
Blogging to Improve Instruction in Differentiated Science Classrooms

The need for highly qualified science teachers who can differentiate instruction for diverse learners is acute. The authors show how the wise use of classroom blogs, coupled with podcasts and vodcasts, can help teachers extend and differentiate their instruction.

BY MICHAELA W. COLOMBO AND PAUL D. COLOMBO

THERE IS a shortage of science teachers in the U.S.¹ That is a problem because this country's future could depend on our expertise in science and technology. Fortunately, while there is no magic wand to increase the number of qualified science teachers, there is a way to extend the instructional impact of the teachers we have. And the advantage of this method is that it uses a technology that is popular among students and allows teachers to differentiate their instruction for students with diverse needs.

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Widely available software now makes it easy for teachers to establish class blogs. A blog is a website that contains text, audio, and video postings on a particular subject. In addition, the popularity of such software as iTunes now makes it possible for students to access high-quality instruction from class blogs long after they leave their science classes. While all students may not have Internet connections at home, students can access and download blog files at the community library or in school computer labs or media centers during study periods, after school, and during tutorials.

SCIENCE INSTRUCTION IN DIFFERENTIATED CLASSROOMS

When thinking about the potential of blogs to increase effective instructional time, it's worthwhile to

first consider how science teachers provide high-quality, differentiated science instruction for all students in the classroom.

For example, consider Ms. Daniels, a (composite) seventh-grade life science teacher, and three of her students. Ms. Daniels has a master's degree in science education and has been teaching life science for eight years. She stays current in her field and has participated in teacher development projects through the National Science Foundation. Over the past three years she has worked to differentiate instruction for the diverse students she teaches. Ms. Daniels teaches English-language learners (ELL students), students with individualized education programs, and gifted and talented students in her heterogeneous, mainstream science classes of 20 to 24 students. She differentiates instruction to help all students learn high-level science content and develop the academic language skills necessary to effectively communicate science concepts. She builds units and lessons around the "enduring understandings" that she and her colleagues have established for seventh-grade life science. She explains, "Helping students focus on the essential questions provides context for learning and keeps students focused. It also allows students to demonstrate their level of understanding in various ways."

Today, Ms. Daniels is teaching about mollusks. Ana, an ELL student who has been in the U.S. for three years; Robert, who reads at a fifth-grade level; and Taylor, who has been identified as gifted and talented, listen as Ms. Daniels describes the characteristics of mollusks and uses PowerPoint slides to display detailed photos of clams and other bivalves. Ms. Daniels speaks clearly as she points to illustrations and related vocabulary.

The students take notes in their daily science journals. Every other week, Ms. Daniels holds individual journal conferences that engage students in academic discussions about their work. She wants students to understand that scientists do not work alone. Students learn to discuss concepts using scientific terms and expressions. In these conferences, Ana uses journal notes to practice the language of science. The conferences allow Robert to verbally express understandings he cannot make clear in writing. And they give Taylor the chance to discuss the links on the class blog that allow her to access more advanced content.

At the beginning of each school year, Ms. Daniels conducts several lessons focusing on text structure. She uses overheads of pages from the science text to demonstrate to the students where and how they can find key concepts, new vocabulary, and important explanations. "Regardless of students' current reading levels, understanding text structure helps them improve their

ability to read in this content area," she explains.

Ms. Daniels uses cooperative group work and individual projects to assess students' understanding. She also gives tests, and she explains, "I try to prepare my stu-

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dents to do well on all assignments. Tests are part of students' academic reality."

Ms. Daniels discusses the benefits of this additional support for students:

Ana is a student who will soar in science with extra support in academic English. Robert needs additional help with basics, but he's very engaged in science. If we can scaffold his academic skills, he'll be successful. Taylor is gifted. She needs to be challenged. Most of my students would do better with additional support. I differentiate content and assignments, yet students need more instructional time to master concepts at their highest level of understanding. Most parents try to work with their children at home, but often they don't know the content or they don't know it in English. Once most students leave my class, they don't get support or enrichment in science.

BLOGGING TO EXTEND CLASS TIME

The iTunes phenomenon that has swept the U.S. over the past several years has the potential to extend academic instruction. Many colleges and universities have already begun to make recorded lectures available for students to download. With newer technologies becoming more affordable and user-friendly, the possibilities for extending content instruction in K-12 classes continue to increase.

Blogs expand instructional time by providing teachers with a user-friendly online format to reinforce strategies, introduce new topics and concepts, review important class points, review for tests, and provide enrichment. Blogs contain text, audio, and video files that are archived on a Web page for easy student access.

The text files are similar to those found on Web discussion boards. These allow students and teachers to engage in written, two-way communication. The audio files, commonly referred to as podcasts (play on demand), allow students to listen to a description or explanation. And the video files, called vodcasts (video on demand), allow students access to a file that combines video with audio.

Ms. Daniels integrates technology into her instruc-

tion using text files. She creates postings that link unit content to essential questions and that promote inquiry. During the mollusk lesson, for example, Ms. Daniels relates the filtering capability of mollusks to environmental issues and asks questions on the blog, such as “If a serious red tide algae bloom occurred in Cape Cod Bay, why would the bay be closed to shell-fishing?” Students are encouraged to engage in online dialogue about the question and related environmental issues.

Ms. Daniels also posts study guides that outline key points students should understand for projects, tests, and other assignments. She includes links to more advanced materials for students like Taylor. However, while the text files allow Ms. Daniels to interact with students outside the classroom, these files are not enough to help many students grasp the content and develop the strategies they need to reach their potential in science.

INTEGRATING VODCASTS AND PODCASTS INTO INSTRUCTION

Like Ana, many ELL students need additional support with the language of science and the pronunciation of science vocabulary. Other students, like Robert, have difficulty reading and reviewing science texts and materials. Vodcasting provides a powerful tool to address these needs. Teachers can combine PowerPoint visuals and narration to review key points of class lessons and then save these as vodcasts. They can then upload the vodcasts to the class blog, which increases the accessibility of these lessons not only to students but also to parents, tutors, teacher specialists, and paraprofessionals who work with students.

To become lifelong learners of science and to reach their full academic potential, all students must develop strategies for reading complex science texts and materials. Because texts frequently follow predictable patterns, the best person to teach students to read like scientists is a qualified science teacher.³

Ms. Daniels uses vodcasts to support the science content reading lessons she conducts at the beginning of each year. When students struggle with text that is difficult for them, they and their parents can access these reading-strategy lessons. With one click, students are able to download “Using Unit Objectives” and “Learning New Vocabulary.” When Robert and his parents open “Using Unit Objectives,” an image of the first page of a unit from the textbook appears. As they see the words “Unit Objectives” being circled, they hear Ms. Daniels explaining, “In this text, objectives are found on the left-hand side of the first page

of the new topic. All objectives in units that you read for this class relate to one of the enduring understandings we have discussed.” Ms. Daniels then asks Robert to think about that enduring understanding. There is a pause, and then the next slide appears, displaying the enduring understanding as Ms. Daniels reads it. The following slide explains the relationship between the objective and the enduring understanding.

Robert then clicks on “Learning New Vocabulary Words.” Again a page from the science text is displayed, and Ms. Daniels explains that key vocabulary words in this text are always found directly below the objective. Robert watches as the first word is circled. He listens as Ms. Daniels pronounces the word. Because students are more likely to remember words that they can pronounce,⁴ her voice prompts him to repeat the word and to listen to the pronunciation again.

Ms. Daniels explains that key vocabulary words are often illustrated within the text. Robert listens as her voice directs him to the page of the illustration that corresponds with the first vocabulary word. She calls Robert’s attention to features of the illustration that help him understand the word. She then directs Robert to turn to pages that illustrate the boldface vocabulary words where they are used within the text.

Using the same presentation sequence that she established in class and followed in the vodcasts on reading strategies, Ms. Daniels creates podcasts to introduce each topic within the text. She has chosen podcasts because they require less computer memory and download more quickly than vodcasts. When students click on a podcast, they hear Ms. Daniels speaking slowly and clearly, providing time for them to locate pages and diagrams in their texts. Podcasts of each lesson are available to students, parents, and paraprofessionals on the class blog.

SETTING UP A CLASS BLOG

Setting up a blog is easier than most teachers realize. Free blog services available on the Internet, such as WordPress.com and Blogger.com, make blogging user-friendly for both Macintosh and Windows users. With a few clicks, teachers can configure class blog sites. Once teachers have configured a class blog, they can upload text files.

Creating podcast and vodcasts requires separate software applications. (See the sidebar, page 63, for commercially available software products.) Although podcasts and vodcasts can be accessed through the blog, the size of these files requires that they be stored on the school or other Internet server. Computers with

SOFTWARE FOR CLASS BLOGS

Note that blogging software is frequently updated, so users should check for the latest versions.

FREE SOFTWARE

- Apple iTunes, available for both Macintosh and Windows, www.apple.com/itunes.
- Audacity, podcasting software, available for both Macintosh and Windows, <http://audacity.sourceforge.net/download>.
- WordPress offers two options: open-source blogging software available for Macintosh, Windows, and Linux; users load to their own servers for full blogging capabilities, <http://wordpress.org>. Free blog account including full text and graphic capabilities; participants need to store podcast files elsewhere and link to them, <http://wordpress.com>.

SOFTWARE FOR PURCHASE

- Camtasia 3.0, podcasting and vodcasting software for Windows, www.techsmith.com/camtasia.asp. The cost is \$299.
- ProfCast 1.5, podcasting and vodcasting software for Macintosh, <http://profcast.com/public/index.php>. The cost is \$35.
- QuickTime Pro, podcasting and vodcasting software for Macintosh and Windows, www.apple.com/quicktime/pro/mac.html. The cost is \$29.

operating systems of Windows XP or Mac OS X, with a minimum processor speed of 2 GHz and a RAM of 2 GB, are recommended.

SUPPORTING TEACHERS IN INTEGRATING TECHNOLOGY

While creating and maintaining a classroom blog is not difficult, it is time-consuming, and the effort will not be successful if it is considered as an add-on to a full-time teaching schedule. Successful blogging requires content-area master teachers to rethink current teaching models and to make important decisions regarding the effective integration of technology. Teachers need time to consider how best to adapt content and pedagogy to the online format. They also need time to experiment and to share their work with others

in the same content areas in order to evaluate its effectiveness and to make necessary adjustments.

Teachers also need ongoing access to technology and to professional development that meets their individual needs. Those who are technologically savvy will benefit from experimenting with new technologies and sharing ideas with colleagues; those without technological expertise will need more focused training and sufficient practice time. Less-experienced teachers can review existing educational blogs, develop a sense of what works, and then gradually create their own technology-enhanced educational materials.

USING BLOGS TO EXTEND SCIENCE EXPERTISE

There is no substitute for qualified science teachers. Blogs, however, can help school systems expand access to science expertise. Consider a seventh grade with eight classes of students, eight teachers, and only one highly qualified science teacher. Even if the qualified teacher teaches four sections of science, the other four sections will be taught by teachers without science licensure. This arrangement may result in little in-depth instruction and even less enrichment. The teachers' assessment of student understanding may be limited to end-of-section check-up questions and tests supplied by the book publisher.

Schools can increase access to science expertise by providing technical support that allows highly qualified science teachers to create text, podcasts, and vodcasts for class blogs; training other teachers to use these blogs with their students; and providing time for the grade-level teachers to meet regularly for discussions. These blogs will also allow students at all levels — and their parents, tutors, and specialist teachers who scaffold their learning — to benefit from the knowledge and skills of a qualified science teacher.

We are currently collecting anecdotal information that will help us determine the effects of science blogs on the achievement of diverse learners in two secondary science courses. We anticipate having preliminary findings during the summer of 2007.

1. National Science Foundation, *Science and Engineering Indicators 2006*, available at www.nsf.gov/statistics/seind06/c1/c1h.htm.

2. Grant Wiggins and Jay McTighe, *Understanding by Design* (Alexandria, Va.: Association for Supervision and Curriculum Development, 1998).

3. Cris Tovani, *Do I Really Have to Teach Reading? Content Comprehension Grades 6-12* (Portland, Me.: Stenhouse, 2004).

4. Barbara M. Birch, *English L2 Reading: Getting to the Bottom* (Mahwah, N.J.: Erlbaum, 2002). **K**

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