Computers, Brains, And Children

Book Review, By Stephen Talbott

Jane Healy walks into the school's computer room, where she sees a huge banner proclaiming, "COMPUTERS ARE OUR FUTURE!!!" Thirty-two nine- and ten-year-olds sit at the computers, pursuing their solitary math and reading tasks while a teacher and an aide lend what support they can.

Taking up a position behind Raoul, Healy watches as he effortlessly solves a few simple addition problems and then gleefully accepts his reward: a series of smash-and-blast games. When the games end, Raoul is confronted with more math problems. "Groaning slightly, he quickly solves the problems and segues expertly into the next space battle."

By the time I move on, Raoul has spent many more minutes zapping aliens than he has doing math .... [I] wonder if what we are really teaching Raoul is that he should choose easy problems so he can play longer, or that the only reason to use his brain even slightly is to be granted by an automaton over which he has no personal control - some mindless fun as a reward. (p. 43)

Then Healy observes Dareesha, who is practicing reading skills.

Dareesha watches as a page with a few lines of storybook text appears, embellished by a colorful illustration. She examines the pictures as the cursor highlights and a voice reads each phrase of the text. This takes approximately twenty seconds; now Dareesha's face breaks into a broad grin as she seizes the mouse and for several enchanted minutes clicks skillfully on the objects in the illustration. In response, each picture animates and performs a clever act: a mailbox opens and waves its flag, flowers bend in a rhythmic dance, vegetables turn jet-propelled and zoom across the screen. Dareesha, mesmerized, laughs aloud, unfortunately attracting the attention of the aide who materializes over her shoulder. "Read me that story!" she demands. Dareesha wilts and begins futilely to attempt sounding out the words on the screen.

"You'd better try harder or you'll never pass this grade", comments the aide, moving on. Dareesha sighs, looks over her shoulder, makes a few limp passes at the words, which are clearly too difficult for her, and begins once again clicking on the pictures. (pp. 43-44)

Later, Healy chats with Dareesha's teacher:

"No, I don't have nearly enough time to give attention to each kid", she sighs. "Actually, I'm not really a trained teacher. They drafted me because I was pretty good with these machines. So I get the kids started on the programs, then I can go about my business a lot of paperwork and there are always a few of these darn things that need fixing." (p. 44)

Looking for the Benefits

In her new book, *Failure to Connect: How Computers Affect Our Children's Minds—for Better and Worse*, Healy offers numerous such stories based on her remarkably extensive observation of computer based education around the country The stories range from good to bad to ugly - with the great majority being decidedly ugly. It's enough to make any sober-minded reader despair of the American educational system.

Healy herself struggles mightily to see benefits, real or potential, in the classroom use of computers. Currently, however, her typical positive scenario runs something like this: Here's an example of a reasonably healthy exploitation of the computer in a richly textured classroom setting; but, of course,

given the setting, much the same thing could easily be achieved without the massive expenditures on high-tech equipment and support.

"There's no question that one's initial reaction to much children's software is bedazzlement", she says. It may take awhile to realize that "the remarkable tricks are mostly being played by the computer, not by the child" (p. 48). It's a measure of our extremity today that Healy is driven to spend a good deal of time repeating such obvious truths. For example:

> *"The mere presence of computers guarantees nothing about their educational value".*
>
> *"Just because children like something does not mean it is either good for them or educational".*
>
> *"Using a computer will not automatically make your child smarter".*
>
> *"Facility with a computer signifies nothing special about a child's intelligence".*
>
> *"Information is not the be-all, end-all of learning".*

But Healy's advice is by no means all so elementary. She is an educational psychologist and educator of some thirty-five years' standing, who previously wrote *Endangered Minds: Why Children Don't Think - and What We Can Do About It*.[1] Her new book, grounded wonderfully in wise observation of actual classroom work, is a vital resource for educators. By way of the endnotes, it provides excellent access to the current research literature. And throughout the book there are valuable check- lists for parents and educators: for example, how to

> *Evaluate software for different age groups*
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> *Encourage girls to use computers*
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> *Boost motivation with computers*
>
> *Avoid "online addiction"*
>
> *Improve attention*
>
> *Control video-game use*
>
> *Protect against health hazards*
>
> *Plan for the introduction of computers in a school*

and much more.

I found some of this advice about how to make the best use of computers slightly disconcerting—especially when it immediately followed a series of horrific pictures illustrating our society's systematic inability to engage the computer sanely. This was particularly true in the discussion of pre-schoolers and children in the lower grades, for whose use of the computer Healy could find few redeeming benefits to offset the many disastrous consequences. Given her awareness of our society's "irrational obsession with high-tech solutions" (p. 81), and given the computer's near-perfection of our

prevailing imbalances, I half expected her to say (as I myself am always tempted to say) “Ban the cursed machines from the classroom; in today’s social context they are almost certain to work destructively”.

But instead (for which we must thank her) she offers her eminently sensible advice about how to get the most from the machine. As a practical, feet-on-the-ground guidebook for parents and educators, and as an admirably comprehensive introduction to the massive literature bearing on computers in education, *Failure to Connect* is perhaps the most valuable book we now have.

Remembering the Alternatives

If I had to lodge one complaint, it would be that Healy does not follow up on her repeated observation that most successful projects would prove just as successful without the computer. That is, she does not spend much time helping us to imagine the alternatives. This exercise is important, however, because it almost invariably shows how the alternatives can readily provide what children are most lacking in our society, whereas the computer itself tends to exacerbate the lack. Surely this has a bearing on educational policy.

To take one example: Healy visited a fourth grade class where the children were studying water resources. They collected data on local water quality, in cooperation with twelve to fifteen other schools around the world.

But hands-on learning comes first, as they visit a well to investigate local water sources and research water rights which date from the 1850 gold rush. Then they conduct science experiments to test water for chemical elements and send the results to a central “server”, which collates them with data from children as far away as Russia. Finally, an adult scientist receives their data, analyzes it, and sends back a summary of her findings.

Much about this context is indeed healthy, and the notion of collecting and sharing “data” about environmental problems around the world is highly regarded in most educational circles. And yet, the features most directly facilitated by the computer - namely, the electronically mediated datasharing and the scientist’s analysis and report point to what is most questionable in the project.

To see why this is so, listen to a story told by David Sobel in his exhilarating little booklet, *Beyond Ecophobia: Reclaiming the Heart in Nature Education*.[2] He is discussing how the water cycle is usually taught:

> *Starting in first grade, children do little experiments in jars and soon thereafter draw diagrams of clouds, condensation, rivers flowing to the ocean and evaporating back to the clouds. Too often the denatured words have little connection to the real world. Rarely do children step outside, investigate puddles, collect rainwater, make miniature landscapes, or follow streams. (p. 22)*

Once, when Sobel was working with fourth, fifth, and sixth-graders who could all “recite the water cycle forwards and backwards”, he decided to test their understanding. He asked, “When it rains over the ocean, does it rain fresh water or salt water?”

Almost all of them were adamant that it rained salt water. If we were teaching the water cycle in an experiential fashion, these children would know the answer to this question. But the problem is that we’re not really teaching science or environmental education, we are teaching a veneer of words, recitation without reality. (p. 22)

The challenge for children today is to find a direct, meaningful connection with nature. The scientist's chemical analysis of the children's data gains meaning only within a vast body of high abstraction that these kids must eventually find some approach to. But that approach must be grounded in their own experience. Far better at their age to test the water by observing its effects upon seed germination or other life processes the children themselves can observe than to have scientists or "black boxes" report back the presence of so many parts per million of such-and-such a molecule.

We adults too easily forget that these remote facts make no sense - not even to us - except insofar as they are correlated with sensible effects. ("How does this chemical affect health?") The child whose direct experience of nature has been shortchanged - the child who thinks it rains salt water - is not going to gain in scientific stature by obtaining abstract chemical analysis of unpronounceable trace elements.

Sobel's book, incidentally, contains several examples of water-related instruction. Students can undertake to clean and groom a section of a local stream - an exercise that, by itself, could supply many years of curriculum in physics, biology, ecology, geography, map-making, and any number of other subjects. Class trips can be taken to explore along the length of a stream. (Sobel describes one fifth-grade class that went exploring to find out about the stream that flowed through a culvert under the playground. It became an exciting adventure for the students, and fit well with a neighborhood contour-mapping project.)

And, again, a third-grade class, after reading *Paddle-to-the-Sea*, constructed their own little boats and then, after a brief ceremony, launched them in a local stream. When, a few weeks later, a canoeing stream-lover found one of the boats with its message and wrote back to the owner, the class excitedly traced the boats position on the map and debated its further progress. They also knew that they had been in touch with someone else out there who deeply shared their concern for the life of the stream.

Upon reading this, I couldn't help thinking, "Now *there's* distance education that really works!" As children grow, their horizons need to expand - but by manageable increments, so that the threads connecting them to the surrounding world are continually lengthened and strengthened, not summarily snapped.

It is precisely these connecting threads that our children most desperately lack in a society where they find themselves isolated from both nature and the world of adult work. In this context, the computer -a veritable engine of abstraction - a black box that inserts incomprehensible layers of mediation between the child and whatever it is he experiences - is something the educator must always work against.

Given the endless opportunities of the sort David Sobel describes, why do we work so hard to make the task more difficult? Do you realize what we could do in the way of nature education if we diverted even a modest portion of current computer expenditures toward real-world engagement?

I say all this because Healy's exemplary fourth grade class project does indeed represent one of the better educational undertakings in conjunction with the computer. But it is important to see how the computer's role in this project is peripheral to the most urgent benefits of the project, and is actually a strong invitation to sacrifice some of the benefits by pulling the kids away from a science rooted in their own experience and understanding.

It's also worth noting that the communication function served by the computer in this project could readily be exercised by old-fashioned mail. I'm not aware of any educational loss that would result from the several days' lag time - and there might possibly be a gain in the kids' anticipation and in their more sustained focus. If, as so many people think, the computer's role in such projects is educationally remarkable, one wonders why so few educators previously saw - or now see - the same remarkable

opportunities being offered by the vastly cheaper postal service. Apparently the computer exudes a glamour that simply pre-empts all “common” educational answers - and thereby also pre-empts common sense.

I Wonder What My Brain is Thinking

One of the many virtues of *Failure to Connect* is its emphasis upon the stages of child development. Healy carefully details the needs manifest during each period of growth. She then shows how the computer can distort the growth or (at least potentially, and after the first school years) complement it. She is often compelled to point out that the consequences of particular computer uses for good or ill are currently unknown; we are conducting a huge experiment, with our children the guinea pigs.

I will not try to summarize Healy’s wide-ranging commentary - an impossible task, Instead, I wish to look at how she speaks about the brain - a way of speaking that has profound consequences for our understanding of both man and machine. I believe her many references to the brain are largely irrelevant to her case. Or, putting it the other way around: the immense amount of clear-headed advice in the book gains little from the misleading references to the brain. Nevertheless, these references pose huge questions of their own.

Here are some examples of her usage:

> *“The need for relatedness is so ingrained in the human brain that even adults treat computers a lot like human beings” (p. 192).*
>
> *“Musical intuition and the sense of musical form are ... grounded in the brain’s experience of the body during development” (p. 122).*
>
> *The problem with many prestructured computer programs is that “attention is guided by noise, motion, and color, not by the child’s brain” (p. 178).*
>
> *“Contrary to popular belief, says Robert Sylwester from the University of Oregon, ‘adolescence occurs mainly within our brain’” (p. 178).*
>
> *“No one is sure how ‘creativity’ arises in the brain...” (p. 163).*
>
> *“Since there are a limited number of [brain] circuits, it is hard to pay attention to both pictures and language at the same time” (p. 231).*
>
> *Section heading: “Brain-Appropriate Technology for Elementary-Aged Children” (p. 263).*
>
> *“The intellectual job of the middle-school brain is to start divorcing itself from the total dependence on concrete experience ...” (p. 273).*
>
> *Another section heading: “New (and Some Old) Responsibilities for the Human Brain” (p. 299).*

This usage is objectionable in the first place because it grotesquely alters the normal meanings of words without explanation. It’s hard to know how the usual meaning of “adolescence” might apply to a brain - unless, perhaps, adolescent brains produce their cortex in the shape of a baseball hat turned backward.

Similarly, if you were in charge of a row of brains and one of them failed to carry out its "responsibilities", how would you discipline it? What is a fit punishment for an organ? The notions of responsibility and punishment apply to whole selves - selves with hands to reach into cookie jars, selves with privileges that can be revoked, selves with faces that blush with guilt, chests that swell with pride, and limbs that grow unsteady with fear.

The Brain as Violin

In the second place, the shift in usage gives us a wholly illusory sense that we are approaching a scientific, cause-and-effect understanding of child development, whereas in fact it continually encourages us to move away from real understanding.

How could we know that an activity is "brain appropriate" in Healy's sense? Primarily by observing the consequences of the activity for consciousness and behavior. Even if we could trace in exquisite detail how brain changes correlated with the particular activities of a particular person, this correlation would forever remain inadequate as a basis for reasoning from brain to behavior - even for that same person at a later time.

Let me elaborate just a little bit. Healy writes,

> *Since metacognition [that is, self-evaluation] appears to be controlled by the prefrontal cortex, it is not surprising to learn that highly gifted children seem to have enhanced prefrontal functioning, just as learning disabled children show less. (p. 190).*

There's no problem with the correlation, but one needs to remember that the only way to distinguish an "enhanced" cortex from a "degraded" one is by getting to know the person in thought and behavior. Further, having once drawn this correlation, we cannot rely on it in the future. If there's one thing we know about the human race - which has produced a Mozart, Gandhi, Picasso, Helen Keller, Einstein, Mao, Charles Manson, and Mother Teresa - it is that it embraces vast potentials of consciousness impossible for any of us to imagine adequately. And if there's one thing we know about the brain, it's that it exhibits enormous plasticity; it is like a highly expressive instrument in the hands of a consummate musician: there is no end of different ways it can be played. A structure that correlates with one thing in one person may correlate with an entirely different thing in another person - now or in the future. We are always driven back to conscious experience as the basis for assessing what is going on.

So even if we started to see massive changes in certain brain structures over the next decades changes that looked (based on past correlations) as if they spelled "pathology" in capital letters - we would only know whether this was indeed pathology or instead, say, a new form of genius, by making judgments about consciousness and behavior, not by resting content with judgments about physical organs. We would have to observe persons, not brains. The human being - as long as he remains fully human - never stops growing toward new, unprecedented achievements of consciousness.

Who 'Plays' the Brain?

In the third place, what really drives this "brain talk" within society as a whole is the untenable assumption that, "well, one way or another it is the brain that produces consciousness. After all, thinking is some- thing that goes on in our heads. If we want to understand consciousness, we've got to understand brains".

When an utterly groundless asumption becomes as deeply entrenched as this one, it can scarcely be pointed out, let alone eradicated, in a few paragraphs. Suffice it to offer a suggestion or two for those wishing to pursue the matter further:

As Owen Barfield reminds us,[3] until a few hundred years ago the universal consensus would have been that thoughts do not occur in our heads. In fact, our ancestors would have found it as impossible to conceive of the head "containing" thoughts as we find it to imagine thoughts outside the head.

You may disagree with the older view, but you should at least acknowledge that none of the current brain research bears on the issue. That is, it does not weigh against the notion that consciousness first fashions the brain as an instrument for its own subsequent use - that the thinking self is the "violin player" who draws from the brain its expressive potentials.

The reason current research is generally irrelevant to this question is that our culture has grown incapable of even asking the question. This alone should be a red flag to any alert individual. If we find it impossible to work our way into the mindset of our ancestors from just a few hundred years back - if we can't experience the "sense" of their view from the inside, so to speak - then we have also lost any ability to defend or even state our own perspective vis a vis theirs. We are imprisoned within the parochial environs of our own culture.

Moreover, for one who is willing to look, it is easy to see why we are incapacitated in this way. Starting with the Scientific Revolution (say, around the year 1600) we made a decision to begin ignoring the qualitative content of consciousness Which is to say: to ignore consciousness as such. We chose instead to focus our attention on certain abstractions - for example, mathematical abstractions - that were easily available as a kind of precipitate of thought.

It is hardly surprising that, given a history of such ignoring, we should by degrees have found our experience of consciousness fading, until finally we convinced ourselves that thought is really an illusory phantom, a ghost in the machine. Having lost all vivid experience of their own thinking, many now congratulate themselves for their great intellectual prowess in exorcising the ghost and manipulating the machine - all in blissful ignorance of the fullness of consciousness that, however deeply it has sunk toward sleep, produces their achievements.

This is not to derogate our extraordinary and vitally necessary victories of abstraction. But an abstraction is just that - something "drawn out" of a larger whole. And to forget the whole is, eventually, to lose the meaning even of the abstractions derived from it.

Lastly, I find it interesting that some of Healy's "brain talk" actually points in the direction I've been suggesting. Referring to a dysfunctional eleven-year-old, she says, "Boyd couldn't manage his own brain" (p. 182). That may be a bit silly, but it's a far sounder way of speaking than the various usages cited above.

More substantively, Healy puts this question:

> *What is the magic of language that helps the brain control itself, think more effectively, and deal with stresses of all types? Language actually serves as "brain food" for the prefrontal cortex, enabling it to make effective connections and organize the confusing assault of information from sensory and emotional systems. (p. 190)*

Despite the misguided mention of the brain "thinking" and "controlling itself", this reminds us of a profoundly important fact: language - one's own as well as that of others - must shape the brain before the

brain can adequately mediate language. Who knows whether the child's first, playful babbling - the melodic eruption of a yet-unfettered imagination - is even mediated by the brain in any full sense? It seems more likely that, like powerful sound waves evoking beautiful, delicate forms from a layer of dust, it is singing and shaping the instrument by which later it will be sung.

Barfield, on the basis of his work as a semantic historian, has remarked that it makes little sense to ask about the origin of language because this is to ask about the origin of origin. It is noteworthy that few can see the sense of this remark - not even those who make it a matter of religious profession that "in the beginning was the Word". Many meanings that once confronted us right there in our language are simply no longer accessible to us, whatever our verbal professions.

Nothing I have said above subtracts from the importance of brain research. If consciousness fashions this marvelously complex instrument for its own expression, then messing around with the instrument is surely the height of foolishness, and learning about the instrument is just as surely relevant to the one who wields it. My point has been only that, in the end, all understanding of the brain is rooted in and made comprehensible by our understanding of consciousness - our self understanding - and not the other way around.

If you doubt the importance of all this, just ask yourself about the development of a sense of responsibility in the child. Why should anyone begin to feel responsibility for the actions of his brain? We don't in general feel that sort of relation to our internal organs. Only people bear responsibility, and I fear that Healy's usage will contribute further to the underlying problems of dehumanization that she herself so heroically combats.

Biographical Note

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NOTES

[1] Jane M. Healy, *Endangered Minds: Why Children Don't Think - and What We Can Do About It* (New York: Simon Schuster, 1990).

[2] . David Sobel, *Beyond Ecophobia: Reclaiming the Heart in Nature Education* (Great Barrington, Ma.: The Orion Society and the Myrin Institute, 1996).

[3] See Barfield, Owen, Speaker's Meaning (Middleton, Conn.: Wesleyan University Press, 1967).