Technology In Environmental Education

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In a world where we are frequently exposed to controversial high-tech headlines about self replicating miniature robots, attempts to download human brains into computers, and cars with night vision and heads up displays, I am often asked what does technology have to offer environmental educators and their students? When it comes to technology, we are of two minds. We hate TV, but we have a favorite show. We hate deforestation, but we love beautiful wood-grain furniture. We hate electronic eavesdropping. But we love it when it's used to capture a fiendish criminal. Technology. We love to hate it. We hate to love it. In the next few pages, I will explore the philosophy and examples of how we try to embrace (if not love) Technology in our programs at IslandWood.

In a recent survey of environmental centers, Bethany Lesure found the most common reasons for integrating technology into educational programs are "audience demand", "State Ed. Requirement", a way to "Reach Out", and that "Kids Relate" to technology. While these are very pragmatic reasons, I would argue that we need to be more deliberate in our choices - after all, isn't much of Environmental Education about considering the consequences of one's actions?

Integrating technology into our educational programs provides students with additional tools to enhance their learning. So you might wonder, "What are the benefits of taking this approach to help students explore and understand the world around them?"

Technology supports our efforts to appeal to different learning styles. With a variety of learning tools, students can understand their experiences through verbal, written, spatial, quantitative, and/or graphical means. As a result, many more students become engaged in the learning process.

Technology supports our multidisciplinary approach to learning. Integrating different disciplines helps students combine their mathematical, logical, scientific, linguistic, artistic, and social knowledge to make their lives and interactions with the world clearer.

Technology is integral to modern science. Modeling the research techniques of biologists, engineers, and other professionals, helps students use technology to measure, document, interpret, obtain, and manage data.

Technology aids our efforts in supporting teachers. Regardless of their disciplines, few teachers currently receive training in the use of technology. Technology allows us not only to demonstrate teaching strategies, but also to deliver training, which provides teachers with the skills and confidence to become leaders in their classrooms and schools.
Technology gives us a way to connect with each other and extend the learning experience. Interactive web elements and participation in video conferencing provide students with experiences before their visits to IslandWood, and allows them to continue projects after their stay at our campus.

There are many definitions used to define ”technology,” particularly when looking at how it is used in education. One of the simplest definitions, and one I like, is that technology is how humans change/control their environment. A metaphor I like to consider when explaining the role of technology in education is that technology is an ”amplifier.” By that, I mean that technology helps us extend our senses. Since we interact with the environment through our senses, using technology seems a logical element of instruction about the environment.

Here are a few of the specific ways we have infused technology into programs at IslandWood. I have tried to include enough information to enable readers to modify the uses for their own locations.

The plethora of digital cameras on the market allows us to capture all sorts of images that previously have been fleeting. Simple adapters are available, and even specialized instruments that make it easy to capture and save digital images from microscopes, binoculars and telescopes - essentially any optical instrument. In each of our lab classrooms, we have microscopes hooked up to video screens so children can see what it should look like before they look into their own microscope - a valuable ”clue” to provide feedback if you’ve never used a microscope before. Similarly, a video screen on a spotting scope in the bird blind helps new users understand how to use their own scopes and binoculars.

A great digital camera activity involves kids taking pictures of each other to learn constellations. Each child researches and chooses his or her own constellation. They then pose in a manner similar to the figures associated with constellation and have a buddy take their picture. Once the picture is transferred to the computer, kids remove the background, add the stars in the correct places, and possibly include some text and drawings. We’ve had kids print their constellations on transfer paper and iron them onto T-shirts. It's hard to forget what Cassiopeia looks like once you’ve sat in her chair!

We can use technology to speed up or slow down time. High speed movies allow us to ”slow down” time and see how milk splashes, or how cats lick. Time-lapse photography allows us to see how slow process work. My daughter made a time-lapse movie of a caterpillar metamorphosizing into a butterfly using the software that came with a $99 web camera. What took three weeks to film could be played back in 30 seconds. The neatest thing was watching the chrysalis - that had looked pretty much the same to us all the time - wiggle and change in shape.

Handheld devices, Palms and PocketPCs, are a great way to get technology into children's hands at a fairly affordable price. The advantage of these devices is that they run lots of software, so they are multifunctional. We use handheld computers to collect data, help analyze data, and as a multimedia reference. Imagiworks produces ImagiProbe - a sensor-based data acquisition system that enables students to conduct authentic scientific investigations much as research scientists do. Dozens of probes are available to measure just about any parameter you
want. We use probes to measure temperature and pH of various bodies of water on our campus as the children study stream health. CyberTracker is another great tool for the Palm devices. It helps children step through the process of identifying what species they've "seen." We've also created a collection of simple web pages for animals specific to our location to act as a multimedia reference. With this guide installed on a PocketPC, our instructors, and the children, have a field guide that not only shows pictures and words, but also can play the vocalizations of birds. By working through the sounds on the PocketPC or tracks or seat in CyberTracker, children learn that sight is not the only way to make a PID (Positive Identification.)

Computers, themselves, have a role in what many people think of when discussing "Technology" in education. They are great ways to find information and learn facts, manipulate that information, and communicate what has been learned.

Two of my favorite "species references" help children learn about species in the context of their environments in a highly interactive setting. Photo Hunt in Yellowstone helps kids learn about what animals they'll find in Yellowstone Park, as well as learn to decide where to find them. Similarly, students can take a virtual dive through Monterey Bay's kelp forest and see 17 of Monterey Bay's native species at in context. These are both wonderful examples of presenting reference information in fun, effective ways.

Spreadsheets are great applications for helping kids display data graphically - if there's only one thing you are allowed to do on a computer with data, have kids learn to create graphs (and gain control of their information!)

Showing how things work through simulations is also useful. A favorite tool of mine is Model-It - a visual modeling and simulation tool for use on desktop computers. Students can easily build, test, and evaluate qualitative models without needing to know the underlying calculus driving these models. They can create models that represent their theories about the scientific phenomena studied in class, and they can run simulations in order to test their models. Again, they are in control and use this as a tool to describe what they think is happening.

Finally, remember, "There's No Such Thing As the Technology Itself." You'll need some training on how to use it, and some strategy for supporting, fixing and replacing what you have. One challenge we face at IslandWood is that children visit our facility for three to four days. We want to minimize the time they spend learning how to use the technology, and maximize the time they spend learning. This often means more sophisticated systems (to make them fool-proof) or more time training our staff how to use the systems. No matter how you address it, remember the goal of the learning is not how to use the technology, but what is was used for!

I hope this gives you some ideas about the appropriate uses of technology in Environmental Education. Think about the needs of the learners, and the educational values the applications provide. Consider technology as a way to amplify and extend the essential skills and knowledge you want your students to acquire. If it's also fun, great!
About the Author:

Clancy J. Wolf, Ed. D. is the Technology Coordinator at IslandWood. You can email him at: clancyw@islandwood.org. As a teacher who has taught across the United States, Dr. Wolf has challenged students to think about how they fit in the world around them, and explored how to use technology to help students create better understandings. An example is an activity he designed and supervised for the University of Michigan-the Columbus Odyssey -- where students followed reports from a family retracing Columbus' route. As a team member of the National Consortium for Environmental Education & Teaching, he created EElink, a major website for Environmental Education information. Most recently, as President of the Northwest Council of Computer Education, Clancy initiated NCCE's DigiTalkies digital media competition co-sponsored by Apple Computers. Education: B.A. in Mathematics/Physics, Whitman College; M.Ed. in Curriculum and Instruction - Secondary Education, Bowling Green State University; Ed. D. in Science Education; University of Michigan.
Notes & References:

This article was originally written for an online journal, and had many hyperlinks built into the text. The links are listed below, however, it may be much easier to follow the links of you go to the original document located at:
http://www.newhorizons.org/strategies/environmental/wolf.htm

1 http://www.time.com/time/europe/magazine/article/0,13005,901030512-449458,00.html
2 http://news.zdnet.co.uk/story/o,926982083914,00.html
3 http://www.usatoday.com/money/autos/2003-04-03-cartech2_x.htm
4 Bill Daggett and his colleagues at the International Center for Leadership in Education (http://www.leadered.com/vycu.html) share a monthly briefing on trends and technologies that will have an impact on education. Sample topics in the last year: Cognitronics, Biointeractive Materials, SPOT Technologies, Robotics at the Bedside, etc. This is a great way to learn about the latest technologies without the fear factor written in to sell magazines.
5 For a fun - non-technical - exploration about the nature of Technology and trying to understand where we fit in the changing world around us and it's implications for schools, read "Then What?" by Jason Ohler. (http://www.jasonohler.com/thenwhat/chapters/)
6 IslandWood is a 255 acre Outdoor Learning Center located near Seattle, WA. Our mission is: "To inspire environmental and community stewardship by providing hands-on learning experiences that link science, technology, and the arts in a natural setting." Many of the articles in this online magazine were written by IslandWood staff. For more on IslandWood, visit out website at: http://www.islandwood.org/
8 Marshall McLuhan, as many others, warns us that technology begets technology. There are consequences for every choice to use technology - costs, training, the need for additional infrastructure, etc. The main point is that it's difficult to consider all the benefits as well as all of the costs and implications when you choose to integrate technology into your programs. I like to think we have adopted "Appropriate" uses of technology - instances where the technology adds something to the learning experience, with an acceptable cost, and that could not have been done in other ways.
9 The activity described is called "Catch a constellation" and is part of a set of resources available from "Tech4Learning" (http://www.tech4learning.com/pdfs/session_handouts/constellation.pdf). They also have a collection of "snacks" that take you step by step through a variety of specific tasks - from how to use your camera, to getting the images into a computer, to using specific software to remove the background of the image (http://www.tech4learning.com/snacks/index.html).
10 Playing With Time (http://www.playingwithtime.org/) is a project that looks at how the world around you is changing over many different time periods. The project consists of two major parts: a web site and a traveling museum exhibit. You will see time sped up and slowed down, and behold the beauty of change. Time will be in your hands to witness, replay, and even create. You never know... you might not look at things quite the same way again.
11 http://www.imagiworks.com/
12 http://www.natureoutlet.com/cybertracker/step_one_purchase.shtml
13 http://www.photohunt.com/games.html
15 http://goknow.com/Products/Model-It.html