VOCABULARY PLUS TECHNOLOGY: An After-Reading Approach to Develop Deep Word Learning

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Source: *The Reading Teacher*, Vol. 68, No. 6, Inquire-Integrate-Create-Motivate (March 2015), pp. 449-458

Published by: International Literacy Association and Wiley

Stable URL: https://www.jstor.org/stable/24573849

Accessed: 02-03-2020 21:18 UTC

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An After-Reading Approach to Develop Deep Word Learning

Thomas DeVere Wolsey ■ Linda Smetana ■ Dana L. Grisham

Words are not just collections of letters separated by spaces; a word captures an idea. Vocabulary implies that learners understand these ideas and attach a term to each concept. More than just spelling, more than just a dictionary-like definition—vocabulary is the mechanism human brains use to categorize and make sense of concepts that are often very complex. Students who can use a term conversantly know how to use it precisely in their writing and in their interactions with others; they can be said to really know, deeply know, not just the word but connections to ideas it embodies. When students are intrigued by words and ideas, they want to dig more deeply. Interesting technologies encourage students to connect what makes them wonder with the ideas they encounter in their academic reading, and the effect can be quite powerful (Dalton & Grisham, 2011). That is what the vocabulary self-collection strategy plus (VSS+) is all about.

We have arrived at a truth about word learning: students who are intrigued and who know that their own inquiries have value in the classroom will want to know more about the words they encounter. As we re-envisioned the vocabulary self-collection strategy (VSS; Haggard, 1982) in our digital age, we thought about our work with vocabulary in several ways. We started with two assumptions:

1. Vocabulary learning is largely a social transaction.
2. We learn words we need to use and whose meaning has some value to us, such that we want to make those words part of our lexicons.

While direct instruction is valuable, so, too, are the words students want to learn because they are intrigued, they are interested, or they believe the words might interest them or otherwise have value relative to their learning. Words understood or used in appropriate contexts are, or can be, the signal that concept learning has occurred or is occurring (Biemiller & Boote, 2006; Graves & Watts-Taffe, 2008). Being conversant with a concept and the words that represent that concept is a hallmark of academic language and underlying thinking (Castek, Dalton, & Grisham, 2012). Students who understand the concepts represented by the words—and who can convey the concepts to informed peers by using the words—may be said, in some measure, to have achieved a level of mastery appropriate to the content, the vocabulary, and the grade or developmental level (Blachowicz & Fisher; 2006; Beck, McKeown, & Kucan, 2002).

Word learning, in many ways, occurs as a result of repeated encounters with the term under study. After-reading encounters appear to enhance the probability that the concepts represented by words will be retained (cf. Eckerth & Tavakoli, 2012). We have found it useful to think of vocabulary learning as an activity mediated by objects as well (Arnseth,

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The Reading Teacher Vol. 68 Issue 6 pp. 449–458 DOI:10.1002/trtr.1331

2008); that is, objects, including digital tools, tend to mediate or inform the learning that results from human activity. Our approach suggests that the digital tools students use as they construct meaning is a product, in part, of the choice of tools students or their teachers use as they grapple with challenging vocabulary. We suggest that the use of digital tools that mediate learning and activities, such as discussion, online and paper-based texts, and visual representations, may guide students to meaningfully revisit terms and the concepts represented by those terms. VSS+ is a strategy that may guide students to deep understanding of the terms that are relevant to their study of text.

Nearly 70 years ago, the notion of before-, during-, and after-reading sequences as a common mode of reading instruction (Betts, 1946) came to the attention of teachers as a way of organizing instruction that involves reading and other literacy tasks. Since that time, various refinements to the before-, during-, and after-reading sequence have been proposed. Here, we propose VSS+ as an after-reading instructional routine.

Pause and Ponder

- Consider a lesson in a content area and how you might incorporate VSS+ after the students read a piece of text.
- Think about how you might obtain access to the Internet and which programs you might explore for use in VSS+.
- Consider how you might group your students and encourage collaboration among them.
- Think about how the students can demonstrate their increased academic vocabulary through a variety of tools.

In the age of academic standards such as the Common Core (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010), additional attention to the role of before-, during-, and after-reading sequences has once again come to the forefront. Students are now tasked to overcome challenges with complex texts and, in many ways, they must increasingly use their own cognitive resources. Just what role should before-, during-, and after-reading activities take as students work with increasingly complex texts and take on more responsibility for reading those texts themselves? We wondered that, too. Part of our response to the question lies in what students do to manipulate, grapple with, and come to really know the ideas in the texts they read and discuss. VSS+ provides students with opportunities to engage with words in such a way that they become conversant with the concepts the terms represent.

In addition, new criteria for academic success can direct us to tools (such as VSS) that provide us with opportunities to learn from the past. For example, Bloom's Taxonomy has been updated (Anderson & Krathwohl, 2001) to include seven categories with "creating" at the top. Even more recently, Churches' (2007) digital taxonomy assists in understanding the need for higher order thinking skills in a digital world. In using VSS+, students are, in fact, using these higher order thinking skills with technological tools to create new knowledge for themselves.

Of course, we live in an era of unprecedented access to information, tools for manipulating knowledge, and generative approaches whereby students can become makers of products that also help them learn as they create products they might share with others. Generative technology, defined by Grisham and Smetana (2011), means using the affordances of technology to combine reading and writing skills and strategies with authentic questions for learning content within learning communities. Students learn vocabulary deeply when they read about the ideas, write about and present them, discuss them, think about the deeper implications of vocabulary in particular contexts, and rely on sources to support their thinking.

When we look at reading and writing instruction in our preK–12 schools, we may find students who are being asked to read and compose in a traditional manner while the world beyond those classrooms asks for texts to be digital and to carry meaning across the traditional and digital literacy borders (Takayoshi & Selfe, 2008). Instead, we believe technology use in our schools should be generative and should assist students in integrating technology, language arts, and literacy into every discipline (Grisham & Wolsey, 2006).

In our prior work with K–12 students and novice teachers (e.g., Grisham & Wolsey, 2006; Grisham & Wolsey, 2014), we have found that students often learn best when they work together. The communities that exist in classrooms that are built around common tasks, individual inquiry, shared interests, and the wonder of an interesting world are the best way to learn about that world.

Vocabulary Self-Collection Strategy Plus

Some years ago, Haggard (1982) noticed that many vocabulary learning tasks in school did not mirror the way that words are learned outside of school. Copying definitions and writing sentences with terms that are largely

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unfamiliar doesn't seem to result in vocabulary learning that really sticks (Castek, Dalton, & Grisham, 2012). When words selected solely by the publishers of a textbook or by the teacher are given to students to learn, such words often do not reflect what the students really need to know. Thus, Haggard devised VSS.

The idea is very straightforward. Students gathered words they thought represented concepts they needed to know and brought the words to class (cf. Ashton-Warner, 1963). The teacher added a couple of words, as well. From the compiled list, the students engaged in a variety of activities throughout the week; then, they tested themselves on the words. For general vocabulary development, this process worked well. However, for learning the vocabulary of content, Haggard (1985) suggested that students might engage in reading and concept development activities followed by word work using VSS as an after-reading activity with words derived from the text that represent concepts that need further development or are otherwise important to know well. In both cases, the students are positioned to decide what they need to know based on the context of the learning environment. Students build independence as thinkers who are capable of knowing what they know and deciding what they still need to learn. VSS has also proven successful (Ruddell & Shearer, 2002) in building general, academic vocabulary knowledge with low-achieving middle school students. The approach has considerable empirical support for the effect it can have on student word learning.

In our VSS+ approach, students engage in the activity after reading, as noted in the original Haggard (1982, 1986) model. In VSS+, the activity is centered on technology and builds on the dynamics of the group to choose and learn content-specific words and build students' capacity to understand those words and to use them in appropriate oral and written contexts. Outcomes of VSS+, as reported here, are that students learn the word as it is used in academic texts appropriate for the grade level, make critical decisions about which images are most representative of the term, explore additional connections (such as synonyms, antonyms, and related vocabulary) to the word, and develop a rationale for their selection of the term and exploration of it in the VSS+ activity.

The rationale for choosing a word is of particular importance in VSS+. To construct a rationale that is coherent and understandable to others, students must have engaged with the term in many ways via discussion, image search, use of online reference tools, and the textbook. As a result, the students become conversant with the term. They know it, and they can use it appropriately. Their constructed rationales provide the opportunity for them to finalize their thinking and use the word in a way that demonstrates their command of academic vocabulary as well.

The VSS+ Project

When Mr. Danysh, a fifth-grade teacher in a major metropolitan area on the west coast of the United States, approached us for help with the technology available in his school, we were immediately interested. Mr. Danysh recognized that the computer labs in his school, loaded with software, were little more than digital worksheets for his students to complete. They were rote tasks, and while they were entertaining at times, students did not engage in meaningful academic ways with the content. Neither did students seem to possess viable knowledge of how generative technologies, tools students could use to foster understanding and create content, might be used. In fact, when we asked the students how many knew what PowerPoint was or had used it, only 5 of the 28 students raised their hands. Few had ever been required, using even the most common of tools, to employ technology to learn and to help others learn as a result of the presentations they might develop.

In short, it seemed to us and to Mr. Danysh that students did not use the existing technology in ways that produced meaningful learning. His students were certainly interested in using technology, but their capacity for using digital environments to create and promote concept development was lacking; that is, they knew how to navigate the digital worksheets and games they found on the school computers, but they were not familiar with a means of using technology to generate new understandings

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about academic content. We suggested that content learning (in this case, science) might be more likely to result if students could grapple with the ideas found in their science text by exploring online resources, including images and graphic organizers. Mr. Danysh agreed, and so did his students.

From this serendipitous juncture of needs, Mr. Danysh and his fifth graders helped us polish a model that resulted in VSS+. Together, we looked for a sweet spot: an intersection of technology, content needs, pedagogical demands, and students' interests (Mishra & Koehler, 2006) built on the strong community of learners Mr. Danysh had already established in his classroom.

Research in Mr. Danysh's Classroom With Science Content

VSS+ as we implemented it in Mr. Danysh's class involved several steps. First, we introduced the VSS+ process. Students would work together in small groups to create an online class dictionary. We used a wiki for this purpose, but blogging tools with tagging features would also be effective (see the list of resources in Figure 1). Next, students would decide on a word from the text they thought was important from their reading of the science concepts in the textbook. After that, they would go to the computer lab. If your students have tablets or classroom computers, they might work on the class dictionary as part of a rotating station assignment in word work.

In the computer lab used for this study, each student group used two computers: one for searching online for content and one for creating a contribution of one entry in the e-dictionary. Each contribution would be made using either PowerPoint or ThingLink as a kind of frame or platform for students' work. The contribution needed to include the following:

- An image that represented the term
- A graphic representation of the term using a drawing tool or the online WordSift tool
- A written definition of the term from a reliable online dictionary
- An audio component or podcast explaining the group's rationale for selecting the term

Finally, all the VSS+ dictionary entries would be compiled into the class online dictionary.

Figure 1 Technology for VSS+

Technology needed includes a platform for creating the e-dictionary entries, a platform for the e-dictionary itself, and support technology for finding, creating, and embedding images, audio, or video. Multimodal work is a critical component to the success of VSS+.

Platforms for the Vocabulary Entries

* Criteria for selecting a platform include the ability to embed audio files, images, and text. (See Figure 3 for a sample entry.) Platform examples include the following:

ThingLink (see sidebar)	www.thinglink.com/edu
PowerPoint	office.microsoft.com/en-us/powerpoint/
Prezi	www.prezi.com
VoiceThread	www.voicethread.com
Popplet (We like Popplet but it doesn't support audio. It does support video from sources such as YouTube.)	www.popplet.com

Platforms for the E-Dictionary

* Criteria for selecting an e-dictionary platform include a means of organizing topics via tags or pages; linking or embedding student dictionary entries.

Webpages such as Google Sites	sites.google.com
Wikis	
• PBworks	www.pbworks.com
• Wikispaces	www.wikispaces.com/content/student
Blogs	
• Blogger	www.blogger.com
• WordPress	www.wordpress.com
• Edublog	www.edublogs.org

Support Resources for Audio Recording, Hosting, and Concept Maps

Voice Recorders	
• Digital voice recorders	Search online for "digital voice recorder"
• Vocaroo	www.vocaroo.com
• Windows Sound Recorder	windows.microsoft.com/en-us/windows7/record-audio-with-sound-recorder/
• Audacity	audacity.sourceforge.net
Podcast Hosting Sites	
• Podbean	www.podbean.com
• PodOmatic	www.podomatic.com
WordSift	www.wordsift.com

What Is ThingLink?

ThingLink (www.thinglink.com) is a tool that allows users to select an image and add interactive hot spots to it. Each hot spot can be linked to other content that is uploaded or found elsewhere on the Internet. When users hover over a hot spot, the video, text, map, or graphic is displayed.

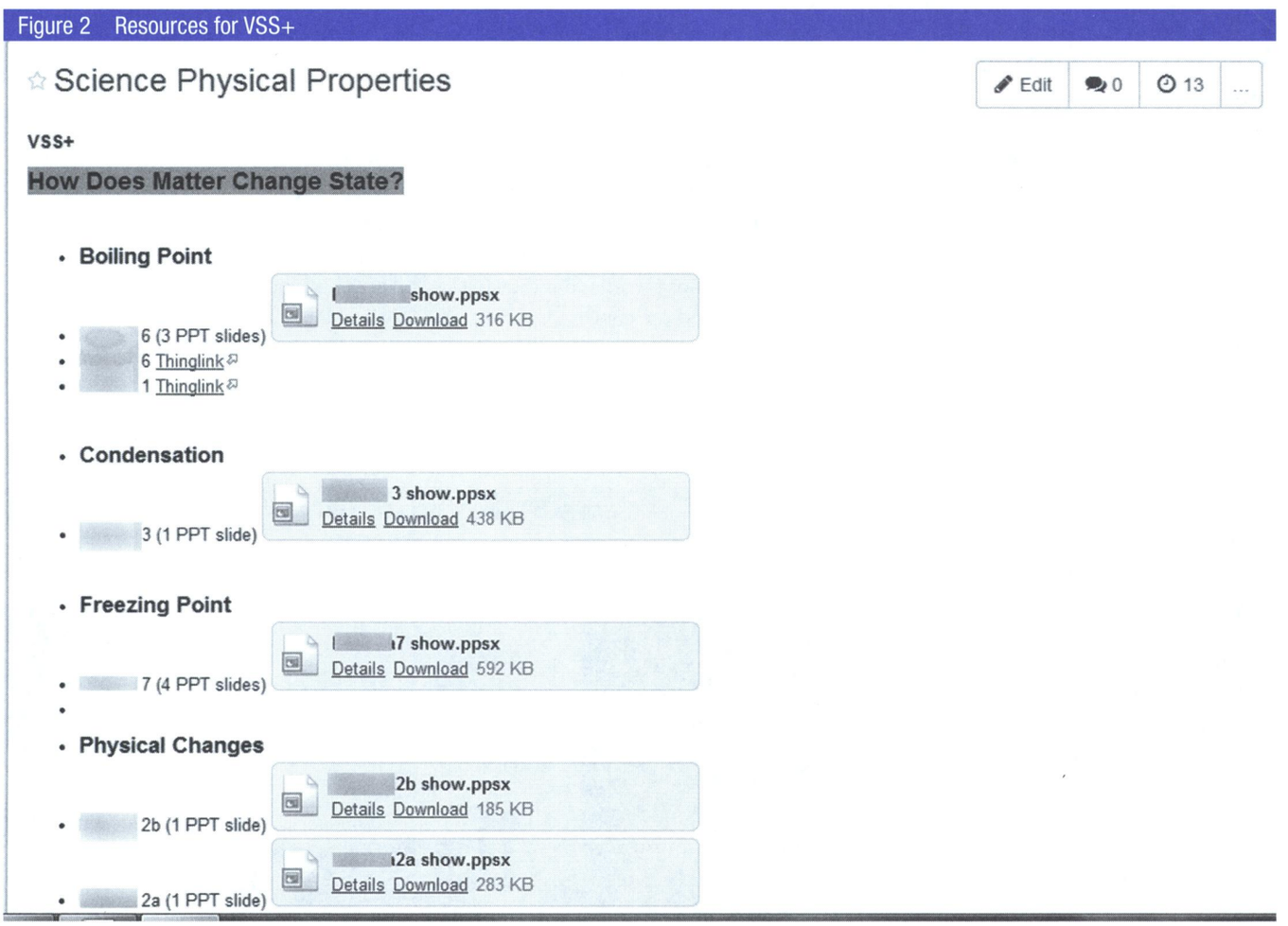
In VSS+, students learn to layer multiple tools to produce their dictionary entries and compile those into a useful resource, the e-dictionary, for all their classmates. Figure 2 illustrates how a wiki was used with students' ThingLink or PowerPoint presentations to construct the e-dictionary.

The Technical Part

Because the students were unfamiliar with the technology, we introduced them to each tool they would be using. Other tools could be used, but we first showed students how to launch PowerPoint and save the file using their group number (e.g., Grade5_group1). We emphasized that this would be important for keeping track of the files students added to the class dictionary. We also showed the whole class how to insert images and create audio using the built-in tools in PowerPoint. Because we wanted the students to have options and consider which tool best suited their needs, we also demonstrated ThingLink, which required students to build a dictionary entry by starting with an image they selected. The tools they used would be layered; for example, students might use an audio recording tool, save their recordings, and embed that in their final e-dictionary contribution.

The fifth graders quickly grasped that each tool had different affordances and that their selection would affect the way they built their VSS+ entry. Students also needed to know how to search for images, how to create and embed audio, how to find the bookmark we had placed on the computers for WordSift, and how to create links to embed Web content in their presentations.

Figure 2 Resources for VSS+



A few students knew how to do this, and they became the class experts for each topic. For the most part, students learned as they went and relied on each other when they did not know how to move forward with a particular task. For us as researchers, seeing the students interact to solve problems they encountered when they did not know how to do something was particularly exciting. Their interactions were those of thinkers who recognized the possibilities and affordances of a tool, knew who to ask when they needed help, and learned both the science content and the best approaches to making a product in a digital environment that they could share with the class.

What We Learned About Vocabulary Learning and VSS+

What students created was informative for us and for them. As we watched the students create their VSS+ dictionary entries, we were impressed, as we often are, with the quality of the thinking that students gave the task. They looked with precision at just what terms such as *boil* and *boiling point* meant and went well beyond everyday definitions to the more precise scientific definitions as they searched for photos they could include in their dictionary entries.

As we observed the students, we heard them discuss among themselves how one photograph looked like the liquid was boiling but another actually showed how the vaporization process occurred throughout the liquid and not just at the surface (see Figure 3). The students settled on an image through discussion; in conjunction with the other aspects of VSS+, they strengthened their understanding. When students can transcend common notions of a concept and examine thoroughly the scientific implications of precisely what *boiling point* means, for example, we may infer that they have deeply learned the concept and the terms that represent it.

We suggested that the students use WordSift to develop a web about their concept word. Previously, we had incorporated WordSift into student activities and liked the web or the visual array that could be created. What we had not considered was the difficulty of capturing the visual array. Since the lab computers did not have a program to create screenshots of images or text and students lacked experience with this task, students were not able to move WordSift images to their ThingLink pages.

Students decided to create their own word webs instead. Rather than incorporating all of the words on the WordSift array into the newly created word web, the students discussed the meaning of each word and the relationship of the word to the concept word for the ThingLink entry. They incorporated only those words that they felt best represented the concept word. In this way, students further demonstrated the problem-solution mindset that Mr. Danysh had fostered all year.

Simply, students did not know how to capture the image but they quickly used available resources to create an alternative that, ultimately, was more powerful than our original plan for using the WordSift technology.

As previously described, we offered students two platforms—ThingLink and PowerPoint—for creating their dictionary entries. They were quick to pick up on what affordances each platform offered them relative to the task at hand. ThingLink required students to first determine what image best suited their purposes before they linked video, static images, text, and audio files to it. PowerPoint was more flexible in this regard, but students were surprised to discover that PowerPoint included tools for drawing (for example, creating their own cluster diagrams) and embedding audio files in the slides. (Figure 4 shows a slide that includes a speaker icon, which indicates that a student-created audio recording of their rationale for choosing the term is available.) At first, many students were intrigued with ThingLink because it foregrounded the search for images. Later, some of the groups switched to the more familiar PowerPoint, finding new affordances in a tool they thought they knew.

Figure 3 Screencapture of the Online Dictionary in Wikispaces

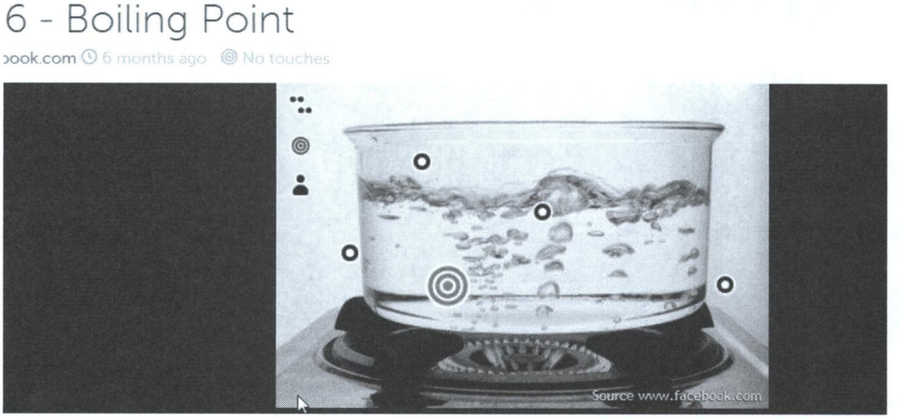
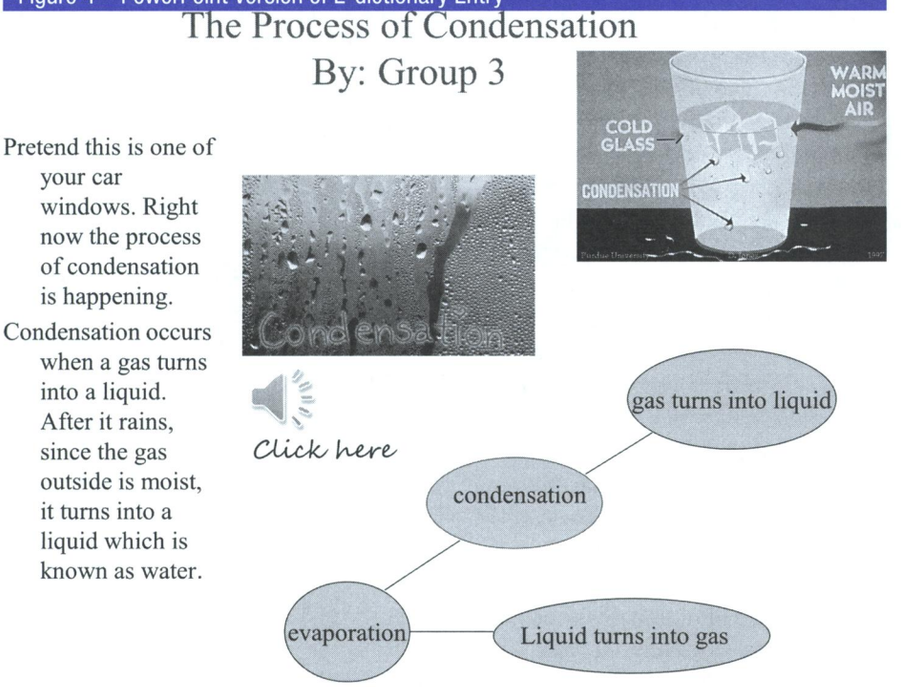


Figure 4 PowerPoint Version of E-dictionary Entry



What Students and Teachers Learned

After students completed the VSS+ project, we interviewed Mr. Danysh and some of his students. One point Mr. Danysh made that stood out was the power of the group work, of students collaborating to create something as they learned. He said, "Most of the time, the purpose of the groups' work activity comes from me. This time, the purpose, selecting the word to share with the group, came from the kids. I wonder if that was what made a difference."

At least as important, we learned that students do understand the importance of vocabulary work. They learned from interactions with each other and their collaborative inquiries into science concepts as they explored the web for more information. Such forms of information observed included cluster organizers, images, and definitions—all showing students that words are fascinating in and of themselves. Moreover, the fifth graders with whom we worked built on the culture of wonderment about the world as they experienced it and which their teacher had patiently built with them over the early months of the school year. They trusted him to let them explore, and he trusted them to be explorers of content and builders of concepts. Mr. Danysh noted how amazing the students were at explaining why they chose the terms they did: "They were so much more articulate than I imagined. I did not realize that the students could articulate their own reasons for choosing a word."

At first, the technology seemed rather daunting, given that that the students had very little experience with searching the Web, using PowerPoint and ThingLink, or adding audio components to either of these tools. However, because the students were motivated to more deeply understand the science content in the lesson and they learned to rely on each other, they learned the terms in a way that made them conversant with the terms and the concepts they represented. Simultaneously, students became more proficient with the technology and built on the collaborative skills Mr. Danysh had taught them from the beginning of the school year. "Wow! They were problem solvers," Mr. Danysh told us. "I did not hear any fights or disagreements as the groups needed to settle on images for the slides. They just kept working—plugging away, trying different things when something wasn't working and they needed to try another way."

The real value behind the VSS+ approach is found in the repeated use of the target term in discussion as students created their e-dictionary entries, in reading the text, and in finding a visual that they really believed matched the definition of the term as it was used in science contexts. "The fact that they had to locate a visual image for the word made them think of how the word is understood. There were lots of ways to remember the word. Some kept going back to the book and making sure that they were presenting the correct definition," Mr. Danysh reminded us. One of the fifth-grade boys, Abel (student names

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are pseudonyms), noticed how important the pictures are to understanding challenging concepts. "Sometimes you need pictures to explain something difficult. We wanted the picture to be perfect," he said. Anna, another fifth grader, came to us with a simile for how she learned as she engaged with her partners and the technology to learn the science words: "The project was like bubble gum… the more you chew it, the more you get from it. It (VSS+) helps you understand things better." Moreover, the students continued to discuss the project and the science terms they came to know more deeply months afterward. Often, they used the knowledge they gained about states of matter to make comparisons to new learning later in the year, Mr. Danysh told us.

Since the time we spent in Mr. Danysh's class, other teachers have taken the VSS+ concept and put it to use in their own classes. Helen, a student teacher in an intermediate self-contained class for students with learning disabilities, incorporated VSS+ into her class's study of bacteria and germs. She shared,

> Using ThingLink, the students studied the visual that they chose to represent the word. Two students were debating the visual image for their word and one student pointed out to the other that the image needed to represent all facets of the word, not just one or two characteristics. The students returned to the chapter for more detail, reviewed another set of images, and finally agreed on the image to anchor their ThingLink.

View some of her students' e-dictionary entries on ThingLink here: www.thinglink.com/user/445019437775454209/scenes

Reflecting on the assignment, Helen thought that the students learned more about the word at the conceptual level than she could have taught them directly. Seeking definitions, examples, application, videos, songs, and other images required the students to critically evaluate the information to be presented and how it related to the word within the content area.

Elyse, another student teacher, had her students create an online dictionary of words relating to sneezes and sniffles. After completing the VSS+ process, the students composed their entries using ThingLink. Elyse posted the entries at elyserynhoud.weebly.com, a website that she set up for this project.

Next steps for the students and their teachers included expanding the selection of words to other content areas, including literature, social studies, and math. One teacher noted, "The content areas of science and health offered words with concrete meanings that were not open to much interpretation." However, as students worked, they found depth in their understandings of the terms. Another teacher stated,

> I created a sample slide with the term *oppression* to see if I could use this process with the reading selection for the next day. I found that there were so many options for content; I was concerned that the students might become distracted. However, I realized that the choices the students would need to make would require critical analysis and attention to the greater context and author-intended meaning of the word. The students could create several slides for a single word. Each slide would be based on a different use of the word.

"The students returned to the chapter for more detail, reviewed another set of images, and finally agreed on the image to anchor their ThingLink."

In addition to expanding the VSS+ strategies to other content areas, a mechanism for peer and teacher feedback is needed. We realized that all of the slides were not completed with the same sophistication or level of complexity. Mr. Danysh and one of the researchers discussed the need for more feedback. "[We] brainstormed how the students could provide some type of feedback to their classmates. Perhaps each group could view a presentation from another group. Each group would have a class-generated (with teacher guidance) checklist to use in the review process." Components of the rubric might include accuracy of information, types or variety of information included, layout, and image selected to represent the concept.

If students are not familiar with the technologies, the first session may take a bit of time as students learn to use the tools. Mr. Danysh noted, "The students became more proficient with the technology as they used it. There was a difference in the amount of work produced in the last hour as opposed to the first hour, with the last hour more productive."

Implications for Instruction

While we are convinced that the VSS+ and similar approaches that combine traditional and new literacies are what is needed for deeper engagement with academic learning in our schools, we have observed that technology use may be very uneven across schools—even schools in the same district. As we have written elsewhere (Wolsey & Grisham, 2012), access to technology

"We believe that we must take risks as teachers to do justice to our students."

may be a challenge, and there are a number of other issues to consider when planning a technology project such as VSS+. In our case, prior computer experiences at the school had not provided students with opportunities to create projects using digital technologies. The materials on the computers were games and electronic worksheets. For many students, the VSS+ was the first time that they had made an original product.

Teachers need and want professional development and support to address the issues inherent in wider technology use. For example, schools need sufficient bandwidth for multiple simultaneous searches on the Internet; if sufficient bandwidth is not available, student groups must rotate in their use of classroom or lab computers rather than all students working simultaneously. In some cases, access to computers may be limited, and the teacher may also need to obtain formal permission for children to search various Internet sites—censorship is ubiquitous where minors are concerned. Collaboration among teachers and technical support, if available, is recommended to address such topics as firewalls, popups, and other technical issues when planning for technology use.

New teachers need preparation programs that will provide them with some thoughtfully structured instructional uses of technology (Grisham & Smetana, 2014). The programs in which we teach provide a standalone technology course that provides some expertise in the use of computers but does not include much on instructional uses of technology (Wolsey, Grisham, & Smetana, 2014). We would argue that new teachers need field experiences in their methods courses that include individual and collaborative instructional projects with a variety of students.

VSS+ was incredibly influential for the groups that have experienced it. Updating the original VSS (a versatile and useful strategy without technology) proved fortuitous, both for the students and for us. We believe that we must take risks as teachers to do justice to our students.

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TAKE ACTION!

- Determine what technological resources (hardware and software) you have available to work with.
- Determine your students' ability to use digital tools for academic purposes. For example, students may need to be taught how to insert an audio file into a ThingLink image or a PowerPoint slide.
- Identify texts with academic vocabulary with which students need to be conversant. For example, Mr. Danysh selected a text section that contained words such as boil and freezing point, which students could use in everyday conversations. However, through the investigation of the words, students learned the precise meaning of the words within the science context.
- Assess your own level of comfort in allowing students to use technological tools with which you may not be familiar or proficient.
- Choose a text and section for the VSS+ lesson.

MORE TO EXPLORE

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