VISION FOR EDUCATION: THE CAPERTON-PAPERT PLATFORM[1]

By Seymour Papert and Gaston Caperton

Gaston Caperton, a leader in business and government, conceived and implemented an exemplary statewide program of technology in schools during his two terms as governor of West Virginia, from 1988 to 1996. Seymour Papert is a professor, mathematician and author of seminal books on technology and education. For their pioneering work in technology and ucation, Caperton and Papert received the *Computerworld Smithsonian* Award for Leadership in Education -- Caperton in 1996 and Papert in 1997. This platform is a result of the collaboration between Caperton and Papert to see whether a get-it-done governor and a theory-building visionary could work together as a team toed map out a path for technology and education.

I. The Need

The approach of the 21st century has brought a chorus of pronouncements that "the information society" both requires and makes possible new forms of education.

We totally agree with this. But we do not agree that tardiness in translating these declarations into reality can be ascribed, as it often is, to such factors as the lack of money, technology, standards or teacher training. Obviously there is need for improvement in all of those areas. But the primary lack is something very different -- a shortage of bold, coherent, inspiring yet realistic visions of what education could be like 10 and 20 years from now.

What we mean by vision is not a blueprint but a compelling view of the "look and feel" of the future -- its needs, its opportunities and how we can prepare ourselves now to act on them. Vision allows us to look beyond the problems that beset us today, giving direction to our passage into the future. Even more important, vision energizes that passage by inspiring and guiding us into action.

II. Visions

Vision as Headlight

---

[1] This essay was written for the 91st annual National Governors' Association meeting held in St. Louis, Missouri in August of 1999.

The alternative to giving far more attention to envisioning the future is to squander resources on vainly trying to use new technologies to solve the problems *of school-as-it-is* instead of seeking radically new opportunities to develop *school-as-it can-be*. The conversation about technology in schools is trapped in the wrong subject. The talk is all about "does the technology work" as a fix for the old. It ought to be about developing and choosing between visions of how this immensely powerful technology can support the invention of powerful new forms of learning to serve levels of expectation higher than anything imagined in the past.

Consider an analogy. In the 1950s, the USA, hoping to be the best at transatlantic travel, was developing a new ocean-liner. The *SS United States* brought "success" by adding a few miles per hour to the speed record for Atlantic crossing. But in the very same year the first commercial jet-plane took to the sky and the record became irrelevant. Will current attempts to make our schools the best of their kind only succeed in making them the best of an obsolete kind?

Vision as Driving Force

Better test scores, Internet in every classroom, more teachers. These are undoubtedly useful things, but they are not made of the same stuff as Martin Luther King's "I Have a Dream" speech; Abraham Lincoln's words: "Of the people, by the people, for the people"; Henry Ford's vision of a car everyone could afford to own; or Louis Pasteur's vision of medicine based on the revolutionary idea that germs cause disease. These are visions that inspired people to perform great deeds.

The "Vision" Vision of Education

Vision is the key to how policy-makers and educators can participate in forging an education to match the needs and opportunities of the new century. But vision is also the key to what this education should be about. *The primary commitment of education should be about vision.* Every citizen should enter the world with:

- A proud vision of self as a powerful life-long learner,
- A vibrant vision of a worth-while life ahead,
- An optimistic vision of a society to be proud of, and
- The skills and the ethic needed to follow these visions.

The "Vision" Vision of School

School is a place where students learn largely by working on projects that come from their own interests -- their own visions of a place where they want to be, a thing they want to make or a subject they want to explore. The contribution of technology is that it makes possible projects that are both very difficult and very engaging.

It is a place where teachers do not provide information. The teacher helps the student find information and learn skills -- including some that neither knew before. They are always learning together. The teacher brings wisdom, perspective and maturity to the learning. The student brings freshness and enthusiasm. All the time they are all meeting new ideas and building new skills that they need for their projects. Some of what they learn belongs to the disciplines school has always recognized: reading, writing, mathematics, science and history. Some belongs to new disciplines or cut across disciplines. Most importantly, students and teachers are learning the art and skill and discipline of pursuing a vision through the frustrating and hard times of struggle and the rewarding times of getting closer to the goal.

III. A Principled Vision ... Faith in America

This is what we most deeply believe: If we build the vision, the people will come.

We are convinced (and every poll endorses this) that the American people will respond to a credible call to mobilize for Education the elements that made this nation great. But if you talk to them about uninspired tinkering of an outmoded system, they would rather have a tax cut.

Our own vision and our call to action are based on three principles:

1. American Can-Do Technological Prowess

Powerful technologies are at work in our hospitals, industries, cars and homes. We must put them to work in our schools! It is intolerable that our classrooms still look like the 19th century -- even when we scatter a few computers in them.

2. Visions of America

The USA was built out of Vision: the Vision of building a new society and the Vision of the can-do pragmatic spirit. School was created to convey that vision to the next generation. It is losing this power. We can give it back! But only if we transform School such that it embodies the spirit of the future.

3. Honoring Teachers

Teachers were once among the most respected members of their communities -- often the most respected. This position is slipping as schools deteriorate and lose their social function. Some visions of the role of technology in education, for example, the image of the best teacher as a distant teacher, further undermine respect for teachers and their personal relationships with students. Our Vision offers a way to re-establish the teacher in a more powerful and important role even while making use of new techniques such as distant and computer-aided learning.

IV. Recognizing a Pattern of Technology-Induced Change

When any new technology is invented, its first use is putting a new twist on what people were doing before. It takes time for the technology to give rise to really new practices and the new cultures that support them.

For instance, the first idea of a movie was to act a play, as if in a theater, in front of the newly invented cameras. It took many years, many people and many ideas before "technology-aided theater" turned into the modern art of film-making. A movie is now very different from a play acted in front of a camera.

The first idea about using computers in education was to use them to do a little better what schools were already doing. This is not a criticism. It is the way a movement towards radical change has to start.

But the time has come to move beyond "technology-aided school." It is time to open our minds to radical change in the institution of school itself.

V. Why Now?

Radical change was not possible until recently. There have always been inspired educators who dreamed of new forms of learning. The primary reason their dreams could not be turned into practice was a lack of a suitable technology. Only five years ago, it would have been hard to imagine all children working in the spirit we see in the following scenario: A perfectly average 10-year-old, call her Jane, is pursuing a passionate interest in creating complex computer art which she exchanges across the Internet with a small community of like-minded young people scattered across the globe. The real wonder is that she is using some very advanced mathematical principles that she learned by exchanging ideas as well as products with the same group. Today such things are beginning to happen. In five years time it will be commonplace for learning to take place through the pursuit of passionately held personal interests. Technology makes it possible to open

new directions for learning. We can do it. Three imperatives change *can* to *must*:

1. The Economic Imperative

Digital technology in the workplace requires a new definition of "basic skills". The transformation of work requires much more than a mastery of a fixed curriculum inherited from past centuries. Success in the slowly changing worlds of past centuries came from being able to *do well what you were taught to do.* Success in the rapidly changing world of the future depends on being able to *do well what you were not taught to do*. Already a great number of Americans are doing jobs and using skills that did not exist when they went to school -- soon it will be the majority.

2. The Social Imperative

As the slow evolution of school lags further and further behind the rapid evolution of society, increasing numbers of students all over the world see school as irrelevant to life. Many drop out. Many more drop out mentally, emerging from school with poor skills and negative visions of themselves and the society they are entering.

3. The Moral Imperative

Because of our technology we *can* restructure our education system. Because of our commitment to democracy we *must* do it. The image of Jane acquiring powerful knowledge previously inaccessible to all children puts a spotlight on a new ways in which privilege breeds greater privilege. Having a personal computer and the freedom to use it to follow personal learning gives Jane access to a new world of knowledge. If some are left out, the gap between the "haves" and the "have nots" will grow exponentially.

Waiting will only increase the difficulty and the cost. The spread of digital technology into every other sector of society makes it *inevitable* that it will eventually permeate school. Eventually, every student -- and most pre-school children -- will have more computing power than any professor of computer science has today. Indeed, already most home computers have more power than any professor had thirty years ago. And when children grow up with this kind of knowledge-technology it is inconceivable that school will not change very radically.

So the choice is not whether we will consider deep changes in school but how many children will be lost before we recognize that we have to do so.

VI. How Much Difference Makes a Difference?

There is much talk about "closing the equity gap" or "leveling the playing field" by connecting every classroom to the Internet and so giving every child "access to the Information Highway." But these are abstract phrases. "Access" to a personally owned computer that is available all the time is fundamentally different from the kind of "access" a student can get from a handful of computers in a classroom. Obviously, limited access is better than none, but it is delusional to think of it as "equity." The *minimal action* that will make a serious difference is ensuring that every child has a personal computer.

But equity is not the only, or even the strongest, reason for a one-to-one ratio of computers to students. The real lesson to be drawn from the vision of Jane learning mathematics by following her passion for graphics is about opening new ways of learning through having *full-time* access to a computer. Imagine a country that has schools but has not yet invented writing. One day writing and pencils and paper and books are invented. Educators get the idea that these new technologies can help education. The boldest among them argue that they could afford to place a pencil and a book in every single classroom in the land.

A pencil in each classroom in our imaginary country might have provided a lot of fun and would surely allow creative teachers to invent some new activities. But these innovations would not give even a hint at the holistically transformative effect the introduction of writing has had on the production and dissemination of knowledge. The following "learning stories" are intended to give a very conservative peep at our vision of the computer as supporting change that is no less holistic and no less transformative.

VII. Learning Stories

Story 1. In a School

Children everywhere fantasize about "what I'll be when I grow up." Our first learning story recounts an event in a school in one of the poorest counties in West Virginia in a kind of place where very few children find any way to follow up on their dreams. This school had been connected to the Internet and a student, let's call her Alice, had been pursuing the idea that she would like to become an astronaut. "A few years ago, I wouldn't ever have been able to make my dream come true," Alice said. "Now I'm on the

Internet with NASA all the time learning from scientists what they're doing, learning what I have to learn."

Alice dreamed of going to the stars.

Another West Virginian student used the Internet to explore Paris and another enrolled in an on-line course in Japanese offered by a university in Nebraska.

To appreciate the impact of these incidents we must remind ourselves that just a few years ago these students -- and their parents -- would have thought it a big deal to travel to the state capital. Digital technology has given them an immeasurably larger view of the world and of themselves! The next stories focus on how it could give so much more.

Story 2. In a Multicomputer Home

Eight-year old Bill had been spending a lot of time on "shoot 'em down" kinds of computer games. Concerned parents looking for a way to divert him into something with more depth eventually bought a flight simulator program. Although the program was designed for adults, flying real planes captured the kind of excitement Bill found in the computer games and added a new element of doing something grown-up! During the next year he spent hundreds of intense hours on it. Bill soon discovered that the goal of learning to fly was not easy. But a year later he had passed simulated flight tests and was able to discuss the strengths and weaknesses of different airplanes and talk at length about the airports of the world with a well-informed, mature sense of geography.

The point of the story is *not* about Bill becoming a pilot. It's about digital technology allowing children's career fantasies -- indeed, all their fantasies and all their interests -- to become occasions for important learning which will support whatever vocation they eventually follow.

Bill's experience with the flight simulator required reading very far above his "grade level" and understanding some mathematical ideas very, very far above his "grade level." Like Alice, he acquired a new vision of himself, but his greater access to the computer gave him the additional experience of learning what it is like to struggle bitterly hard to learn something he really wanted to learn and feel the reward of success.

Story 3. A Projection Into an Imaginary School of the Future

Pinetown School is a place that may not exist today, but is a composite of features that do exist and are known to work.

Pinetown student Mary, at age 12, also thinks a lot about possible careers. She is not attracted by technical fields like flying or space travel. She thinks about working in the service sector -- she says she is a "people person" and thinks of work that will help people. She speaks of being a "consultant" but she also loves the teachers at Pinetown and thinks of becoming one herself. During most of the previous year she had been fascinated by the idea of joining the police force.

Pinetown offers Mary all the advantages Bill had over Alice and much more as well. The sheer quantity of computer time Bill consumed was greater than Alice's school could allow, but this was easy to fix: every student at Pinetown has a mobile computer. A no less important factor was that Bill could follow his personal learning style of total immersion in what he was doing: he would work at the computer for five hours at a stretch! Allowing this kind of learning had required much more restructuring of the school and had met with a lot more resistance. But in the end, Pinetown recognized the organization of the day into periods and school life into grades as a relic of an "assembly line" model of disseminating knowledge. That form of organization was no longer necessary or even compatible with the project-based, immersion learning that was made possible by the technological and the epistemological infrastructure now available.

During Mary's police-officer period, which lasted about a year, she had researched (as her academic advisor at Pinetown insisted on her doing) what this entails and had been required to learn some of the necessary skills. She chose to study driving and crime reports. She was too young to drive but used a driving simulator as Bill used his flight simulator. When she developed special skills at making fast turns and getting out of the skids that sometimes resulted, her advisor suggested that she study the physics of skidding and join a group of students of varied ages who were interested in the science of cars. The crime study led Mary to find a network of students in other cities and countries who were interested in similar issues. Through them she heard about and enrolled in an on-line course in statistics pitched to her level of mathematical background. By the end of the year, the international group had put together a multimedia report on the relationship between car theft and teen-age alcoholism across a variety of geographical locations.

We leave Mary in her twelfth year as her interest was moving away from fighting and studying crime to exploring a career in teaching with a special interest in how education could prevent crime. She has begun to explore the possibility of doing volunteer work for an on-line help service for children in trouble.

VIII. Most Frequently Asked Questions

Question: Your Pinetown sounds great for the smart kids. In fact, it is nothing but a high-tech version of what is already being done in programs for the gifted and talented. What does your vision say about the others -- the vast majority of average and below-average kids?

Answer: The question begs the question! In our vision the "vast majority" of children *are* "smart kids." Babies start life as powerful, motivated learners. For all sorts of reasons the drive to learn is too often dimmed or even extinguished as the child grows. Experience has amply demonstrated that the drive can be kept going or rekindled by offering challenging opportunities. *The role of digital technology in our vision is to offer all children (and everyone!) more challenging opportunities than was conceivable in the pre-digital era.*

Q: But there are statistics to show that in most cases technology in schools doesn't work.

A: The statisticians ask a silly question and get a silly answer. Of course "technology doesn't work." *Technology doesn't do anything.* People do. Statistics that lump together technology implementations across the board -- averaging the good with the bad -- only prove that throwing a lot of computers into an otherwise unchanged school will just leave you with an unchanged school. What else is new? Technology gives *people* the *opportunity* to create new, high-expectation learning environments. If we don't have the vision and the courage to take advantage of the opportunity, statistics will continue to prove the obvious. The critics of the use of technology in schools are absolutely right when they cast doubt on technology's cost effectiveness. But the cause of widespread low effectiveness is not the technology. It is using digital technology without a vision of a digital world. And often it is using technology at a level below the critical mass at which it has a chance to be used effectively

Q. Your vision includes a computer for every child. That's 60 or 70 million computers! I can't imagine how we can ever afford it!

A: You certainly can imagine it if you only think a little differently. Think of $10 billion, which is certainly a lot of money compared with typical school budgets. But now divide the 10 billion by 50 million (near enough to the number of students in American schools) and then by 200 (near enough to the number of days in a school year). You will come out with exactly one dollar, which is hardly a lot of money for people in the richest country in the world, but that's what it would cost not only to provide every student with a computer connected to the Internet but also to revamp the school system to take advantage of the technology. Our "expensive proposal" boils down to spending one dollar per student per day!

Another reaction to your question is that *we* can't imagine how the nation can afford *not* to make this investment. Think of it in business terms. Everyone must agree that having a highly educated workforce would produce *some* increase in productivity. It is hard to guess how much -- 3 percent or 5 percent are conservative estimates. But these are percentages of huge sums: our economy has soared into the trillion dollar range. Much smaller increases, in fact just a fraction of one percent, would represent a gain much greater than the dollar a day investment.

Q. Your claim that a dollar a day is enough does not agree with estimates of the cost of technology that have been made in studies by respected organizations such as RAND.

A: We are afraid that these estimates are badly flawed and, if we may say so, precisely because of a lack of vision -- in fact several kinds of vision.

They fail in technological vision of short-term trends by projecting onto the future numbers based on the spending made by schools in the past. For example, they assume that the cost of a computer is in the $1,500-$2,000 range because that is what schools paid for the computers they bought in some period during which data was collected. But we are dealing here with a field in which trends operate rapidly. It is already possible to buy greater computer power for less than half that cost and before any action based on this discussion could be implemented, the cost will have come down to less than a third of it. So on this count alone the estimates are too big on the hardware side by a factor of three.

The estimates are further bloated by assumptions about replacement costs. These vary from study to study, but typically the studies assume that computers will have a useful life of four years. But why? Using an extreme case to emphasize the point we note that in some schools 15-year-old computers are doing yeoman service! These old Apple's would not actually support the kinds of new learning that are central to our vision. But many eight-year-old computers would do so. And we are quite confident that the present generation of hardware is good enough to support a revolution in learning to cover the period until the cost of hardware falls so low that nobody would think of it as expensive.

The bloat of estimated replacement costs reflects a failure of educational vision as well as a failure of technological vision. It may seem paradoxical that our bold vision should lead to lower estimates of cost. But the point is that we can match choice of computer to a vision of actual educational function. Those who try to estimate costs without a vision fall into one of two traps: they follow the practices that the business world has

(for good or bad reasons) adopted or they make sure they are covering all bases. Both traps lead to gross overestimates.

Q. O.K., I accept your argument for the hardware, but what about all the other costs?

A. Our dollar a day is intended to cover more than buying computers. In fact, averaged over the next decade, only 25 percent of it would go for computers as such. But our argument that lack of vision bloats cost estimates is true across the board.

An obvious place where costs are overestimated is Internet connectivity. Here the cost will fall as sharply as in the case of computers, unless we make the gratuitous assumption that in order for learning to be effective schools will have to keep up with the race to develop applications that use the maximum speed technology is capable of delivering.

Lack of educational vision also leads to ignoring the opportunity for growing in-house expertise. The high estimates of cost also count installation, maintenance and teacher training. In our vision, students would acquire enough computer fluency to carry out all the technical items, including those parts of "training" that have to do with helping teachers deal with the mechanics of using computers.

Q: O.K., O.K. But you are still dealing with the technological side and ignoring the most important and expensive factor associated with introducing technology: teacher training. How do you "envision" that?

A: We left this aspect for last because it does indeed raise the most important question about the implementation of our -- or any -- vision of educational change. But the question is wrongly stated. The issue is not about "technical training" but about helping teachers address serious educational issues that have nothing to do with technology. Teachers will have to make a transition and this will have a cost. But this cost should not be attributed to technology; it is the cost of transition to the needs of a future world. Or rather, it is the cost of the failure of our schools of education to anticipate these needs. *And this cost grows higher every day that schools of education continue to pour out graduates prepared for a bygone world and so in need of costly transition to a new world.*

The transition would cost something even under optimistic assumptions about the ability and willingness of schools of education to change. But our vision of learning makes it far less costly than it might seem and, indeed, we have included an essential core of what is needed in our dollar-a-day scenario.

The central idea underlying our approach to the transition is that the learning environment we envisage will be good for teachers' learning as well as for students' learning. In fact, in an initial stage, it might provide greater improvement of learning for teachers than for students. Teachers will be learning as they work. This does not mean that they do not need some preparation time outside of their work; but what this preparation should prepare them for is to become more willing and able to learn as they participate in the learning-rich kind of work they would be doing in a context like Pinetown School.

Q: But even if the cost is less than some say and even if we can expect a huge return on investment, there is still the $64,000-question: Where will the money come from?

Our own proposal is to create a National Educational Technology Trust on the model of the National Highway Trust. Creating the trust would recognize that technological infrastructure for education should be treated as a national resource of the same nature as the highways. It would also provide a mechanism for funding the technology -- *and the cost of developing its uses* -- in the same spirit as the funding of highways based on the gasoline tax. A tax on the computer industry could provide enough income to go far beyond our dollar-a-day minimum without affecting the competitiveness of any firm.

IX. We Must Have "Imajunashun"

A first-grade girl in a Mississippi school used a computer to compose this philosophical statement: "The biggest thing about someone is imajunashun. Before you can be something, you must imajun it."

Salk imagined a way to eliminate polio … not a treatment to relieve it.

Kennedy imagined a man on the moon … not a faster jet.

We imagine a school that revolutionizes learning for the next century … not one that reconditions learning as we have known it in the past.

We imagine a school in which students and teachers excitedly and joyfully stretch themselves to their limits in pursuit of projects built on their own visions … not one that that merely succeeds in making apathetic students satisfy minimal standards.

We imagine a school from which every student will come with vision:

- A proud vision of self as a powerful life-long learner,

- A vibrant vision of a worth-while life ahead,
- An optimistic vision of a society to be proud of, and
- The skills and the ethic needed to follow these visions.

Given this, the rest will follow.