

In a neighborhood of elegant townhomes and modestly shuttered boutiques, I locate the discreet placque of one of the city's most exclusive private schools. A waiting room with Williamsburg décor and gleaming antiques serves as a genteel holding pen for an anxious couple awaiting the admissions director. One of their reasons for choosing this school, they tell me hopefully, is its computer program. "We want our daughter to have a head start," they beam. "That's what kids need these days. Everything's so competitive."

She will be four in September.

From *Failure to Connect* by Jane M. Healy, Ph.D.

Questioning Computers:

Issues for Education in an Electronic Age

by John Shackelton

Curriculum Update

Concepts of Connection

We bought our three-year-old this great computer, but all he wanted to play with was the box it came in. A Florida father.

Computers will better connect our kids to learning—won't they? And then there is the world wide web, which connects people across the globe to each other—well, sort of. MIT psychologist Sherry Turkle is one of many researchers into the human-computer connection who believes we risk losing respect for genuine relationship (real human connection) as we blur the line between simulation and reality. As schools cut back funds for hands-on field trips so they can fund virtual trips, many insightful educators worry that we are making "the fake seem more compelling than the real," says Jane Healy.

MIT's Turkle agrees: "The new practice of entering virtual worlds raises fundamental questions about our communities and ourselves . . . For every step forward in the use of instrumental technology (what the technology can do for us) there are subjective effects. The technology changes us as people, changes our relationships and sense of ourselves . . . there is no simple good news or bad news."¹

No simple good news or bad news. The question of value and risk in computer use is not at all simple, not at all one-sided. Computers are wonderful tools few of us would be willing to abandon; in fact, I am typing this reflective article on my home computer, and I am thankful for all its technical flexibility. It lets me delete mistakes and relocate a chunk of text. Returning to the old typewriter seems labor intensive, almost Medieval.

However, my own observations and the growing mass of evidence from research and experienced-educator wisdom strongly indicate that we may be paying a price for the labor-saving efficiency we cherish, or rather, that our children may be paying a price, the dimensions of which we are only beginning to discover. Acute observers and systematic researchers are uncovering evidence that there are connections between inappropriate computer use and our children that few of us are yet aware of—and this is what makes the questions surrounding computers a lot less simple than advertisements and educational hype would have us believe.

September, 2004

¹ Turkle, Sherry. *Life on the Screen: Identity in the Age of the Internet*. New York: Simon & Schuster, 1995, p. 105

The Growth of a Mind

It appears we have often mistaken a child's performance of tasks that look technologically sophisticated for the experience of real learning. This is easy to do if we think of learning in a goal-driven, unidimensional way and do not understand the natural unfolding of it as children pass through what educational psychologists term the "developmental stages."

The brain of the growing child passes through a series of critical or "sensitive" periods from birth through adolescence. During each sensitive period, the child's development is sensitive to particular effects (or lack of them) in her environment. For each such period of growth, certain types of activities stimulate and undergird the natural learning processes, and certain others hinder. Jane Healy states unequivocally, "If we waste or subvert these developmental windows, the losses may be irrecoverable."²

Consider the ability to pay attention. During the early stages before age seven, children develop selective attention, the ability to choose to focus the brain on one thing or one task. If a child responds indiscriminately to irrelevant sights or noises, he is immature in this regard.

If a child spends a lot of time where the noise level is constantly high—because of unceasing media or human conflict—he may learn to "tune out" both the music or television and the human voices, but this is not the same thing as developing the powers of selective attention.

It is not a positive choice that helps the brain to develop selective focus but an avoidance strategy that fails to support the brain's efforts to grow.

Software designers have learned to hold kids' attention through visually distracting, fast-moving action. This, also, fails to stimulate the brain's natural evolution toward an effective ability to choose a place of focus. Instead, *the computer makes the choice for the child* by bombarding her senses with compelling "input." At this stage in a child's development, she can actually learn *lack* of attention and end with a deficit in her ability to focus that may remain a challenge for the rest of her life.

*I would urge that we not fall
all over ourselves in our haste
to filter all of our experience
through circuitries.*

Sven Birkherts
in *The Gutenberg Elegies*

From age seven to about age nine (second grade to fourth grade), children experience a sensitive period called *response organization*. After learning to control where it focuses, the brain next seeks to respond to what it chooses to focus on: it must form an organized plan and act on that plan. This is best facilitated when children operate on things in the real world and learn the various results of their actions, then test plans and correct them, so they can form better plans in the future.

According to Dr. Healy, many software programs—including a lot of "educational" ones—steal from the child all responsibility for selective attention and response organization by "running the show themselves." This stems from many software programs being based on "guess and test" strategies in which little is required in the way of response organization. There are notable exceptions to this, which we will consider later.

In the RMCS world of experiential learning, our kids do projects in which they must focus on appropriate materials, keep in mind project goals, and formulate an investigative procedure as well as a report of results. This is ideal environmental support for this sensitive period, the great window of opportunity for teachers to undergird the child's natural development.

The final phase of attention development is termed *sustained attention*, the ability to stay focused, to sustain involvement in a task. The period of greatest development for this is from about age eleven. Now it becomes important to be able to pursue a problem to its conclusion even if parts of it are not all that interesting or may even be "boring."

At this stage, the world of cyberspace can loom as an overwhelming attraction because the child can quickly leave whatever fails to provide immediate gratification and choose colorful images and exciting sounds to distract him.

A few software programs do encourage sustained attention, but most feed the opposite tendency.

Merely a Tool for Learning?

No carpenter (as far as I'm aware) holds his hammer in awe; no artist is likely to bow to the "opinions" of her paints (except in a metaphorical sense, of course). Yet studies show that people respond to computers as though they were more human than machine. Clifford Stoll, a pioneer of the internet, says that if you are typical, you automatically "... subjugate your own thinking patterns to those of the computer. Using this 'tone' alters your thinking processes."³

This suggests a reciprocal relationship between person and computer that requires close examination. It should be obvious enough that educational software programs subject the child to the objectives, knowledge base (sufficient or not), and biases of the programmers. In a way, it's like hiring a stranger as a baby sitter without references. George Burns, computer director at Bank Street College of Education in New York City, suggests that 90% of so-called educational software is not worth buying. There are several reasons for this. Most such software is programmed by market techies for whom child development and real learning issues are a virtual unknown. For example, much "learning" software consists largely of time-consuming and extraneous effects that distract children and "distance them from real learning," says Healy. Such software can actually subvert important educational objectives by teaching kids to value information delivered in a certain way—in small pieces and QUICKLY.

²Healy, Jane. *Failure to Connect*. New York: Simon & Schuster, 1999, p.27

³Stoll, Clifford. *Silicon Snake Oil*. New York: Anchor Books, 1995, p.45

Real Input

Computers in class: A waste of \$50 billion? Skeptics say students need more real-world learning and less high-tech flash.

USA Weekend headline.

Our historical period is often referred to as the Information Age; however, thoughtful observers like author Bill McKibben are concerned about our children LOSING information. In his compelling analysis, *The Age of Missing Information*, he reflects on widespread separation from nature and lost real-life lessons such as patience (which computer software often discourages) and learning about human limits through interaction with the physical world. Such real-world learning tends toward tolerance for frustration—a valuable life skill without which people are likely to become reactive and difficult to work with.

McKibben is not excited about computer-generated global consciousness either. Is this a genuine consciousness, or merely a social, electronic-pen-pal excitement that distracts us from a personal awareness that our actions “have direct and observable effects on other living things”? McKibben suggests that nature videos impart less important information than is to be found through studying the natural world in real time. “For a child,” he says, “reflectively examining a leaf or a pebble would be far more valuable than any published CD-ROM.”

Jane Healy shares this concern that we may be moving our children toward “life in an information-loaded but depersonalized landscape.”

As children find a virtual world more satisfying than a world of real human connections, what effect might that have on the real world—especially the world of human emotion? See Brain Basics below for thoughts on the connection between emotional well-being and success in life.

Thinking and Sense-making

Another aspect of the connection issue is the need for children to mentally integrate pieces of their learning. This is essential because the human mind makes sense of the world by seeking patterns.

Preschoolers are continually extracting patterns from their experience as in, “The picture and the teddy bear are both Pooh.” Patterns become more complex as kids grow: “This story-problem is similar to the one we did yesterday about the fundraising sale.” Maturing in this kind of thinking leads eventually to connections like *How the fall of the Roman empire speaks to present-day challenges for American democracy* or *How super-power foreign policy relates to increasing terrorism*.

Although software exists that assists in this mental integrating process, Jane Healy points out, “Much of today’s technology fragments children’s experience instead of integrating it and distracts their minds from the job of sense-making.”⁴

Brain Basics

How the Brain Seems to Prefer Growing in a Natural Garden instead of a (virtual) Hot House

IQ and EQ

Thinking is an issue relevant to computer use (see next page), but perhaps as telling are possible computer effects on emotional capabilities, what psychologists sometimes refer to as EQ—emotional intelligence. Decades of research have shown that social and emotional skills are better indicators of future success in life than IQ is.

Best-selling author Daniel Goleman states that IQ contributes only about 20% to financial and personal success. Social-emotional ability takes the lion’s share. So perhaps the parents in Jane Healy’s story at the beginning of this Update would have done better to postpone computers a few years and let their four-year-old play with other kids and have early lessons in navigating interpersonal waters instead of virtual ones.

Exercise for the Mind

Physical exercise stimulates secretions from the brain that enable it to deal better with stress, lower anxiety levels, and work against depression. This process contributes to more effective learning and memory by reinforcing positive emotions. Exercise also increases blood supply to the brain (bringing nutrients and oxygen) for increased mental responses. I don’t think we can expect the someday-appearance of “virtual” exercise.

Hemisphere Stimulation

The right and left hemispheres of the brain must develop many connections between them to work effectively in contributing to overall intelligence. Fast-moving, visual software tends to arouse the right hemisphere and almost leave out the left where such skills as language proficiency develop. Scientists now know that negative emotions such as lethargy and depression are accompanied by activation of the right hemisphere; on the other hand, feelings of happiness are accompanied by activation of the left hemisphere. One doesn’t have to be a rocket scientist to see a connection here.

⁴. Healy, *Failure to Connect*. p.

Much educational software emphasizes procedure rather than thinking through a problem—discovering an operational trick rather than strategizing a creative plan. Local school systems recently adopted an experiential math curriculum focused on thinking skills but “support” it with math software that limits kids to standard algorithms and multiple choice responses. Effective problem solving requires more than what Jane Healy calls “romping through information.” This point leads us to the crucial distinction between superficial knowledge and the deeper kind of knowledge called *understanding*.

In terms of educational software, we must watch for the programs that impart facts or procedures without requiring the child to think or make meaningful connections. We must watch for “learning” games that encourage kids to get the “right answer” through trial and error, rewarded then by some exciting visual effect or sound. I mentioned earlier that there is software that can help with true learning, and here is where we begin to identify some of its properties.

Deeper knowledge stems from the experience of a child making strong connections among facts and between systems. A crucial element of deeper learning is inviting the child to elaborate her knowledge to others—classmates and teachers. This requires the child to process information more thoroughly and leads to long-term learning. The ability to elaborate in this way also contributes significantly to a working definition of intelligence. At RMCS, the elaboration of acquired knowledge in the form of age-appropriate research, creative projects, and formal presentations begins in kindergarten and matures through middle school. Our students do not use computers very much before fourth grade, which is when formal classes in computer skills begin.

However, some educational software does support elaboration and deeper thinking processes. For instance, we have in our computer lab *Inspiration* software which allows students to investigate various ways to organize information. They can then determine which way matches their own thought processes, the material they are organizing, and their purpose and focus in presentation. It is still possible to evade some thinking by choosing randomly, and this is where a little teacher oversight is helpful. With organizational software like *Inspiration*, students can think through the connections and levels of a Powerpoint presentation (which our students learn to do at least by eighth grade) and can engage in very sophisticated thinking processes that challenge the growing mind and excite the youthful researcher.

Stanley Porgow of the University of Arizona, an innovator in classroom software use, says that “producing sophisticated learning is a function of the sophistication of the conversation that surrounds technology—not the sophistication of the technology.”

Eight third-graders have been sent here [school library] to work with a software program designed to motivate story writing. First they create a picture by selecting one of several backgrounds and elaborate the scene with a wide choice of icons; then with their imagination presumably stimulated, they write a story. . .

Two boys deftly call up a landscape and add a river, a bridge, and a pagoda (although they don't know its name). They drag icons of trees and flowers and spend a number of minutes debating their placement and experimenting with their size . . . Other groups are similarly engaged, but they, too, have yet to do any writing. Two girls spend the entire time printing their names and changing fonts.

At this point the teacher arrives to check their progress. She is a second-year teacher with a graduate degree from a premier college of education. She scans the group. “Aren't they great?” she asks me. “It gives them ideas what to write about. We use this program a lot.”

“But the period's half over, and they haven't written anything,” I point out.

. . . At this point, one serious-looking girl becomes disgusted and moves to . . . where she can use a computer with plain old word processing and no graphics. [At the end of forty-five minutes no one has produced more than a few words except the motivated girl using the word processing, who has a two-page draft.]

The children return to their classroom, and the teacher says to me, “Isn't it wonderful what this technology can do!”

from Failure to Connect by Jane Healy

Tips for Parents

- Beware of excessively stimulating software. Hallmarks are loud, surprising sounds and very sudden, attention diverting movements as well as colors that are overwhelmingly stimulating.
- Exercise is immeasurably more important than early computer “literacy.” Even after the academic need arises (middle school and beyond) for a lot of computer time, insist on breaks for physical activity.
- Symptoms from lack of sleep can mimic attention deficit disorder. Don't allow computer time to compete with exercise, nutrition, or sleep.
- Observe some of your child's time on the computer with the question in your mind, Who is controlling his attention? Who is determining his responses? If it's not your child, toss the software.
- Evaluate your child's “educational” software by observing how much integrating—like combining picture, sound, movement—the computer does, leaving your child little to do but experience what the computer has already coordinated. Look for software that lets your child coordinate things himself, that requires him to THINK.
- Take advantage of *real-life situations* to engage your child in developing strategies for problem solving.

Recommended reading: All books referenced in the footnotes, plus *Technopoly* by Neil Postman; *Endangered Minds* and *Your Child's Growing Mind* both by Jane Healy.