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Educational Technology and the Technological Mindset: Friend or Foe?

by

Robert Boody

After several years of studying educational technology and instructional design, I realized that I did not want to play their game any more. I had started a graduate program in instructional science because I liked the new technologies, but over time I became convinced that education is better seen as personal transformation in a social world than as the accumulation of decontextualized facts in a detached environment. It seemed to me that technology in education was mainly about memorizing a limited set of facts faster.

Then, at the 1991 AERA convention, I went with a colleague to a technology session simply because I wanted to talk with him longer. I was prepared to be bored, but instead I was riveted because what the presenters were talking about was not just the technology but also the powerful educational effects their uses of technology facilitated, including alternative curricula, teacher as facilitator, collaboration, and authentic learning activities—ideas I lean towards. Although these ideas are often discussed, they are by no means widely accepted nor are they often implemented. And here were technologists taking these controversial and rarely-tried ideas for granted, actually implementing them, and reporting success facilitated by the technology. All of a sudden my interest in educational technology was rekindled!

Is it possible that some of the very real problems associated with the use of technology in education may be more related to a particular way of viewing the world—the technological mindset or paradigm—than to particular technologies? There are many voices advocating the use of technology. There are also many, if fewer, voices raised in protest to technology. But I want to explore the possibilities that certain uses of technology may well be effective tools in the fight against the problems of the technological mindset.

The Technological Mindset

What is the technological mindset, and why is it a problem? Let me address that in two ways: first with a poem, and then through a more formal definition and argument.

Consider the following lines from T.S. Eliot:

I do not know much about gods; but I think that the river
Is a strong brown god—sullen, untamed and intractable,
Patient to some degree, at first recognized as a frontier;
Useful, untrustworthy, as a conveyer of commerce;
Then only a problem confronting the builder of bridges.
The problem once solved, the brown god is almost forgotten
By the dwellers in cities—ever, however, implacable,
Keeping his seasons and rages, destroyer, reminder
Of what men choose to forget. Unhonored, unpropitiated
By worshippers of the machine, but waiting, watching, and waiting.

His rhythm was present in the nursery bedroom,
In the rank ailanthus of the April dooryard,
In the smell of grapes on the autumn table,
And the evening circle of the winter gaslight. (1943, p. 35)

We see human connection with the river at the beginning and the end of this portion of the poem. At the beginning of the poem is described the less technological days when people had to take the river seriously, when they had to live with it. In the last four lines is another kind of personal connection that could even be experienced today if one was open to it, as a child might be. But along came a bridge builder, and to him the bridge was merely a technical problem, that is, one where the desired goal is already given and only the means need to be worked out. The river did not exist for him as a part of a *human* life. This bit of technology further removed the river from everyone else's mind as well. All of this is a diminution of their experience of the world, leading towards an aseptic world we create out of the artificial. No one who has spent any time in one of our country's inner cities can doubt that something has indeed been lost. But the poem goes even further: no matter how aseptic we become and how far we try to shut the world out it still will break through sometime. Even though we forget the river, in flood season it may cause great damage and even sweep away the bridge. There is nothing necessarily wrong in building a bridge. But there may be something wrong in letting it establish our ways of living in the world.

Broadly put, the technological mindset or the technological paradigm is to ask how to most efficiently solve a given problem. "Technological" here is not equivalent to "machine"; in its broadest sense, technology can include any rational procedure for attaining some particular end, or indeed, even the idea that all problems can be solved through the application of goal-oriented intelligence. Its strength is that it can bring to bear on the solution of a given problem considerable effort and knowledge. The problem is that the focus is only on *this* given problem; it does not ask if it is a good problem to solve, or if there is another way to view the entire situation. It is means-ends oriented, but does not ask about the ends except to know them as a goal.

The twentieth-century philosopher Martin Heidegger put it this way:

Man today is in *flight from thinking*. This flight-from-thought is the ground of thoughtlessness. But part of this flight is that man will neither see nor admit it. Man today will even flatly deny this flight from thinking. He will assert the opposite. He will say—and quite rightly—that there were at no time such far-reaching plans, so many inquiries in so many areas, research carried on as passionately as today. Of course. And this display of ingenuity and deliberation has its own great usefulness. Such thought remains indispensable. But—it also remains true that it is thinking of a special kind.

Its peculiarity consists in the fact that whenever we plan, research, and organize, we always reckon with conditions that are given. We take them into account with the calculated intention of their serving specific purposes. Thus we can count on definite results. This calculation is the mark of all thinking that plans and investigates. Such thinking remains calculation even if it neither works with numbers nor uses an adding machine or computer. Calculative thinking computes. It computes ever new, ever more promising and at the same time more economical possibilities. Calculative thinking races from one prospect to the next. Calculative thinking never stops, never collects itself. Calculative thinking is not meditative thinking, not thinking which contemplates the meaning which reigns in everything that is. (1966, pp. 45-46)

As Heidegger shows, technological thinking fills a place. Technological thinking is needed, and it is important, but it is not the only kind of thinking that there is. A characteristic of the technological mindset is to believe that it is the only game in town and to value nothing else.

In today's world most of us seem to have implicit belief that science and technology can help us overcome all our human problems. The problem with the technological paradigm is more serious than that we are polluting our planet, serious as that is. The problem is that we are polluting ourselves. Ellul "argues that there is an illusion that technique (including technology) serves human ends, when, in fact, it creates instead an artificial and self-serving environment that meets its own needs, while diminishing our humanity" (quoted in Kobayashi, 1987, p. 255).

It is not computers or video or technology itself that is specifically the problem, it is the irresponsible acceptance and propagation of the technological mode of thinking. It is exalting means over ends, and making means into ends-for-themselves. And this can certainly be done without any recourse to machinery or electronics at all.

The critique of technology is not really a critique of any specific use of technology. It is more a critique of the living out of a technological mindset and the over-reliance on technological metaphors.

Computers in Education

Clearly computers are a form of technology. Indeed, in today's world they appear almost as the epitome of all technology. Clearly their use in education can be critiqued the same as technology in general.

A frequently-made critique of computers in education is that, since computers themselves are mechanistic, they will likewise tend to develop mechanistic students, or at least students who see the world in mechanistic ways. A frequent defense of the use of computers in education is that they are simply a tool, like a hammer. A spreadsheet saves the use of a 10-key adder (which itself saves the use of scratch paper or mental math), a word processor simply makes it quicker and easier to write papers.

I want to suggest that both of these claims capture only part of the truth, and that a clearer way of discussing the actual issue is needed. Consider the position that, as a tool, computers are not a threat to our culture. This is equivalent to a claim that tools are neutral, which is indeed a commonplace. On this view, I have a problem that I want to solve, so I choose an appropriate tool to solve it. The problem with this view is that the kinds of tools we have available also shape how we see our world, including what problems to work on and how to solve them. The old saying that "to a person with a hammer, everything begins to look like a nail" is not far off. Another way to put it is that tools (like every other way we articulate our world) both reveal and conceal. Simply put, a hammer reveals aspects of the world amenable to hammering, but tends to conceal things we might glue, sew, or something else entirely. The tools we use help structure our world. Therefore, it is a mistake to think that we lightly use a technology as long as we think of it only as a tool. Tools do encourage us in certain directions which we can be wary of (if our entire world view is not sucked into the technological view as yet).

On the other hand, I think it is equally as true that using a particular technology is not equivalent to buying wholeheartedly into the technological paradigm. One of the problems seems to be a difference in level of abstraction between physical use and metaphor in mind.

Consider the example of drill and practice software. Drill and practice software is intended to aid in memorizing certain bits of information. Typically the computer gives some "stimulus," such as (for a math drill) $2+2=?$. The student then types in a response. The computer then provides feedback to the response. In essence the computer becomes a glorified flashcard deck. The computer can be used to implement strategies to speed up memorization based on memory research and to keep careful track of how a given student is doing and tailor presentation according to this information. But the essence of the thing is still drill, still rote memory. Is this bad? I used to think so. Indeed, the prevalence of both research into this kind of learning (paired-associate learning) and of software to teach like this is part of what originally turned me off to educational technology. And, indeed, as a metaphor for education I still think it is extremely bad. One of the problems with technology is this extending of an idea that works within a particular and limited content as a metaphor in a wider context where it is not appropriate.

For example, I do not see drill and practice as fundamentally an educative experience. But if it is in a context of education, where students who have decided they need to master a language, for example, could use a computer/random access audio combination, giving them better opportunities to learn and freeing human teachers for conversation and other things machines don't do well, the total result could be highly educative. But the technology would not be the main point—the people and their learning would be.

Another question arises at this point—can we escape having the technological mindset? The language of technology arises out of a particular way of seeing the world, a way pervasive in our present culture. There are alternative views of the world. But "because most of us are rooted in the technological view of reality ..., it is almost impossible for us to see competing views of reality without reducing those views into the same categories of thought we are attempting to contrast them to" (Birch, 1991, p. 2). This is a real concern. But our Western tradition, which often leads us into technologization, is not monolithic. Within our own tradition are voices showing other ways of living, knowing, and educating than the technical and scientific.

If educational technology is simply used to reinforce the patterns of the dominant technological mode of thought, then it will just be more of the same. But if a particular form of educational technology is used in ways which are not technological, which might even subvert some of the ideals which technologization holds dear, and so open space to us to change in, then educational technology would offer us help in assessing our culture and in renewing its education.

Stories of Computer Use in Education

How can technology be used in education in ways which foster non-technological outcomes? Consider the following description of the American Constitution Project (Salomon, 1991).

We wished to introduce the use of a data base into the study of the American Constitution, not the most exciting or easily comprehensible topic for eighth graders. However, it became apparent that the introduction of a database to be constructed, in and of itself, would not be effective. It had to be woven into a whole new conception of classroom learning activities. Indeed, it came to serve as a Trojan horse because its introduction led to radical changes of almost everything else in these social science classes. Students split into teams. Each team assumed the role of an adversarial party (e.g., Loyalists, New Yorkers, Federalists) whose task it was to rewrite the Constitution in light of their particular interests, while preparing for the reenactment of the Constitutional Convention where the "new" Constitution was to be debated and

drafted. The construction of the database served to help the intellectual process; in fact, it enabled it. Each clause and article had to be built into the data base, disagreeable phrases reworded, and the changes proposed by other teams put next to them. Excitement was high, and rose even further as the Constitutional Convention neared. Students came early to class and refused to leave when the period was over; they traded hints about history, the Constitution, and ways to get the most out of their self-made databases. The teacher hovered around, directing, guiding, suggesting, and advising, more like an orchestra conductor than a music composer. All this culminated in the Constitutional Convention, with the principal, dressed as George Washington, leading the debate among the teams which tried to reach compromises and formulate their new constitution (it excluded the Vice President but assured voting rights to slaves). (p.12)

In this example, the designers of the project used a computer database as the key to teaching the American Constitution to eighth graders. They recognized that the use of the database was not trivial—it changed everything else in the classroom. They expected that it would help produce good effects in the classroom, and it did.

It is not always the case that all good effects are intentional, that they are designed for or suspected ahead of time. For example, a midwestern state tried an innovative program which put computers in the homes and classes of fifth graders. Both the students and the parents used the computers to network—to communicate with each other via electronic bulletin boards. This was gratifying to the program planners, especially since some of the parents—living in the inner city, poor, and often functionally illiterate—had not previously been involved in any education related activity. These results were part of what was hoped for in designing the program. There were, however, unplanned-for effects as well. For the first couple years of the program, at least, the teachers had to act as facilitators instead of directors, because they did not understand the computers any better than the students, and sometimes not so well.

Sometimes technology might even help facilitate entirely unplanned effects. The English department at a large, private university set up a computer writing lab. One of the purposes of the lab was to “allow a composition teacher to ‘intervene’ in students’ composing processes while they were writing, thus allowing writing instructors to teach students strategies for inventing, organizing, editing, and revising their papers” (Zimmerman, 1991, p. 4). This was certainly not a Big Brother scheme in intent—the intent was simply to help students become better writers by offering a streamlined system of frequent review and help from a qualified teacher of writing. At the same time, there is the implicit assumption that this is indeed the right procedure to teach and learn writing (a questionable assumption), and it does reinforce the importance of teacher authority and individual effort at the expense of students’ developing editorial expertise themselves and collaborating in writing (as they would often do in professional settings).

What happened, however, was different than the planners of the lab envisioned. The teachers soon found that the network went down frequently, and even when it was up they could not monitor the doings of all 25 students on-line anyway. How the teachers responded depended a great deal on their views of writing and teaching.

In the class of one of the teachers, who had a teaching philosophy he described as “connected,” “decentralized,” and “supportive,” the students ended up helping each other a lot. This helped the students become more like experts themselves and less dependent on external authority. There

were more opportunities in this class, the teacher believed, for freewriting, collaboration, and on-screen conferencing, all aspects of a process view of composition.

In this case, the effects of the technological use were unplanned, indeed, they were partly the result of the breakdown of the technology. But it is important to note that, even in this case, the planned use of the technology changed the nature of the course from the usual lecture and homework format it had, and facilitated something different. It ended up calling for more, not less, real involvement than before.

Conclusions

These examples demonstrate to me that computer technology can be used in ways in education which undermine the technological mindset. That is, not only is the usage of technology not necessarily a preliminary to obtaining the technological mindset, but specific uses of technology may be a useful tool against the mindset.

It has long been noted that teachers can improve or subvert any instructional program. This has often been seen as a problem by the technocrats of instructional design. I see it as a sign, however, of the human context of education surfacing. Pearlman (1988) writes about two schools being set up in the Twin Cities that will innovatively use technology. He notes that the general conception is that computers in the schools haven't fundamentally changed anything. Why should these two schools be different? Because they thought about school restructuring first, about more human ways of teaching and learning, and then looked at how technology could help. A technological approach would have been to start with the technology first, or with a set of predetermined goals for student achievement. The technology is a help in designing these new modes of schooling, but how the technology is used, and not the existence of the technology itself, is what is fundamental. And the meaning of how technology is used is not itself a technological problem.

And this, ultimately, brings us back to the human and the humane. Bossert concludes, "As always, the technologies can only support us; they cannot relieve us of our ultimate responsibility as human beings to make the final choices" (quoted in Kobayashi, 1987, pp. 268-269).

It is true that much of the uses made of the computer, educational or otherwise, are calculative. But there may be times when particular students or teachers in a particular setting are helped by computers to open up to new ideas, to have some room to re-evaluate their position in the world. When this happens, perhaps we might say that technology can indeed be a valuable tool in the fight against the technological mindset.

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