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.
- 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 or to use as a self-assessment tool
- can be used effectively in the one computer class for group skills and practice sessions
- very useful for the differentiated classroom

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.

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