Technology in Schools: Local fix or Global Transformation?

Remarks by Seymour Papert for a House of Representatives Panel on Technology and Education on October 12, 1995.

1. Recommendations.

- 1.1. The understanding in the Education Establishment of the consequences for education of digital technology is deplorably limited. The policy of Federal agencies is a grab bag of uncoordinated initiatives that provide neither vision of, nor leadership for, deep changes that are inevitable in as short a time-frame as the immediately coming decade. Even some initiatives that are exemplary in their short-term effects convey a wrong message for what might happen a few years ahead.
- 1.2. The question at stake is no longer whether technology can change education or even whether this is desirable. The presence of technology in society is a major factor in changing the entire learning environment. School is lagging further and further behind the society it is intended to serve. Eventually it will transform itself deeply or breakdown and be replaced by new social structures.
- 1.3. The open question is not whether but how. Will the transformation of schooling take place in an orderly, constructive manner or will we see aggravated versions of the breakdown already happening in some cities? Will public schooling survive? Will the needs of the economy be well served?
- 1.4. The Federal government cannot control the process of educational change but could provide leadership and vision. My recommendations include:
    - – Turning educational institutions that are under federal control into model sites for far-reaching change. A no-cost example would be freeing the Job Corps from bureaucratic micromanagement and making innovation a criterion in bidding for management of Job Corps Centers.
    - – Setting the sights higher in the formulation of national goals. For example it is pitiful that a national leader could see wiring each school to the internet as a significant goal. This would be a good thing, but a minimal level for a significant national technology-in-schools goal should be more like “several networked computers in every classroom within three years and a computer for every student within six.”
    - – Having the courage to support the idea that all assumptions about the content of the curriculum, the modes of learning and the structure of School are open to re-examination and radical replacement as we move into the digital era. Recent initiatives such as Globe, the new standards and the new methods of assessment should be seen as baby steps in the right direction.
    - – Creating a challenge to the technology industry to produce radically innovative low cost (for example $200) high performance networked portable educationally oriented computational devices.
    - –Creating a challenge to the “ideas industry” to produce radically innovative new concepts of intellectually rich curriculum without constraints imposed only because they have always been there such as inclusion of traditional topics (e.g. fractions or formal grammar), segregation of learners by age (K, 1, 2 etc.) or artificial traditional divisions such as “science vs. math vs. writing” or “vocational vs. academic.”
    - – Creating supportive conditions for visionary teachers (of which there are many) to “blow the whistle” about the deficiencies of “School as have known it” and join in the launching of a national debate about the future of the learning environment.

2. Resistance to Change in Education

2.1 Some sectors of human activity such as medicine, transportation and communications were transformed beyond recognition during the twentieth century. Compared with such megachange the practices of school have been virtually static.

There are in principle two diametrically opposed visions of the role of new technologies in education. In one vision the technology is a means to bolster and improve established practices. In the other, the new technology renders these practices obsolete by creating the opportunity for radically new practices.

It is impossible to think sensibly about change and resistance to change in education unless one recognizes that the Education Establishment will not easily depart from the first view. It is held there by its intellectual paradigms as much as by its bureaucratic self-interest. Its professional structure reflects a certain model of education. So does its political and its financial base.

2.2 Reasons for the relative lethargy of educational change include the following:

- Technology capable of producing an infrastructure to support megachange in education developed only in the last quarter, and largely in the last decade, of the past century;
- Educational policy is dominated by a hierarchy of bureaucracies at federal, state and local levels;
- Educational thinking is dominated by an intellectual establishment (in schools of education, research institutes, federal agencies and elsewhere) whose culture formed under conditions of a lethargic pace of change;
    - Since almost everyone has spent many years in schools, the image of "School as we have known it" is deeply imprinted in our collective and individual consciousness;
    - Neither the general public nor education policy makers have access to elaborated descriptions of alternatives. As a result small modifications of the existing system can be presented as "radical innovation."
    - There is widespread confusion about the costs of technology and the costs of failure.

The last two points will be amplified by some arithmetic in the next section and some parables in the following one.

3. The Mathematics of the Cost of Technology

The cost of technology is vastly exaggerated in the minds of education policy makers. The following factors enter the process:

3.1 The cost is seen in absolute and not in relative terms:

Consider the following extremely conservative assumptions for a school system:

School budget: $6,000 per student per year

Cost of a computer: $1000

Life of Computer: 5 years

Consequences:

- Cost per year of providing every student with a computer is $200 a 3% increase in budget.
- Cost of enough computer power in school to allow access whenever needed would be about 1% increase in budget.

3.2 Costs are based on retail prices of machines structured by an industry's perceptions of other markets:

- Even without significant redesign of computers the above costs could be cut to half by hard bargaining for very large scale use.
- An innovative design could produce an educationally powerful machine for a quarter of the above prices.

Thus: the cost of providing every student with high quality computation is much less than the annual increase in cost of education due to inflation.

3.3 Costs are not compared with the cost of school success and failure.

The above figures show that if the use of technology permitted a 5% improvement in the outcome of education it would be vastly cost-effective. If one adds to this costs of social services, loss of productivity, incarceration and other consequences of educational failure the figures are even more compellingly in favor of cost-effectiveness of investment in educational technology.

4. Parables

The following parables are intended to consolidate what I mean by my assertion that the Education Establishment has fallen victim to a fundamental error which I recapitulate as follows:

The Education Establishment has misunderstood the historical role of digital technology in relation to the education of children.

A pervasive error consists of seeing the technology as a way to improve the practices of contemporary School. In fact the technology makes them obsolete.

For the foreseeable future one can assume that there will be places children come together in order to learn. But almost every particular aspect of how these places will be organized will be different: certainly the "curriculum" will be radically different; the segregation of children by age and the fragmentation of knowledge into separate "subjects" may no longer be considered desirable, etc. All these features of School can be traced to the lack of powerful knowledge-handling technologies.

4.1 First Parable

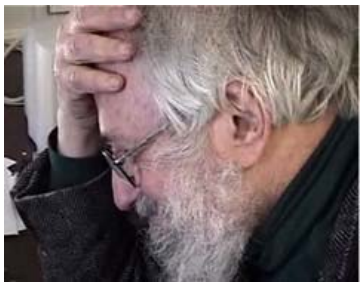
Physicians of a bygone era greet new medical technologies such as anesthesia and asepsis as providing an opportunity to improve their procedures …….. for example they see ways to achieve wonderful improvement in the use of leeches for blood-letting.

4.2 Second Parable:

Nineteenth century researchers seeking to improve transportation stumble on the idea of a jet engine and propose to use it to augment the power of horses pulling stage coaches. Researchers of a rival school ridicule the idea of using technology to solve the problem and suggest that the better way is to train the coachmen. They cite careful experiments to show that stage coaches are slowed down by friction in the axle bearings. They demonstrate that a statistically significant improvement in speed can be obtained simply by training the drivers to use more and better grease.

Of course the anti-technologists were probably right in the short term. But the revolution in transportation was not going to come from studying axles and grease or by training coachmen in better skills. It would come through the invention of the airplane.

Of course the parables don't prove anything about technology and education. But they do set the tone for what has to be proved: the need and the possibility of inventing the educational airplane.



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