Chapter 3

Educational Software and Web Sites

Thinking About Educational Technology

Joseph Weizenbaum, former M.I.T. Computer Science professor, once gave a speech entitled "Are Computers Good For Children?" He claimed that his speech would be short: The answer is no, he said. His main objections were:

- literacy vs. computer literacy: Basic reading and math skills must have preference over computer literacy and programming.
- too much money is being thrown at problems when computers are under used, teachers inadequately trained, and so many other needs exist.
- too much truth coming from a CRT: children already spend too much time sitting in front of that other CRT, the television set.
- not real motivation for learning.

But Weizenbaum was missing the point. The future of computers in schools is not to see them as separate entities to teach computer literacy but to use the computer as a powerful tool for enriching, expanding, and ultimately, rethinking our primary and secondary school curriculum.

We need to recognize that educational software and web sites are simply another learning medium. We must accept their imperfections and work on using their strengths. We do accept imperfections in our textbooks, but we use them for what they offer. And so it must be with educational technology. Beware great expectations; but also realize the tremendous potential.

In thinking about educational uses of technology, inevitably we become involved in global school issues by focusing more attention on the curriculum and learning process. In fact, an important humanware theme involves altering job descriptions to create time for evaluating software and web sites. It is crucial that several people at each school become active as educational technology experts.

- Drill and Practice software and web sites are not ideal, but they serve a useful purpose. They should not be compared to an ideal teacher - ever patient, ever rational - that cannot exist. Instead, they should be used for their patient objectivity and record-keeping options, and evaluated for their graphics, animation, and intelligent use of the material.
- Educational technology functions as marvelous project tools, in the way that Howard Gardner suggests is so important in *Frames of Mind: The Theory of Multiple Intelligences* and for those who focus on differentiated learning styles.
- We need to use the strengths of technology to address the weaknesses of the curriculum. Two striking examples are improving problem solving and writing skills.
- There is tremendous value in using technology to address the problem of heterogeneous classes and differentiated learning. The flexibility of technology both allows for and encourages the creation of projects suited to the needs of a variety of skills and a variety of learning styles.
- Some aspects of our curriculum do need dehumanizing. Removing the human relationship in these areas can be useful for the learning process.
- In contrast to programming, educational software and web sites demystify the computer, opening it up to everyone. Diverse use of the computer helps to overcome the trap of the computer as male territory.
- The time crunch is a challenge to be met, not a problem to be solved.
- It is not necessarily a question of the right software or the best web site, but a question of what individual teachers find intriguing and exciting.
- There is no “right” way to use educational technology, but rather a variety of approaches. See the section on Classroom Management which formalizes these various styles.
- It is particularly important that females see the computer as more than a math/science tool. Girls too frequently “drop out” of higher level computer courses and even at an early age, girls perceive the computer as boys’ territory. By using a word processor, drawing tools, and simulations, girls feel empowered by computers and in control.
- Evaluating educational technology should be seen as a process that can help promote faculty colleagueship and communication. We need time to see if the technology serves its purpose. We need to be careful of both the explicit and implicit values found in software packages and web sites, e.g. racism, sexism, violence. We need to evaluate with children and take advantage of the 30 day preview flexibility that many software publishers allow. We should make errors in using it to see how it handles mistakes. We should investigate if the simulation can be saved to play at a different time. Ideally, we should gather a group of friends or colleagues to try out the technology or let a group of students try it out. Many

aspects of educational tech come as positive surprises for a school. With a fairly well-defined goal of seeking educational software, many teachers and schools have found these significant fringe benefits:

- Use of technology can be a revitalizer and lifesaver for teachers, helping in some ways to reprofessionalize the profession.
- Educational software and web sites can excite and energize the classroom, e.g. simulations, projects, creative endeavors. Tom Snyder talks about using educational software for "rainy day activities."
- Because educational software and the web add conceptual richness to so many topics, we may come to realize that we need to slow down the pace to cover subjects in greater detail.

Drill and Practice Software/Web Sites

Frequent complaints

- most commonly maligned as an electronic workbook
- asks only close-ended questions, left vs. right brain teaching
- cannot compare to an ideal teacher, an ideal text and an ideal role for the computer
- no supertechno answer to children's difficulties in learning and no zippy future tech use of the computer
- doesn't change education in any fundamental way; the computer is a scarce resource and should not be wasted on D & P which teachers can do better. Teachers should be encouraged to do things that may be riskier, more exciting and potentially more beneficial; lulls teachers into thinking that they are using computers to their full potential
- Too much focus on "fact-based" education
- Too cute, too many games, unnecessary animations, and not enough content

Reasons for Drill and Practice

- Patient and consistent, non-involved, self paced, can respond individually, errors can be analyzed and corrected, records can be maintained, future ones will be able to detect conceptual problems that are leading to mechanical errors (i.e., multiplying 9 x 3 = 12)
- relatively easy to implement because it involves a change of mechanics but not a change in point of view, easily worked into the existing curriculum to support and perhaps accelerate the pace
- frees up teachers' time to allow them to be more creative and to focus on higher order thinking skills
- works well to reinforce a concept, but not necessarily to teach it
- can be used effectively in the one computer class for group skills and practice sessions

Research and General Observations about Drill and Practice Activities

- impact of computers is highest with young children and decreases steadily as grade level increases
- using a computer to supplement regular teacher-led classroom instruction is usually more effective than use to provide instruction
- in mathematics, younger and lower ability students learn better from drill and tutorial programs while other students appear to profit more from simulation-type Computer Assisted Instruction (CAI.) (A recent study, however, suggests the opposite: drill and practice software can increase the gap between strong and weak students because good

students can use the software to shore up their skills quickly and then move on to more demanding problems.)
- in a two year CAI math and reading test, children did not differ from non-CAI children in attitudes towards school or towards math. However, children in the CAI experience did develop a stronger sense of academic self-confidence and a greater sense of personal responsibility for success than did the non-CAI children. This finding was especially strong for educationally disadvantaged children.
- Girls do far better on drill and practice that stresses cooperation rather than competition, does not contain negative reinforcement, timed drills, violence, and the game involved is not arcade-oriented.

Examples of Drill and Practice Software
- Grades PreK-3: Jump Start Series, Letter Sounds, Number Meanings and Counting, A to Zap, Carnival Countdown, Numbers Undercover, Stickybear Series, First Phonics, Reading Who?, Sunbuddy Math
- Grades 4-6: Grammar Games, Punctuation Rules, Tackle English, Schoolhouse Rock series, Mighty Math Series, Math Workshop Deluxe, How The West Was One, Fraction Attraction

The Next Step: Simulations

In contrast to drill and practice software, simulations inevitably raise issues of higher vs lower order thinking skills. According to B.S. Bloom's *Taxonomy of Educational Objectives,* higher order thinking skills include knowledge (define, repeat, record, relate), comprehension (translate, restate, discuss, describe, explain), application (interpret, employ, demonstrate, dramatize, illustrate), analysis (distinguish, appraise, calculate, experiment, solve, categorize), synthesis (compose, plan, design, formulate, create), and evaluation (judge, appraise, evaluate, revise, estimate, measure).

Many people want to focus on what can the computer do well that schools need to be doing. Where do the strengths of the computer meet the weaknesses of the curriculum: that's the place to look for effective and exciting use of educational software. Two most frequently mentioned problems are Writing and Problem Solving. Simulation activities are natural for the latter because they can involve spatial relations, higher level thinking skills of analysis, synthesis and evaluation, asking critical questions, classifying ideas and facts, and the social skills of working cooperatively. Simulations fit in wonderfully with Howard Gardner's *Frames of Mind* approach to education that builds on the theory of multiple intelligences and different children learning in different ways.

Simulations support and enrich the entire curriculum. The computer must be part of the curriculum, which usually means that something is happening away from the computer which relates to what is happening on the computer. The activity must be an integral part of a larger unit and its presence must make a difference; computers should not be stand-alone products. It is of utmost importance that children view technology in a larger scope, with a wider context and a big picture. An appropriate analogy is learning how to use the English language: it is not something we do in and for a language arts class alone; it has definite links across the curriculum

as a discovery tool and as a means of communication. Children need to see that technology, too, has ties with art and music as well as math and science.

Computer simulations frequently involve the creation of microworlds to set up experiences that challenge students to enter into another system of thought that allows them to manipulate data. Computer simulations have the potential to ignite a spark by turning facts and figures of so many classes into living environments in which the students participate and demonstrate how skills gained can be used. Students control the environment; simulations have tremendous potential for energizing the whole learning process and the be the central focus of a laptop program.

Social Studies has a tradition of using simulations to bring historical and contemporary topics to life. With the computer, simulations have the advantage of graphics, animation, number crunching and actively involving students in collecting and interpreting data. They also provide access to another country or another century.

Science Simulations provide experiences in scientific reasoning or using the computer as a lab assistant. Additionally, students can observe changes that could not be done under normal circumstances. May web sites contain flash animations of physical properties and chemistry experiments. Explorations of the solar system can be heightened by many web sites and by KML tours created for Google Earth.

Problem Solving Software and Web Sites

This type of software addresses areas that traditionally are difficult to teach but can be reached with the power of the computer: spatial relations, critical thinking, estimation, recognizing patterns, discovering attributes and rules, scanning for clues, predicting results.
Examples:
K-1: Sequencing Fun, Shape Up, Spatial Relationships
2-4: Factory, Building Perspective, Incredible Laboratory, Googol Choo Choo
5-6: Number Sense and Problem Solving, Shape Up, Factory Deluxe

May web sites, with their use of Flash and Shockwave animations, provide terrific resources for spatial relations activities. One tip: when searching for these sites, check delicious/schalman for many resources, or when searching in google add the word “activity” or “animation” or “interactive” to the particular topic you are searching. For example, if you want an activity about tangrams, enter tangrams animation into the search box. (You do not need the quotation marks.) This tip, by the way, is a useful one for all web searching of curriculum resources.

Cooperative Learning

The computer's capacity to be open-ended makes it an ideal problem solving tool to use in cooperative groups whose focus is not only on what students learn but also on how they learn. Cooperative computer learning encourages pursuing the goal (how many would have given up if left on their own?), building our knowledge on the knowledge of others, thinking of new ideas by listening to others' ideas, and giving support when about to give up.

Cooperative computer learning reinforces key life skills: the ability to think critically and the ability to work with other people. Create unique roles and activities for each group; then ask each group to report to the others or form jigsaw groupings to share knowledge.

Examples: For a software solution, Decisions, Decisions series force group cooperation and problem solving. Or use Google Earth: each team is assigned a state or a country to study, with each student investigating a different subject area of the locale, such as products, demographics, climate or economics. Then the three-person teams split up and form "expert groups" consisting of members of the other teams who have been assigned the same subject area, then return to original teams and teach what they discovered. They have to come up with a single team product (create an advertising campaign to convince people to move to their venue) or debate about the quality of life with other teams or create bartering units to show how different states could combine resources or focus on one issue — demographics, cultural background — to discuss political or social ramifications.

The Creative Computer

Graphics, animation, movie editing, and music software provide an alternative route to the computer to those children who see the machine as a math/science tool or who are more "right" brained in their approach to school work. Students can explore digital storytelling for all subject areas.

Examples include Kid Pix Deluxe, Inspiration, iPhoto, PhotoShop, Movie Maker, Comic Life, Garage Band, iMovie, Final Cut Pro, Microsoft Photo Story.

Innumerable web sites allow for on-line and collaborative photo editing, video editing, comic book creation, drawing, and elaborate slideshows (See Chapter 16 on Web 2.0); in fact, many of these sites are so powerful that they are replacing the standard software packages.

Students can create powerful videos (see www.tellingstories.org for a spectacular Holocaust project) on a variety of topics, or they can use multimedia sources as an alternative assessment for a class project or lab report. Perhaps student can be assigned to create tutorials on topics covered in class or engage in a digital storytelling project.

Technology Integration: The 1-2-3 Approach

As one “thinks about” technology applications, the following 1,2,3 integration approach is a helpful model to lay the framework for evolutionary and meaningful change.

STAGE 1: Start slowly, incorporating educational technology as a means to support the existing curriculum. Don’t use software that involves extensive teacher training or web sites that involve extensive rethinking of the curriculum and the educational goals for the year. Don’t expect too much from the technology but also recognize that the computer use is at phase one and that the power of the computer is not yet being fully used. Main focus is on drill and practice and some keyboarding and word processing.

STAGE 2: Extend the use of technology to enrich the curriculum in a variety of ways. Increasingly, word processing becomes a tool for educational change and improvement of writing skills through process writing. Spreadsheets begin to provide new ways of viewing information. Problem solving software begins to introduce new ideas into the curriculum: topics that might have been touched on before now can be explored extensively. Simulations enhance the social studies and science curriculum. It is here that the Time Crunch is most severe because old topics are now being explored in different ways, new topics are being introduced; but the curriculum has not been changed and many old topics still need to be covered.

STAGE 3: Teachers begin to redefine the curriculum based on the increased educational possibilities and uses of the computer. Certain long standing beliefs and aspects of the curriculum are no longer valid or have much lower priority: long division, simplifying radicals, cursive writing, number crunching all come under question. Although this stage heads towards a computer based curriculum, the focus is not “on the computer” but “because of the computer.” Modifying the curriculum will involve more than changing topics but will include reordering topics, eliminating some, and creating new ones. The computer might alter our notion of appropriate grade level and act as the facilitator of Alfred Whitehead’s notion that almost anything can be learned at any age. Some topics might be accelerated, some slowed down and some eliminated. The computer has the potential to decompartmentalize academic departments - even at the Upper School level- and integrate different themes and subjects. In short, educational software has the potential to revise the way we think, the way we learn, the way we teach.

Common Mistakes in Evaluating Educational Technology

Because the medium of educational software is so new to us, we are prone to many traps in evaluating software.

- **Mistake #1: we spend insufficient time evaluating software and web sites— not reading the manual or exploring features.** We should learn from our experiences with textbooks that the process of evaluation is time-consuming and that first impressions are just that. We all want the quick fix—view the site and pass judgment. Many software packages come with extensive notes and instructions. Many packages reflect years of person time in developing the software and writing up instructional notes. To pass judgment quickly is like a student who evaluates *Jane Eyre* after browsing the first few pages. Many web sites improve upon closer inspection.
- **Mistake #2: we can be too righteous in our evaluations**. We forget the diversity of interests and appeals of various teachers. We forget to take a holistic approach. Because software and web sites can have that magical feel, people like to find a few faults and thereby write off technology. Perhaps some words were misspelled, perhaps an instruction set was faulty, perhaps the software is slow or perhaps the directions have some ambiguity. Yes, these are correct observations, but no different than what you might make in evaluating another teacher's class or evaluating a textbook. We rarely write off a colleague for a few faults and we all use textbooks that have some faults. Unfortunately, we hold with technology up to a higher standard.
- **Mistake #3: we too often evaluate without children.** It is so easy to pass judgment as adults and be dead wrong. Watching kids communicate, interact and problem-solve so frequently convinces an adult that the specific application or web site has much more merit that originally conceived. When you evaluate technology by watching children use it, you gain a richer appreciation of the learning process.
- **Mistake #4: we have no models of how to use software as part of the teaching process**. Most adults and teachers today have never taken part in the use of educational technology as a learning tool. Even those adults who can recall computers being used in classes are thinking only of computer programming and word processing. Doing webquests, designing Google Earth maps or incorporating YouTube are not in the common experience set of most adults. We learn to teach partly by good and bad models we have had when we were students. Lacking these models, most of us need to be in experimental mode in trying to use software. For a teacher who has taught for 20 years, using technology is risk-taking of the highest degree, resembling the first year of teaching. Not that many adults are comfortable increasing their level of anxiety by breaking new ground. It is much safer to continue on with the traditional, proven approach that has worked for the past 19 years.
- **Mistake #5: we are fearful that educational technology threatens our roles as teachers**. Instead, we need to embrace the big picture. Kids learn from teachers, books, videos, software and the web. The advent of books once Gutenberg invented the printing press in 1456 did not make classroom lectures and group discussions meaningless. Books in the last 500 years have not come to replace teachers. That is the analogy we need to understand regarding technology.

Summary of Classroom Management Styles

Since most of our teaching styles have been deeply influenced by the role models we've observed during 12-16 years of sitting in classrooms as students, it is no wonder we are at a total loss when it comes to teaching with computers. We have had no such role models! No wonder it is common for teachers to think that teaching with computers means taking 18 students to a computer lab to work on 18 computers.

Style #1 **One Computer/Corner**: The majority of children are working on various tasks and projects at their desks, while 1-3 children work on the computer in a corner of the room. In effect, the computer becomes one of several activity centers in the room. Drill and practice activities work well in this style since there are usually very few computer usage skills involved. Perhaps the one machine becomes a dedicated word processor or digital storytelling option. Certain types of simulations or micro-worlds such as The Factory, Hot Dog Stand, How The West Was One might work well this way with proper preparation and setup. Other software also works if it can be used without teacher supervision. In order to make this style work, the application has to be for the most part self-explanatory. Teacher organization can help in this regard, with the important keys and features marked clearly on a poster next to the computer. Additionally, the teacher needs to have enough "other" classroom activities going on so that everyone gets his/her turn at the computer while others are doing similar productive work at various locations.

Style #2 **One Computer/Teams**: The children are split into groups. The computer poses a problem. Each group tries to solve the problem and plans out the solution on paper within the group. One group at a time takes its turn at the computer while the other groups are planning and/or watching. Problem solving software such as The Factory or Building Perspective works well this way since the computer displays the problem to be solved. Simulations such as The Inspirer Series and Decisions, Decisions are created to be taught in this style, since they allow up to 4 teams to compete and come complete with workbooks and activity books. Microworlds can be made to work this way, if the teacher is skillful with the material and presents a challenge that involves careful group planning.

Style #3 **One Computer/Central**: This is the best style when using software that is fairly sophisticated in terms of content, abstraction and intellectual skill. Use of a projector is an important asset, if not necessity here. Some simulations do not easily allow for multiple teams in the way that the Decision Series does. Therefore style #2 will not always work for them. But one can use style #3 for these packages. The highest levels of Factory Deluxe are much more complicated in terms of abstraction than basics of The Factory. Using Factory Deluxe in style #2 with beginners can be a disaster, since it is quite involved. But using it in style #3 —perhaps making use of manipulatives and a smartboard—can be quite exciting and intellectually provocative for all students.A Voicethread activity can work well in this format; post pictures and have students add comments and doodles. A word processor or Smartboard notebook as aids to writing and a teaching tool for stressing specific ideas on style and grammar can be used effectively this way.

Style #4 **Computer Lab/Hands-On, one-on-one**: Here we have the students go into the lab with one child at each machine. It is best to reserve this style for the types of computer usage that are most appropriate: word processing, typing practice, graphics packages, PhotoShop, and most software tools. This is not to say that these activities can't be done in a different style. They can but sometimes work better as individual projects.

Style #5 **Computer Lab/Several-on-one**: Here we have the students go into the computer room with two, three or four children at each machine. Perhaps one student works the keyboard and the other student takes notes or helps to make decisions. If we have three children at a machine, one can be the operator, one can be the note-taker and one can be the supervisor in charge of the first two. Almost all problem solving software and simulations can be done in this style. This approach also works well with peer editing and a word processor writing assignment; one child is writer, the other is critic.

Style #6 **Computer at home:** Here we have reached the point of development where all students own the same compatible computer. The logic is simple. Once students own the same or compatible computer, the school moves from providing hardware access to being a repository of software. When the fourth grade teacher want to use a piece of software, each child gets sent home with that package for homework assignments over the next week. The time crunch lessens now, as we now have an alternative for hands-on time. In addition, teachers can rely on web access to assign homework on blogs, wikis, gathering photos for a project, conducting web research, or working on a collaborative writing site like Google Doc. Students can download Google Earth onto their home computers to work on creating KMZ Google tours for a literature or history assignment. Students can create timelines for a history class or the steps of a physics experiment on multimedia timeline web sites, like circavie.com.

Style #7 **Required Laptops:** Here we have reached the point of development where all students own the same laptop. Many schools are beginning to require this purchase either targeting one class or the entire school. All students carrying laptops allows for group writing activities, whole class Web surfing and activities, and software explorations. Some schools purchase the laptops, renting them to students for a fee; another option is a collection of fifteen to twenty laptops on a rolling cart. See the Web page at www.summercore.com/laptops for a full treatment!

Beyond Word Processing

Computers can be effective tools to inspire children to write more frequently, edit their work more aggressively, and create more interesting compositions. One way to effect this computer use is to establish a writing lab or writing corner and require students to spend time on the computer as part of the Language Arts and English curriculum. Another way is to build entire creative writing units around a specific software package.

Preschool through Kindergarten

• **Why Mosquitos Buzz:** offers an animated version of each chapter, a read-aloud version, and activities for each section. James Earl Jones provides the narration. Teachers can monitor students' progress. Video Explorer entries provide short detours into themes, key terms, vocabulary, etc.