OUT ON A LIM WITH EDUCATIONALTECHNOLOGY

Ideas for Integrating Technology Into Science Classes

By Janine Lim

A recent study by the CEO Forum found that technology in the classroom can facilitate "increased application and production of knowledge for the real world."

"Technology allows teachers and students to augment the curriculum with current information and timely study of real-world events, thus making learning more dynamic, engaging, and valuable. Studies have shown that students who used simulations, microcomputer-based laboratories, and video to connect science instruction to real-world problems outperformed students who used traditional instructional methods alone."[1]

This summer, as you plan and think about your science teaching for next year, consider the following ways to integrate technology and real-world problems into your science lessons.

Picture Removed

Internet Web Sites

Among the many Internet sites that can supplement your science classes, here is a sampling of some of the most useful. Be sure to visit each site to make sure it is appropriate for your curriculum before having students access the Web site. Also, refer to the earlier article in this column on structuring student activities and research online.[2]

- WebQuests are inquiry-oriented activities that use mostly online resources. A selection of exemplary WebQuests can be found at http://webquest.sdsu.edu/matrix.html/. Scroll down for the science ones.
- Alfy's Thematic Units: Look at the science and health section at http://www.alfy.com/teachers/teach/thematic_units/.
- Education-Now! at http://www.education-now.com/Science/index.htm/ features technology resources for Adventist education and links to sites that correlate to the Adventist grades 5-8 science textbooks: *Discover God's Creation, Explore God's Creation*, etc.
- BrainPop.com: This site features short animations or movies that explain many science, biology, and technology subjects and corresponds to the National Science Education Standards for grades 5-8. Also included are interactive quizzes, experiments, printable activity pages, and more. Limited access is free, and you may view three movies a day for free. Unlimited access is available for a fee.
- Exploring Planets in the Classroom: 25 K-12 hands-on activities from NASA at http://www.spacegrant.hawaii.edu/ class_acts/.
- More than 250 science WebQuests created by other teachers are listed in alphabetical order by title at http://www.teachnology.com/teachers/lesson_plans/computing/web_quests/science/.
- HowStuffWorks.com: http://express.howstuffworks.com/. Visit the Teacher's Corner for lesson plans, activities, and more.
- Interactive Physics and Math includes illustrations that can be manipulated, such as a bouncing ball with an angled floor, a pendulum, diffraction, refraction, oscillation, and more at http://www.lightlink.com/sergey/java/.
- GRIN: Great Images in NASA is a searchable database containing hundreds of photos from scientific to historical that you can use in projects, reports, presentations, etc.: http://grin.hq.nasa.gov/.
- Try Virtual Frog Dissection at http://www-itg.lbl.gov/vfrog/dissect.html/.
- Water Science for Schools from the U.S. Geological Survey: http://ga.water.usgs.gov/edu/. Includes information on many aspects of water, pictures, data, maps, quizzes, etc.
- ChemTutor.com: Basic chemistry help for high school and college students.
- Earth Science links at http://www.remc11.k12.mi.us/bcisd/classres/escience.htm/.

• Life Science links at http://www.remc11.k12.mi.us/bcisd/classres/lscience.htm/.

• Physical Science links at http://www.remc11.k12.mi.us/bcisd/classres/pscience.htm/.

• Creating Rubrics: If you use rubrics to assess lab reports and group projects, be sure to visit RubiStar at http://rubistar.4teachers.org/. This free site is supported by the U.S. Department of Education.

Internet Projects

One of the most powerful uses of the Internet is helping students participate in data-collection projects. Usually, these are organized by another teacher, who sends all the data collected back to participating classes for analysis. One of the best places to find projects on the Internet is the Global School Net Project Registry at http://www.gsn.org/pr/. Projects cover topics such as the following:

• Worldwide Weather Service. Students collect weather data each day and post information on the site. Data is then shared with all participating schools.

• TENAN: The ENdangered ANimals of the World. An international research project for students of all ages. Participants choose an animal to research and post their report on the site.

• Conservation Database. Enter conservation ideas in an online database. Students studying garbage, water, energy, heat, or any other topic can enter and view ideas for how to help conserve the Earth's resources. All ideas will be shared over the Web!

• Some are time-specific, such as this one: Wild Flower Quilt Square Exchange 2002. Early in 2002, students at Pashley Elementary in Glenville, New York, worked with children in grades 2-5 from 12 states to design and make quilt squares representing native wild flowers, which they exchanged with other participating classes by the first day of spring.

• What kind of animals do you have in your neighborhood? Students will collect data and photos of animals from different regions of the world. The information and photos will be posted to the Web site under "Schools and Animals Around the World," and the receiving class will also compose a book for its science library.

More than 800 projects, mostly created by teachers like you, are listed in the registry. Try one out! Or start one yourself!

Using a Digital Camera

Many schools now have a digital camera available for use in the classroom. Prices have dropped drastically in the past several years. Here are some ideas for using a digital camera in your science classroom.[3]

• Take a series of pictures showing how to do a science experiment. If desired, assemble into a slide show.[4]

• Use the five-second movie option (if your camera has that feature) to record students explaining a science concept, definition, or experiment. Assemble into a slide show (PowerPoint or KidPix).

• At the elementary level: Take pictures of your students at various times throughout the year to watch them grow!

• Document the growth of a school project such as planting and growing of a class garden, the changes in a tree outside your classroom window throughout the seasons, your class pet, etc.

• Assign a new "Class Photographer" each week to capture at least one photo of "learning in action" to be used in the school newsletter. Have the student also write a description of what's happening in the photo.

• Take lots of pictures when your class is on a field trip. Back in the classroom, ask each student to choose one picture to label with a short description of what was happening or why this was important, or something he or she learned. Print a copy for each student or assemble into a slideshow.

• Record pictures of bulky science projects to include in student portfolios.

Learning through the use of real-world problems can enhance and deepen students' understanding of scientific concepts.

Using a Document Camera

A document camera, or visual presenter, allows you to show objects, overhead slides, posters, maps, and more. It can zoom in to show detail as small as the date on a coin. Many science teachers use the document camera for demonstrations of experiments, dissection, and slides.[5]

Probes, Handheld Computers, and Data Collection

Learning through the use of real-world problems can enhance and deepen students' understanding of scientific concepts. Handheld computers, probes, and other portable devices can assist student learning. "Real-time data collection seems to be the most effective way to connect a graph with the real-world experiences of the student."[6] A biology teacher at Carl Sandburg High School says that her "students have used their palm computers to measure the 'ecological footprint' of their homes by gathering information on their families' use of transportation and energy, and food intake. This data is easily downloaded for analysis without the need to retype the information from hundreds of paper worksheets."[7]

Geographic information systems (GIS) technology "can be used for scientific investigations, resource management, and development planning."[8] GPS units can be used to collect data to enter into GIS systems for further analysis. GPS "provides specially coded satellite signals that can be processed in a GPS receiver, enabling the receiver to compute position, velocity, and time. Four GPS satellite signals are used to compute positions in three dimensions and the time offset in the receiver clock."[9] Students at Hopkinton High School in New Hampshire use a sophisticated software package called ArcView to collect data about the flora and fauna in their community and to draw conclusions based on the information. This unit helps the students un-

derstand the environmental issues affecting their community.[10]

• Journey North: http://www.learner.org/jnorth/. This data-collection site focuses on a global study of wildlife migration. It includes lesson plans and data from around the world on the bald eagle, manatee, tulips, leaves, etc.

• Handheld Computers in Education: http://www.remc11.k12.mi.us/bcisd/classres/mobile.htm/ includes articles, software resources, and other information.

• GIS/GPS in K-12 Education: http://www.remc11.k12.mi.us/bcisd/classres/gis.htm/ includes articles, data sets, lesson plans, product overviews, etc.

• From a Distance: NASA's introduction to GIS and GPS and remote sensing. Lesson plans for K-3, 4-8, and 9-12 are included. See http://education.ssc.nasa.gov/ltp/.

Software

Of course, you should also carefully consider which software to use. The Children's Software Review offers unbiased, educator and child-tested reviews of many software packages. Their magazine and Web site are a worthwhile investment. Here's a sampling of science software reviewed by CSR:[11]

• DK Multimedia, *Eyewitness Encyclopedia of Science* 2.0 (4.5 stars) contains 80 animations, 40 video sequences, 800 photos and illustrations, and 3 1/2 hours of audio.

•DK Multimedia, *The Mad About Science Series* (4.0 stars) with 32 science lessons introducing children to forces, electricity, light, sound, and heat.

• DK Multimedia, *My Amazing Human Body* (4.6 stars), an entertaining and educational introduction to the human body that teaches about the skeleton, organs, and body systems.

• DK Multimedia, *Pinball Science* (4.8 stars) turns your computer into a responsive and realistic game of pinball . . . with no need for coins. Students apply important physics concepts like force and magnetism as they modify their machines with springs, levers, rockets, or windmills.

• DK Multimedia, *The Ultimate Human Body* 2.0 (4.5 stars) teaches anatomy, science, and health by taking children on a journey inside the human body. Full-color video and animation sequences show how the body's organs work. A 360-degree rotating skeleton lets students examine every aspect of human structure.

• Edmark, *Virtual Labs: Electricity* (4.3 stars): Children explore electricity as they experiment with batteries, bulbs, fans, switches, fuses, and breakers. Designed for classroom use, the software features onscreen labs and comes with 40 reproducible lab worksheets and an onscreen *Sci-Clopedia of Electricity* information.

• Edmark, *Virtual Labs: Light* (4.3 stars): This lab offers 26 different lenses, mirrors, filters, colored lasers, and light targets—all of which can be freely positioned and adjusted.

• Edmark, *Space Academy* GX-1 (4.6 stars): Children use virtual science tools to learn about the Solar System. By experimenting with movable diagrams, reading tables, and controlling simulators, students can compare the planets and their attributes, investigate the astronomical basis for the seasons, and more.

• Edmark, *ZAP!* (4.6 stars): Children experiment with lasers, light rays, electrical gadgets, and sound waves, either in an open-ended fashion or while trying to solve problems in labs. These problems are arranged sequentially, so students learn the main properties of the subject at hand in small, easy-to-understand steps. It's a fantastic program for classroom use but would also work well in the home, particularly for children who like to take things apart and put them back together.

Finally, Here Are Two Other Must-See Software Packages:

• *Decisions, Decisions: The Environment.* This software lends itself to the one-computer classroom and walks students through a simulation where they play the role of mayor of a town and make decisions about the environment. Topics covered include pollution, land use, and economics and environment. Visit TomSnyder.com to find information about this product, and Decisions, Decisions Online, which covers current topics such as cloning, genetically engineered foods, and energy and the environment.

• *Weather Bug* (PC only) http://aws.com/schools: Bring 21st-century learning to your students with all the excitement of real-time weather, the Internet, educational technology, and live television.

Challenge yourself this summer to find two new ways that you can integrate technology in your curriculum next year. As you bring real-world problem-solving to your classroom, your students will learn more and become engaged in the scientific process.

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REFERENCES

1. Carol Chmelynski, "Technology Can Raise Achievement," *Electronic School* (June 2001). Also available at http://www.electronic-school.com/2001/09/0901ewire.html/.

2. Janine Lim. "Effective Internet Research," *Journal of Adventist Education* 62:2 (December 1999/January 2000). Also available at http://www.andrews.edu/~freedj/jae/d99j00extra.htm/.

3. Most of these ideas are adapted from this site: http://www.edzone.net/~mwestern/pix.html/.

4. PowerPoint has a new plug-in available called the Photo Album. It allows you to quickly make a slideshow with digital pictures. Download it for Office 2000 here: http://office.microsoft.com/downloads/2000/album.aspx/.

5. North Central College has a great page explaining how to use a document camera: http://www.noctrl.edu/library_ncc/instructional_media/documentcamera/documentcameradirecti ons.htm/. Elmo is one company that sells document cameras: http://www.elmousa.com/.

6. Douglas A. Lapp and Vivian Flora Cyrus, "Using Data-Collection Devices to Enhance Students' Understanding," *Mathematics Teacher* 93:6 (September 2000), p. 507.

7. Del Stover, "Hands-on Learning." *Electronic School* (2001). Also available at http://www.electronic-school.com/2001/03/0301f4.html/.

8. From http://info.er.usgs.gov/research/gis/title.html/.

9. From http://www.colorado.edu/geography/gcraft/notes/gps/gps_f.html/.

10. From http://www.eschoolnews.com/news/showStory.cfm?ArticleID=291/.

11. From http://www.childrenssoftware.com/sciencejul00.html/. Visit this page for a more detailed review of these software packages. Also visit http://www.electronic-school.com/0698f6.html/ for a 1998 review of science software.