

Technology in Schools To Support the System or Render it Obsolete

by Seymour Papert thinking about the "impossible"

Think of other big changes that came via technological breakthroughs. The Wright Brothers thought of making a flying machine because for generations and centuries people had nurtured this impossible dream.

If the way we think of change is limited by imagining things very much like the ones we know (even if 'better'), or by confining ourselves to doing what we know how to implement, then we deprive ourselves of participation in the evolution of the future.

This is not a personal criticism of any individual: everyone working in the field of education inherits a timidity that has been inherent in the culture of the field.

the parable of the jet powered stagecoach

As a work-out exercise imagine an early nineteenth century engineer concerned with the improvement of cross-continental transportation. Someone comes to them with a design for a jet engine.

Such an analysis will help us pose sharply the question of incremental change. One could not move from a stagecoach to a jumbo jet by making a series of small improvements.

improving the educational stagecoach (and giving the cybercritics a holiday)

Virtually all discussion of the role of technology in schools is focused on two very short term objectives:

- 1. improving existing school practices, including the teaching of the current content;
2. introducing very elementary forms of 'computer literacy' or 'technological fluency' in the form of vocational knowledge justified by being needed in the workplace.

You can't say these goals are bad, but they are like improving transportation by making better grease for the axles of the stagecoaches or better training seminars for the drivers.

The focus on these narrow goals gives the critics like Todd Oppenheimer (see Atlantic Monthly, July 1997 and the discussion which took place last January on this site and Mr. Clifford (Silicon Snake Oil) Stoll huge openings for attacking the technology where it is at its weakest doing a job that is not what it can do most powerfully.

For example Oppenheimer states that "there is no good evidence that most uses of computers [in present day schools] significantly improve learning and teaching."

In my view the answer has to be that he is right. And as long as schools confine the technology to simply improving what they are doing rather than really changing the system, nothing very significant will happen.

playing with the idea of the educational airplane

I am quite sure that when historians of education look back at our times they will be looking at very different aspects of the role of the technology. For example:

content of learning will be radically changed

Certain topics that are regarded today as sacrosanct will be eliminated - or greatly reduced. To make the point I focus on mathematics, but the same kind of consideration applies to all subject areas.

- 1. free access to computers for much more than a few hours a week
2. a level of technological fluency (that has to develop over years) equal to the levels of reading fluency we now regard as basic skill
3. freedom from having to pass tests on nineteenth century knowledge

Many topics that were unteachably abstract in the context of pencil and paper technologies will be considered as appropriate for children in the context of a digital technology that makes the previously formal become concrete.

For example: a six-year old who has learned modern forms of Logo programming uses a "random number generator" to create surprising and appealing dynamic graphics effects.

Technological fluency will be valued far less as something needed for the workplace than as a language in which powerful ideas can be expressed.

The lines between home-learning, school-learning and work will be blurred, perhaps abolished.

from Someday to Monday

I imagine a teacher saying: "Those dreams are fine. I'm sure that will happen someday. So will vacations on Mars! Meantime, what do I do Monday? I have a class of kids who are not technologically fluent, who don't have free access to computers and whose parents (and our school superintendent and our President) insist that they compete with the kids from Korea on passing tests that measure knowledge of fractions.

My answer is that if you have a vision of Someday you can use this to guide what you do Monday. But if your vision of where it is going is doing the same old stuff a bit (or a lot) better your efforts will be bypassed by history.

But using the Someday vision to guide Monday might mean you have to stand the usual criterion for judging progress in education on its head: you have to stop trying to improve the functioning of the old system. Instead lay down the seeds for something new.

the Trojan horse strategy One example of a project that scores high on my measure of preparing for Someday is Generation Why, a project which contributed Ryan Powell to that same forum organized by the Milken Exchange to discuss Todd Oppenheimer's article.

Powell is a 14-year old participant in the Generation WHY project, by far the largest of several projects across the world that mobilize students who have acquired a good level of technological knowledge to teach teachers about using the technology.

The genius of this idea is that by contributing to solving a recognized problem facing schools, it rallies support from schools for something that goes against the grain of their traditional ways of thinking.

I doubt if there is hard evidence that this kind of project has produced improved learning or teaching of the traditional curriculum. But there is clear evidence that it has done something more important in the long run: it is helping schools face the fact that the technology is obsoleting the model of a learning environment in which teachers-who-know hand out knowledge to students-who-know-not.

Instead it demonstrates a model in which younger people and older people are able to give one another the kinds of knowledge that each happens to have. A model in which the old teacher/student relationship is replaced by learning together.

My point is not that this project is the panacea. I use it to make a much more general point about choosing uses of the computer that challenge school's assumptions. But the Generation WHY project does have a special connection with a critically important trend in the relationship between computers, kids and schools.

kid power: at last a real force for change

A hundred years ago John Dewey was showing the faults of the curriculum-driven, non-experiential ways of teaching favored by schools. But all his work had only a marginal effect on what schools do; they have changed in some details but most are not essentially very different from those which Dewey criticized way back then.

Critics of school reform (including Todd Oppenheimer) are fond of quoting the failures of past movements as evidence for the extreme difficulty of changing school and hence casting doubt on the likelihood that revolutionary change is likely to come this time round.

But the critics are misled by their failure to look below the surface of what is happening to the learning environment. If they did they would recognize three aspects of a profound difference between the present situation and anything that has happened in the past.

Each of these takes the form of a reversal:
• Reversal #1: Children become a driving force for educational change instead of being its passive recipients. Dewey had nothing stronger than philosophical arguments to support his attempts at changing school. But academic arguments can never budge an institution as firmly rooted as the School Establishment.

This time we are beginning, just beginning, to see the effects of a wave that will soon become a veritable army of young people who come to school with the experience of a better and more empowering learning environment based on their home computers. There is much talk about schools setting higher standards for students. But what is more important is that these students are demanding higher standards from schools. And moreover they come armed with the know-how that makes better learning possible.

• Reversal #2: Teachers' technologies vs. learners' technologies. The emergence of Kid Power as a force for change is closely related to the fact that digital technology is a learners' technology. This makes it radically different from the educational films and television cited by the critics who scream about previous technologies promising to bring an educational revolution and fizzling.

These technologies were teachers' technologies. The fact is that a teacher talking out of a TV set is not different in kind from a teacher lecturing in front of a class. These earlier technologies did not really offer something really new. The computer does: it offers a fundamental reversal of relationships between participants in learning.

• Reversal #3: Powerful advanced ideas can become elementary without losing their power. The reversal that is most often missed is the opportunity for making accessible to young children very powerful ideas that were previous encountered only in specialized college courses.

I have mentioned two mathematical ideas in this class:
o random variables and
o successive approximations
one from engineering:
o negative feedback

and a whole area of knowledge about project management. However, while this may be the most important reversal, it is also the one that has to overcome the most severe obstacle: for these powerful ideas are by their nature not familiar to teachers and parents raised in the days when they were inaccessible.

The strategy for overcoming the reversal brings us full circle to my opening paragraph: for those of us who want to change education the hard work is in our own minds, bringing ourselves to enter intellectual domains we never thought existed. The deepest problem for us is not technology, nor teaching, nor school bureaucracies.

All these are important but what it is all really about is mobilizing powerful ideas.

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