

Rethinking Education in the Age of Technology¹

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People around the world are taking their education out of school into homes, libraries, Internet cafés, and workplaces, where they can decide what they want to learn, when they want to learn, and how they want to learn. These stories challenge our traditional model of education as learning in classrooms. These new learning niches use technologies to enable people of all ages to pursue learning on their own terms.

Rethinking Education

Education is in flux and where it ends up depends on the decisions society makes. So this is a time of opportunity to determine the future direction of education in ways that we have not faced in 200 years. To be effective in this changing environment requires that the builders of the new education system understand the imperatives of the technologies driving the changes in education.

These imperatives can be thought of in terms of *customization, interaction, and control*. Customization refers to providing people the knowledge they want when they want it and to supporting and guiding them as they learn. Interaction refers to the ability of computers to give learners immediate feedback and to engage learners through simulation in accomplishing realistic tasks. Control refers to putting learners in charge of their learning, so they feel ownership and can direct their learning where their interests take them.

Society should not assume that the only way to improve education is to improve the schools. There are other questions we need to consider, such as: How can we develop games to teach mathematical reasoning? How can we make learning technology available to more people? What tools can support people learning on their own? These are questions about improving education outside of schools. As a society, we don't yet know how to ask these wider questions when we think about improving education.

There are a variety of things we can do to support people to learn on their own: 1) we can provide machines for all toddlers that help them learn to read on their own, with books by writers such as Dr. Seuss. These machines could also have computational games to challenge kids. 2) We can provide tutoring programs on the web to teach a variety of topics that perhaps are tied to certification exams. 3) We can provide computer-based games on the web that foster deep learning and entrepreneurial skills. These are things that governments should support if they want to be competitive in the digital age.

A possible education reform is to develop national certifications that can be administered on computer or by assessors at any school or learning center. These certifications would be much more narrowly focused than a high school diploma. People apply for as many as they like and can sit for them whenever they are ready. Certifications could be developed in three areas: academic skills, generic skills, and technical skills. In the academic area English competency might be assessed at 3rd grade, 6th grade, 9th grade and 12th grade levels of reading and writing. People could take courses to prepare for the exams, or if they wanted to study on their own they

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could. Some learners might obtain a large number of these certifications and some might obtain fewer.

By tying certifications to the specific goals of learners and their parents, assessment could be much more attuned to the technological imperatives of customization and learner control. If a student's goal is to become a doctor they might need to get certificates to demonstrate expertise in chemistry, biology, psychology, college level literacy and math skills, etc. If they want to become a travel agent they will need to establish their expertise in reading, listening, explaining, geography, psychology, resource management, and scheduling, etc. There would need to be an online system that parents and students could consult to learn what certificates are needed for different career choices, what they need to know to obtain each certificate, and what methods they might use to obtain the necessary knowledge.

When students become teenagers, we would trust them to follow a number of different paths. They might attend school, work, study at home to take certification exams, or participate in some kind of youth organization like AmeriCorps. If they want to go to college, they might try to get all the certifications they need for college as soon as possible, and go off to college at age 15 or 16. Others might work for a while and come back to school to prepare for college. Ideally the state would pay for students' preparation for a certain number of certifications (perhaps 20 or 30). Then people could take courses whenever they are ready, at whatever age. This is far better than forcing unwilling teenagers to stay in school until they are 16 or 17. It would produce a mixed age population in the courses, filled with people who chose to be there.

Technology is changing what is important to learn in a variety of ways. There are new literacies that are becoming important, such as creating videos, animations, and web sites. Computers can carry out all the algorithms taught through graduate school, and yet mathematical reasoning is more important than ever. Hence we should spend time teaching students to solve sophisticated problems using computers rather than executing algorithms that computers do well. Memorizing information is becoming less important with the web available, but people do need to learn how to find information, recognize when they need more information, and evaluate what they find.

People will be changing careers often and transitions are difficult. They need help going back and forth between learning and work. They should be assigned a personal counselor when they are 13-14 to help them think about what they need to learn for different careers and how to acquire that knowledge. If they go to work, the counselor could advise them on learning opportunities they can pursue. People will be going back and forth between learning and work throughout life and ideally they should be able to consult the same counselor as they make these transitions.

Parents and citizens need to push for a more expansive view of education reform. School leaders and teachers need to understand how learning technologies work and how they change the basic interactions of teachers and learners. Technology leaders need to work together with educators, not as missionaries bearing magical gifts, but as collaborators in creating new opportunities to learn. It will take a concerted effort to bring about such a radical change in thinking. If a broader view develops in society, leaders will emerge who can bring about the political changes necessary to make the new educational resources available to everyone.

What may be lost and what may be gained

The revolution that is occurring in education will alter not just the lives of students, but the entire society. As with any revolution, there will be both gains and losses. Pessimists see

people becoming subservient to their technologies and being left behind as technology comes to dominate our lives. Optimists see a golden age of learning opening before us, where people will be able to find resources to pursue any education they may want. We don't envision a future that is either bleak or idyllic, but where elements of both are present. We first want to raise our major concerns:

- **Equity.** Schools have been the means by which many immigrants and minorities gained access to the mainstream. Despite widespread tracking and segregation, the public schools are the institution that fosters equity more than any other institution. If education fractionates and the states relinquish responsibility for giving students an education, then poor children are likely to suffer. Public schools may become dumping grounds for poor and uninterested students, while parents who want to give their children a good education avail themselves of home schooling, private schools, and learning centers.
- **Citizenship and Social cohesion.** In Jefferson's and Horace Mann's vision, schooling would prepare people to be good citizens and assimilate them to a common culture. Mann was very concerned about educating immigrants and developing social cohesion. This may be lost as parents and individuals take over responsibility for learning. We can anticipate not only Christian conservatives developing curricula, but many different interest groups, such as environmentalists, Muslims, and Mexican Americans, developing curricula that address their concerns about raising children. In such fractionation by interest groups, citizenship and social cohesion goals may be undermined.
- **Diversity.** As education fractionates, people may learn less about people from other backgrounds and cultures. As David Brooks argues, we are settling into our own little "cultural zones" where like-minded people cluster together. Hence, we may find it difficult to get along with people from different backgrounds or with different views.
- **Broader horizons.** When people select their own education goals, they pick things that interest them or that are occupation-oriented. Their choices are often narrowly focused. But a major goal of education is to expand people's horizons. Hence, there is the problem of parents steering children along narrow paths. This means that children may not be exposed to different views on issues and become more parochial in their ideas.

But there are also potential gains:

- **More engagement.** One potential gain is that education will be directed toward what people want to learn, and hence more engaging. For example, parents who school their children at home usually encourage them to pursue topics they are interested in. Furthermore, in distance and adult education, people choose topics they think will help their careers or that reflect their interests. And when people purchase educational videos, games, or simulations, they choose topics that interest them. So they are much more likely than school children to be engaged in learning.
- **Less competition.** Because school is competitive, a sense of failure overwhelms many students. Most cope by turning their energies to other activities, such as sports. Most students try to do as little as possible. The goal becomes to get grades that are good enough not to hurt one's future, with a minimum of effort. This attitude is inimical to learning and is a product of the competitive nature of school. If people pursue learning on their own, they will not feel the sense of failure that comes when everyone is supposed to learn the same thing at the same time.
- **Customization.** Another potential gain stems from the capability of computers to customize education to the particular needs and abilities of individual learners. Computer

learning environments can be designed to provide hints and support to students when they need help. Hence, computer environments can adapt to the level of the student's ability and help all students to succeed.

- **More responsibility.** Parents who school their children at home try to instill a sense of responsibility in the children themselves. But it is not just home schooling that fosters responsibility among learners. If people are learning at work or at home using distance education, they are forced to take responsibility for their own learning. When the state took over responsibility for education, families and individuals ceded most of the responsibility to the schools. Many school children seem to defy the schools to teach them anything. But people are not going to learn much unless they take responsibility for their own learning.
- **Less peer culture.** Another potential benefit is the diminution of peer culture. Putting young people into schools, where their main interactions are with peers, creates an unhealthy situation. Peer culture tends to devalue learning and foster drugs, sex, and violence. Peer-cultural values emphasize looks and strength rather than intelligence and hard work. To the degree that children are learning at home, in workplaces, in learning centers, or libraries, it will tend to undercut peer culture.

Who will benefit ultimately from this revolution in education? In America there is a commercial push to sell educational products to consumers who are looking for an edge up in the race for success. This means that technological products and services are popping up all over the American landscape. Education, once viewed as a public good with equal access for all, is now up for sale to those who can afford specialized services and computer programs.

Schools have served America and the world very well. Many teachers have dedicated themselves to helping children from different backgrounds to learn and thrive in a changing world. Schools have made invaluable contributions to the world's development and they will continue to do so well into the future.

But it is time that educators and policy makers start to rethink education apart from schooling. Education is a lifelong enterprise, while schooling for most encompasses only ages five to 18 or 21. Even when students are in school, much of their education happens outside of school. We all know that technology has transformed our larger society. It has become central to people's reading, writing, calculating, and thinking, which are the major concerns of schooling. And yet technology has been kept in the periphery of schools, used for the most part only in specialized courses.

The central challenge is whether our current schools will be able to adapt and incorporate the new power of technology-driven learning for the next generation of public schooling. If schools cannot successfully integrate new technologies into what it means to be a school, then the long identification of schooling with education, developed over the past 150 years, will dissolve into a world where wealthier students pursue their learning outside of the public school.

This is the time we need another Horace Mann to provide the vision for an educational system that can integrate all the different elements we see developing. These elements do not form a coherent system, and few people know how to avail themselves of the opportunities that are out there. Society especially needs to concern itself with issues of equity, given that elites can buy themselves many educational advantages.