

Technology in the Early Childhood Classroom

By Elizabeth Ross Hubbell

Countless articles have been written about using technology to enhance instruction. However, only a small percentage have focused on early childhood. Some actually discourage the use of technology with this age group, claiming that doing so will lead to “unwired” brains, lethargy, hyperactivity, or physical impairment. As with any learning tool, technology should be used alongside a variety of learning experiences. This article will outline how teachers can use technology to help their young students engage in critical thinking activities and practice basic skills.

Most five-year-olds have grown up seeing adults using technology as they scan groceries, e-mail pictures, and shop online. As with any tool we expect students to use by elementary age (i.e., pencils, books), technology must be modeled and introduced prior to expecting children to be independent users. Consider that we introduce babies to books, music, and the sounds of their native language long before we expect them to talk or read. Maria Montessori wrote at length about the need for “practical life” exercises for young children. Montessori classrooms, especially for ages 3–6, are filled with apparatus to help students learn to dress themselves, keep their environment clean, and prepare their own snacks. John Dewey wrote similarly about educational “pragmatism,” or the need for everyday tasks to be used as educational experiences.

In *Classroom Instruction that Works*, Marzano, Pickering, and Pollock identified nine categories of instructional strategies that research findings indicate

have a high effect on student achievement for all grade levels in all subjects:

- Identifying Similarities and Differences
- Summarizing and Notetaking
- Reinforcing Effort and Providing Recognition
- Homework and Practice
- Nonlinguistic Representation
- Cooperative Learning
- Setting Objectives and Providing Feedback
- Generating and Testing Hypotheses
- Cues, Questions, and Advance Organizers

These strategies and technology can come together in the early childhood classroom, creating powerful learning experiences.

Identifying Similarities and Differences

Identifying similarities and differences was shown to have the highest effect size in Marzano’s study. Indeed, it’s one of the earliest learning experiences that children have, sorting incoming information into existing or new categories. Scaffolding this experience helps students to actively look for connections to background knowledge as they learn new material.

For example, a kindergarten teacher wishes to help her students activate their existing knowledge about animals and their different habitats. She brings up Kidspiration, a software application that can be used to gather ideas, assign pictures and sounds to words, and put ideas into outline form. The interface has large, kid-friendly buttons and voice-overs to help emergent or non-readers. In this case, the teacher uses a

pre-made template in the science section called “Habitats.”

She first brings up the template using a computer projector. Together, the class identifies the four habitats and shares what they know about the similarities and differences between each. She then asks the students which animals might live in each biome and how each animal is specially suited for its environment. As the students answer, she drags the picture of the animal onto the appropriate biome, modeling the use of the software.

Over the next several days, the students have the assignment of logging onto a computer in the classroom with a buddy and completing their own templates. After checking their work, the teacher saves and prints out copies for each student to take home. She can also e-mail the completed picture to parents.

The advantage of using Kidspiration is the ability to save and send student work, easily correct mistakes, and to tie in the practical life exercises of using the computer, mouse, and the software. Many of the icons that the students use in Kidspiration are very similar to those they will later use in word processing software.

Another advantage is that the templates can be used later. Toward the end of the unit, for instance, the teacher wants her students to write an adjective or two describing each biome. She shows the students how to go back to their template and click the “Outline” button. This button immediately puts the diagram into an outline form, complete with writing guidelines. Now the students have an organizer to help them write about the habitats. The pictures

stay on the outline to help with word recognition.

Another fun way for young students to identify similarities and differences is through games. Below are two online activities that allow younger children to practice this skill.



The "Habitat" and "Outline" views in Kidspiration.

Humphrey Bear's "What Doesn't Belong?" Game

http://www.humphreybear.com/play_belong.html
This game has groups of letters, numbers, pictures, and shapes, one of which differs from the rest of the group. Students learn to identify differences based upon characteristics. (PK–K)

National Institute of Environmental Health Sciences

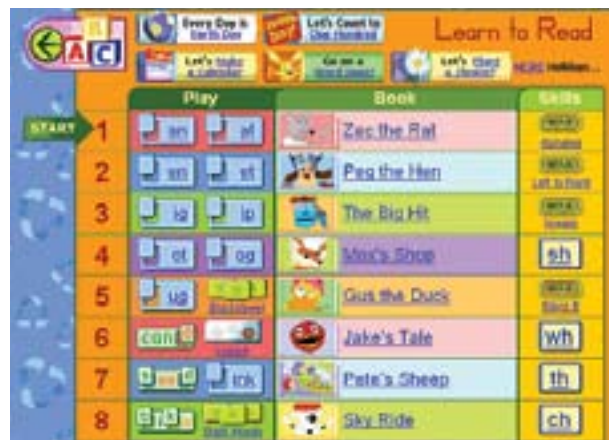
<http://www.niehs.nih.gov/kids/wrong.htm>
Students identify which object "doesn't belong" based on minor differences. (K–1)

Homework and Practice

One advantage of interactive educational games is their ability to provide immediate feedback. A student can practice a concept or skill repeatedly; the technology doesn't tire. This certainly isn't suggesting that software replace people, but that technology should be added to children's learning experiences. Well-made games have built-in methods of encouraging students through praise and prompting. Another advantage is that students of various levels can work in different areas of the games, allowing for differentiated instruction.

For example, a first-grade class is working on short vowel sounds, but some students are ready for more challenging work. One of their teacher's favorite resources for building reading skills is Starfall (<http://www.starfall.com>). In this case, all of the students go

to the Learn to Read section. Some do the short vowel activities while others concentrate on long vowels and consonant blends. Each sound has a corresponding e-book that sounds out an unfamiliar word when students click on it. Each vowel sound also has corresponding games.



The Learn to Read section of Starfall.

Another example of using technology to increase communication skills involves collaboration between kindergarteners and third graders. Every Friday afternoon, the kindergarteners visit the third graders, bringing drawings they made that week, illustrating a story they wish to tell or a concept that they learned. Each kindergartener sits with a third grade "buddy" at a laptop

and dictates his or her story. Watching the third graders type their words on the screen reinforces the letters associated with their spoken words. The activity gives the third graders a chance to work on efficient typing skills and to use correct punctuation and capitalization in an authentic environment.

In addition, they are given guidance from their teacher to help the younger students flesh out their stories. After the kindergarteners leave, the third graders peer-edit the stories they typed, looking for grammatical errors.

The two Web sites listed below are excellent resources for practicing early reading skills.

BBC Little Animals Activity Centre

<http://www.bbc.co.uk/schools/laac>
This Web site includes rhyming games, beginning and ending letter sounds, and interactive stories. There are also addition and subtraction games and other activities. (PK–1)

Get Ready to Read

<http://www.getreadytoread.org>
This resource is appropriate for teachers or parents. It includes an adult-facilitated quiz to see if a child is "ready to read" and follow-up suggestions based on the score. It also has games and activities to practice early literacy skills. (PK–1)

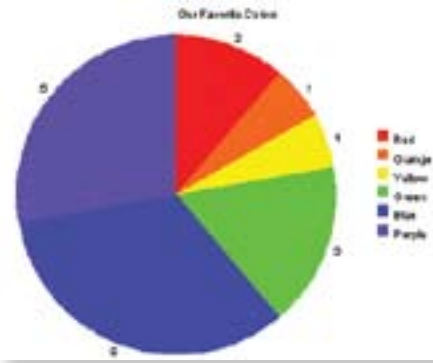
Nonlinguistic Representation

Representing ideas through pictures and graphs, mental images, physical models, and kinesthetic activity helps students better understand and retain new information. Teachers of young students are especially adept at using nonlinguistic representation to help emergent readers make sense of concepts. Multimedia provides nonlinguistic representation for learning in nearly every subject using a combination of audio, video, and interactivity.

For example, a first grade teacher is working with his students on interpreting graphs. Technology-based manipulatives provide scaffolding between use of concrete materials, such as construction paper or Unifix blocks, and abstract comprehension. They also can be accessed from home or when other materials are not available. In this case, the students have created a bar graph of their favorite colors using construction paper. Now, the teacher will show how the same data looks when graphed as a pie chart.

He brings up the Create A Graph Web site from the National Center for Education Statistics, a kid-friendly site that helps students create graphs that they can save, print, or e-mail (<http://nces.ed.gov/nceskids/createagraph/>). He first chooses Bar Graph and duplicates the data from the construction paper graph. The class compares the digital graph to the construction paper graph. All agree that the two graphs represent the same data.

Next, he goes back to the Design view and chooses to show the data as a Pie Graph so that students can compare two types of graphs showing the same data.



Long before technology will be used by the students for text-based research, students need to have the experience of using multimedia to access information. For example, a class studying the continent of Africa typically creates maps, tastes African dishes, listens to music, and experiences other sensory-based methods of exploring a continent. The Web sites below allow them to virtually visit Africa.

National Geographic WildCam AFRICA

<http://www9.nationalgeographic.com/ngm/wildcam/afrika/wildcam.html>

This Webcam is live during certain months of the year and uses recordings during the off-season. The Webcam is situated in the middle of Pete's Pond in Botswana. Various birds and mammals visit the pond daily. (All ages)

PBS Kids Africa

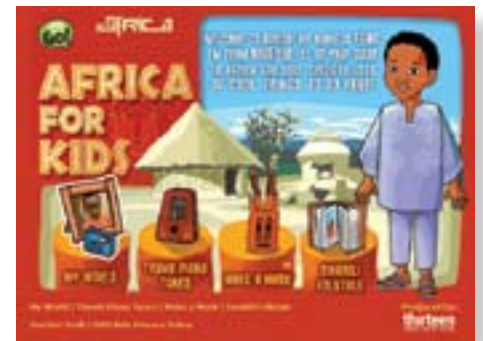
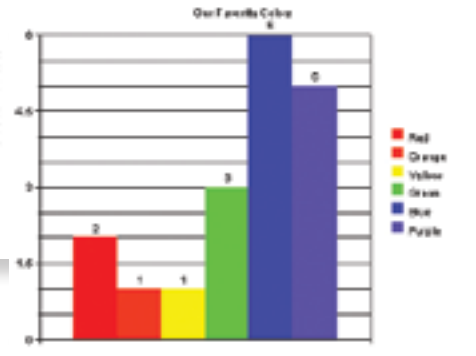
<http://pbskids.org/africa/>

This site introduces young children to Africa through pictures, a virtual thumb piano, a mask activity, and a folktale from Swahili. (PK–2)

Generating and Testing Hypotheses

Once students have conceptual knowledge of a subject, they need opportunities to apply that knowledge in order to deepen their understanding. One of the ways teachers can facilitate this is by engaging students in the process

Pie and bar charts from the Create A Graph Web site.



PBS Kids Africa home page.

of generating and testing hypotheses. When students problem-solve, they must generate and test their ideas about how to remedy a situation. One way that technology can facilitate this process is through puzzles in which students try different solutions.

PBS Parents Creativity Challenge

<http://www.pbs.org/parents/creativity/challenge/main.html>

This site incorporates several games, such as putting together pieces of a pipe so that a marble drops into the appropriate place. (K–1)

National Library of Virtual Manipulatives

<http://nlvm.usu.edu/en/nav/vlibrary.html>

This site, from Utah State University, contains virtual

Call for Curriculum Submissions

Have you or a colleague taught a lesson or unit integrating technology that went particularly well?

Do you have:

- Tips, tricks, or tidbits?
- Stories or quotes that demonstrate student learning?
- A great tech tool or resource?
- Quick ideas easily adapted to other settings or content areas?

If you answered **yes** to any one of these, please call or write the editor with your ideas:

Kate Conley • kconley@iste.org • 1.541.434.8926

mathematics manipulatives. Some that are appropriate for young students include finding a pattern and working with a virtual geoboard. (K–12)

Young students naturally make observations about the world around them and construct hypotheses to explain what they observe. Data collection tools facilitate experimental inquiry by focusing students on *analyzing* data rather than simply *collecting* data. Both Fourier and Vernier make science probes appropriate for younger students. For example, a kindergarten teacher wants to demonstrate the concept of insulation. She asks her students to hypothesize why their hands get warmer when they wear gloves or mittens. Some students propose that perhaps the glove contains heat. She plugs in a Go!Temp probe from Vernier and asks for a volunteer to place the probe in his empty mitten. After a few moments, she places the probe in the child's hand. Finally, she places the mitten on his hand and has the class observe what happens to the temperature. The result of their experiment is created in real time by the LoggerLite software.

Technology is and will continue to be an integral part of classrooms, workplaces, and our everyday life. Using technology helps early learners to communicate, practice skills, and better understand concepts. If used pragmatically in the early childhood classroom, students will be better equipped to begin using 21st-century tools independently as they enter elementary schools.



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Dynamic Human Anatomy

Human anatomy is a commonly offered health course or unit in a high school curriculum. It can provide a foundation to students who wish to become emergency medical technicians, teach health and physical education, or pursue a career in the medical field. The evolution of instructional materials used to teach human anatomy has included anatomical models, charts, and flash cards. In addition, there have been several publications, such as *Gray's Anatomy* and the *Anatomy Coloring Book*, that have become discipline classics. Although few would classify these learning resources as inspirational, they have served a purpose because of the lack of a better alternative.

Dynamic human anatomy software developed by Primal Pictures (<http://www.primalpictures.com>) has provided teachers with unprecedented opportunities to create highly interactive lessons. Students may chart their own virtual tour through the layers of the human body with the use of realistic graphic models that have been created from MRI scan data. The software includes images, animation, clinical slides, text, MRIs, and quizzes to support and enhance the learning process. Fully interactive 3-D animations show both function and biomechanics, and all content can be copied for use in PowerPoint and Word. The figure above shows layer 11 of 24 of a knee joint, and can rotate 360 degrees to reveal all bones and soft tissue associated with the knee. In addition, selection of a bone, ligament, or tendon will reveal the name and definition in the right hand margin.



A look at layer 11 of 24 from the Interactive Knee. Various view options are described in the text located on the right side of the slide.

Various versions are available. The complete anatomy edition contains the interactive hand, head and neck, hip, knee, pelvis and perineum, shoulder, spine, and thorax and abdomen. Other available software includes interactive functional anatomy, and the sports injuries series, which includes the foot and ankle, the knee, and the shoulder. Primal Pictures software is available as interactive CD-ROMs, DVDs, and as a Web-based subscription service. So if you want to add some interactivity and multimedia spice to your anatomy lessons, Primal Pictures might be just what the doctor ordered.

—Ken Felker, professor of health and physical education, Edinboro University, Edinboro, Pennsylvania