>hidden</td>
<td>multi-material</td>
<td>severed</td>
</tr>
<tr>
<td>cold</td>
<td>high-pitched</td>
<td>opalescent</td>
<td>shatter-able</td>
</tr>
<tr>
<td>color-changing</td>
<td>holographic</td>
<td>ornamental</td>
<td>silky</td>
</tr>
<tr>
<td>compressible</td>
<td>identical</td>
<td>pack-able</td>
<td>slashed</td>
</tr>
<tr>
<td>concave</td>
<td>imported</td>
<td>painted</td>
<td>sleigh-shaped</td>
</tr>
<tr>
<td>cool-shaded</td>
<td>imprinted</td>
<td>palm-fitting</td>
<td>thread-able</td>
</tr>
<tr>
<td>copper</td>
<td>intersecting</td>
<td>pastel</td>
<td>three-D</td>
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<tr>
<td>cratered</td>
<td>irregular</td>
<td>pencil-length</td>
<td>“thunk”-ing</td>
</tr>
<tr>
<td>creaking</td>
<td>knobby</td>
<td>petite</td>
<td>top-heavy</td>
</tr>
<tr>
<td>creased</td>
<td>knotted</td>
<td>pitted</td>
<td>touchable</td>
</tr>
<tr>
<td>crisscrossed</td>
<td>lathe-turned</td>
<td>plastic-topped</td>
<td>transportable</td>
</tr>
<tr>
<td>crooked</td>
<td>layered</td>
<td>plugged</td>
<td>turquoise</td>
</tr>
<tr>
<td>crossed</td>
<td>lettered</td>
<td>polished</td>
<td>two-ended</td>
</tr>
<tr>
<td>crumbly</td>
<td>light-reflecting</td>
<td>punctured</td>
<td>two-piece</td>
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<tr>
<td>c-shaped</td>
<td>linear</td>
<td>purplish</td>
<td>two-toned</td>
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<tr>
<td>curvaceous</td>
<td>looped</td>
<td>quartered</td>
<td>unbending</td>
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<tr>
<td>dimpled</td>
<td>luminous</td>
<td>rattling</td>
<td>unbreakable</td>
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<td>lustrous</td>
<td>ribbed</td>
<td>unfinished</td>
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<td>ripplable</td>
<td>unflawed</td>
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<td>dotted</td>
<td>manufactured</td>
<td>rippling</td>
<td>unproportioned</td>
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<td>rocking</td>
<td>unswallowable</td>
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<td>musty</td>
<td>round-edged</td>
<td>upright</td>
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<td>neutral-colored</td>
<td>rusted, rusty</td>
<td>weightless</td>
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<td>noise-making</td>
<td>seafoam</td>
<td>green</td>
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<tr>
<td>equi-proportioned</td>
<td>non-flexible</td>
<td>seamed</td>
<td>wispy</td>
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<tr>
<td>extended</td>
<td>non-porous</td>
<td>slender</td>
<td>worn</td>
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<td>feather-weight</td>
<td>non-rigid</td>
<td>slim</td>
<td>wounded</td>
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<td>non-squeezable</td>
<td>spotted</td>
<td>yellowish</td>
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<tr>
<td>flattened</td>
<td>not coarse</td>
<td>squeezable</td>
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</table>

**Conclusion**

**Preservice Teacher Reactions**

Preservice teachers enjoyed exploring the descriptive adjective object boxes supplied by the instructor. This was evidenced by much excited conversation and positive comments made during the activities. They also enjoyed making their own descriptive adjective boxes. Many spent a lot of time finding a diverse set of appealing objects related to a chosen theme. Several preservice teachers remarked to the instructor that next term’s class should make these same object boxes individually so that they would have a complete box to keep.

**Implications of Findings**

The activities described here helped preservice teachers increase both the number of descriptive adjective words readily available for use and the grade level of those words. The activities supported the foundational science process skills of observation of physical properties of objects, communication using descriptive vocabulary along with charts, Venn diagrams, and poetry, and classification skills in using charts and Venn diagrams. Preservice teachers’ vocabularies also were increased through inquiry into making their own sets of materials rather than through a tedious and non-applied process of studying vocabulary words.

Creating descriptive adjective object box and exploring them through activities is an engaging, motivating way to increase preservice teachers’ descriptive vocabularies for science. Therefore, we recommend that these activities be used in science methods courses to improve preservice teacher vocabulary and process skill development.
References


Rule, A. C., & Barrera, M. T., III. (in review). Comparing three authentic instruction methods for teaching third graders about bird adaptations that integrate technology and thinking skills.


Appendix

**BLUE ITEMS**
Heather DeCare & Vicki Roth

- **Candle**
  - Scented
  - Waxy
  - Patterned
  - Flammable

- **Phone Rattle**
  - Noisy
  - Symmetric
  - Smooth
  - Glossy

- **Arm Band**
  - Fuzzy
  - Embroidered
  - Soft
  - Pastel

- **Staple Remover**
  - Translucent
  - Plastic
  - Graspable
  - Elongate

- **Bracelet**
  - Sparkly
  - Layered
  - Inflexible
  - Rigid

- **Paper Clip**
  - Bendable
  - Partly-metal
  - Looping
  - Small

- **Glass Bead**
  - Hard
  - Reflective
  - Odd-shaped
  - Glassy

- **Headband**
  - Stretchy
  - Long
  - Dark
  - Sinuous

- **Hair Claw**
  - Gripping
  - Plaid
  - Spring-loaded

- **Paper Stick-on Note**
  - Flat
  - Sticky
  - Rip-able
  - Dull

- **Rattle**
  - Heather DeCare & Vicki Roth
DOGS
Alison LaRocca & Sherry Crisafulli

- Silvery Metallic Oval-based Glued
- Brown Dog
- Four-holed Rosy-nosed Bobble-headed
- Vibrating Rattling String-legged Patterned
- Noisy Symmetric Smooth Glossy
- Two-piece Clothed Painted Oval
- Grooved Neutral-colored Magnetic
- Powder-blue Soft Shaggy Open
- Spotted Outlined Shiny Partly-metallic
- Three-dimensional Multicolored Smooth Adhesive
- Pop-up Stickers
- Stuffed Dog
- Furry Plush Glossy-eyed Mirror-like
- Refrigerator Magnet
- Dog Slipper
- Jewel Box
- Shower Curtain Hook
- Pencil Holder

Statue
FISH
Chelsea Gioia & Kelly Knoop

Squeaking
Bright
Hollow
Spotted

Fuzzy
Metallic-
dotted
Round

Sparkly
Rigid
Multiple
Dimpled

Striped
Flat-
bottomed
Bumpy

Suction-
cupped
Shimmering
Scaly

Hard
Yellow
Bulging-eyed
Painted

Thin
Embroidered
Shiny
Jeweled

Curved
Smiling
Furry
Plush

Larage Plush Fish

Cellophane-
stuffed Fabric
Fish

Crinkling
Multi-colored
Stitches
Stuffed

Shaggy
Plush Fish

Chelsea Gioia & Kelly Knoop

Rubber Bath
Toy Fish

Suction-
cupped
Fish

Resin Reef

Small
Resin Fish

Suction-
cupped
Fish

Fish
Appliqué

Clown Fish

Resin Reef

Rubber Bath
Toy Fish

Suction-
cupped
Fish

Resin Reef

Small
Resin Fish

Suction-
cupped
Fish

Curved
Smiling
Furry
Plush

Large Plush Fish

Elastic Fish
Skeleton

Stretchy
Flat
Ribbed
Blue
**Ducks**
Tonya DeLeo & Ashley Joyce

- **Stuffed Mallard Duck**
- **Quacking Velvety Colorful Three-wide-eyed Spongy Clothed Bendable**
- **Rubber Duck Stamp**
- **Wooden Embossed Blocky Textured**
- **Bath Time Rubber Ducky**
- **Rubber Light Hollow Squeaking**
- **Cerulean Springy Plastic Vertical**
- **Resin Duck Figure**
- **Fragile Engraved Painted Bumpy**

- **Sailor Duck**
- **Wide-eyed Spongy Clothed Bendable**
- **Candy Dispenser**
- **Beribboned Feather-weight Felt**
- **Duck with Heart Necklace**
- **Miniature Dull Ridged Two-tone**

- **Pink Floating Duck**
- **Pearly Squeaky Pastel Polished**
- **Soft Bean Bag Duck**
- **Duck with Heart Necklace**
- **Shaggy Yarn-covered Symmetrical**
- **Bean Bag Duck**

- **Rubber Ducky**
- **Candy Dispenser**
- **Beribboned Feather-weight Felt**
- **Soft Bean Bag Duck**
- **Duck with Heart Necklace**
- **Shaggy Yarn-covered Symmetrical**
- **Bean Bag Duck**
Harvest Time
Jim Van Arsdale

Raspberries
Clumped
Stemmed
Burgundy
Rough-

Onions
Long
Bunched
Spear-like
Branching

Mushrooms
Chartreuse
Oval
Extending
Ruby-colored

Beet
Odd-shaped
Veined
Plastic
Curved

Gourd

Pumpkin
Ridged
Orange
Flecked
Imperfect

Leafy
Amethyst
Shimmering
Sugared

Corn
Multi-colored
Bumpy
Papery
Mildewed

Peas
Miniature
Dull
Ridged
Two-tone

Raspberries

Grapes

Gourd

Apple

Solid
Wood-
gained
Flat-topped
FRUITS

Malissa Walker & Julie Throo

Sparkling
Ringlet-topped
Rough

Fuzzy
Indented
Rigid
Asymmetric

Mesh
Round
Squishy
Orange

Smooth
Red
Glassy
Spherical

Arched
Linear
Vitreous
Heavy

Flat
Printed
Thin
Multicolored

Linked
Metallic
Dangling
Jeweled

Porous
Oval
Green-leafed
Spngy

Bumpy
Hollow
Fuchsia
Small

Gourd
Peach
Purple
Rubbery
Frosted
Slippery

Tomato
Watermelon
Card

Banana

Charm
Bracelet

Lemon Dish
Scrubber
Strawberry Candy
Container

Grapes
Compressible
Curved
Absorbent

Reflective
Iridescent
Crinkly
Translucent

Velvety
Crimson
Glittery
Speckled

Vibrant
Rotating
Sheer
Multi-toned

Looped
Lightweight
Springy
Tubular

Bow Barrett
Ponytail Bow

Silky
Partly-
checked
Stretchy

Purple
Molded
Snapping
Pierced

Sponge Bow
Felt Bow
Foam Bow

Raised
Flexible
Homemade
Two-sided

Flimsy
Fuzzy
Flat
Pastel

Segmented
Limp
Hard
Colorful

Pony Bead
Bow

Mesh
Bow

Package Bow

Kali Killian & Keri Eastman
FLowers

Julianne Miller & Liz Farrell

Golden Glistening Branching Metallic

Tissue Box

Long-stemmed Scented Reinforced

Night Light

Right Angled Boxy Hollow Four-sided

Wooded Painted Flat Smooth

Three-dimensional Plastic Translucent Electrical

Hair Tie

Foam Multi-colored Stretchy Squishy

Metal Beaded Strung Shiny

Permeable Violet Glittery Sheer

Bendable Encased Rectangular Floral

Flowers in Pot

Grassy Planted Fenced Supported

Decoration

Flowers in Pot

Wooded Painted Flat Smooth

Toy

Bouquet

Lily

Hair Tie

Tissue Box

Right Angled Boxy Hollow Four-sided

Wooded Painted Flat Smooth

Three-dimensional Plastic Translucent Electrical

Hair Tie

Foam Multi-colored Stretchy Squishy

Metal Beaded Strung Shiny

Permeable Violet Glittery Sheer

Bendable Encased Rectangular Floral

Grassy Planted Fenced Supported