Introduction

CRAFTING A VISION FOR EMPOWERING STUDENTS

For the past 30 years, the promise of increasing processing power, quantum leaps in storage, nearly unlimited bandwidth and the shrinking of computers into handheld devices has caused many educators to dream about the potential of harnessing this power to improve learning. Technology is finally faster, cheaper, easier and smaller. How long will it take to convert this amazing change in technology into improved learning? Will we have 10 times the learning with 10 times the processing speed? What is the formula for converting megahertz, RAM and megabits into learning results? What can we realistically expect the impact of technology on learning to be?

The world is continuing to pour money into educational technology programs. With the cost of purchasing individual computers dropping at a tremendous rate, we are placing technology in the hands of many kids. Even so, the following questions remain: Are we seeing the results in student achievement that we should be expecting? Do these results justify the aforementioned spending?

A few years ago, the *Wall Street Journal* published a special insert on the impact of technology on education. The graphic on the front page depicted a student reaching as high as he could to use chalk on a blackboard. He was standing on a computer to reach higher—not a very flattering image. The image strongly suggests that we are using technology as a stepladder to continue to teach the same way we have been for a long time.

Technology proponents (techno-enamoured nerds like me) argue that the widespread application of technology can reform schools, level the playing field for disadvantaged students, provide disabled students with real opportunities for participating in the mainstream and create new opportunities for educators to build communities of best practices. The list of poten-

tial positives is extensive and even transformational—anytime/anywhere learning for all at a reasonable cost. Some of us even imagine bridging the digital divide while it continues to grow deeper every day.

To date, there is very little test data to suggest that the promise of improved learning for all has been met. What has gone wrong? Is the technology too difficult to use? Is staff development missing? Is education boxed in by government regulations that limit the creative use of powerful machines? Is the structure of schools, prescribed by the Industrial Age, too rigid, too hierarchical? Are we missing the critical mass of investment? Or does it just take a long time to ramp things up? Perhaps the critics have been right all along, and there is much less real promise than many of us want to believe.

One seminal thinker, Shoshana Zuboff (1988) offers a possible explanation for why technology has not transformed education. Years ago, when researching the impact of technology on business, she discovered that an organisation could spend a great deal of money, train everyone and correctly install the network without achieving any significant improvements. She notes that General Motors spent more money than any other private organisation in the world on technology during the 1980s. The end result was a lowering in the quality of cars. Why didn't technology make a difference?

Through her research, Zuboff (1988) observed that there were two very different approaches to the use of technology—automating and informating. Automating led to incremental improvements, while informating led to transformational improvements.

AUTOMATING

Automating is the more obvious and common approach to applying technology. *Automating* essentially means *"bolting" technology on top of current processes and procedures*. When an organisation automates, the work remains the same, the locus of control remains the same, the time and place remain the same, and the relationships remain the same. The same processes solve the same problems. Automating can lead to incremental improvement, but in some cases, as with General Motors, the quality of work actually declines.

In schools, we have automated the school report, the card catalogue, the pencil, various science lab instruments and many other traditional assignments. Many schools have entire programs to automate the blackboard with PowerPoint presentations across the curriculum. We now use computers to print reports faster, to look up library books faster, to edit the five-paragraph

essay faster and to collect data faster. Each can be an underutilisation of the power of the technology. We do it because the work is familiar.

As Zuboff (1988) discovered time and again, faster does not necessarily mean better. For example, a high school librarian once asked me to review the term essays students had written before and after the card catalogue was automated. She was concerned that the new and expensive automated system was lowering the rigour of student work. As I scanned student essays, I could not tell the difference, but she could. She pointed out a pattern in the authors referenced in each bibliography. Students who used the automated catalogue had primarily selected books appearing in the top half of the alphabet. Students who had used the traditional card catalogue had chosen books that spanned the entire alphabet. The ease of accessing the information via the online catalogue had lowered the quality of student research. The librarian was no longer naively touting the power of the automated card catalogue. This serves as a reminder to beware of unintended consequences when technology is introduced; they almost always exist.

INFORMATING

Zuboff (1988) observed that *informating* is a more powerful way of thinking about technology than automating. While informating can lead to a much higher quality improvement, it is much more difficult to implement. It is not that the technology is more difficult to learn; in fact, very often an informated application uses the same technology as an automated one. What makes informating more powerful is a shift of control and empowerment. The organisation fundamentally changes the flow and control of information. With informating, people who previously did not have access to information or the responsibility to apply the information to solve problems find themselves more empowered. New technologies can leverage empowerment through access to new sources of information and relationships.

In an informated environment, more people have timely access to information. For example, parents and students have access to marks every day instead of once a term. Students have access to content information that was previously only available in the teacher's edition of the textbook or in a university. Teachers have access to knowledge about brain research and new technologies that was only available in staff-development workshops. With timely access to information comes the potential for a shift in responsibility. As many traditional companies and universities have already discovered the hard way, when the customer or the worker gains access to new sources of information, chaos and even disaster can rule. But the upside gain can result in a transformation of quality and new services.

Bridging the Digital Divide

Of course, every family does not have access to the Internet—the digital divide may represent the most important issue in our planning for educational technology. One of the most successful home-school equity projects is by teachers Karen Grindall and John Bennet, who have written grants that enable families to connect via cable modem to school resources. Since the project's inception, test scores on traditional measures have risen. When I attended an open house that celebrated the work, a parent explained how the project has changed long-held feelings, saying, "You know, many of us [parents] were school traumatised. We did not do well in school ourselves and it can be very difficult for us to feel comfortable on parent teacher night or any event in school. The computer at home has changed those feelings. Now, it is much easier for me to get involved with my child's education and feel very positive about coming to school. The only problem is that my six-year-old thinks that I use the computer too much!" One year five offered her perspective: "I love having the computer at home because whatever I learn at school I can always go back and review in my living room. I think it helps me keep my goal of [getting good marks]. I don't think we could have afforded to have both the computer and Internet. I am really lucky to have this fun way to keep learning."

School-to-World Connections

The limits of the physical boundaries of classrooms will no longer prevent teachers from connecting students to the world. Judy Lee is an early pioneer in broadcasting low-bandwidth, still video images from her classroom during a class duck-hatching project. One of the benefits of the webcam is that Judy's students are more willing to respond to inquiries about the progress of the ducks' eggs from people from around the world than they are to her inquiries. Judy enjoys watching her students take the responsibility of researching answers for people they will never meet. Because ducks do not always hatch during school time, the video camera also extends the time/space boundaries of her classroom. Her students log on to track hatching progress with family members and friends after school and on weekends. Her classroom is actively engaging students in learning, even at times when the students are not in class.

Tips on setting up an effective videoconference are provided in Figure 2.1. More information on videoconferencing, as well as some fabulous examples of ways different institutions are using this resource to connect with others around the world, is available at http://en.wikipedia.org/wiki/Videoconferencing.

world". In this way, a map of moving from fear to hope can be generated. The connected lists can become an important document that can be revisited every year to make sure that the fears of the faculty are not coming true. Research suggests that adults will attend a workshop and listen for confirmation of their fears. If fears are articulated, validated and discussed, adults are in a better position to learn new skills.

Figure 3.6 Worst Fears/Best Hopes

Worst Fears

- Less physical activity
- Demand for increased instant gratification
- Email pressures for quick responses that may lack careful contemplation
- Blurring the lines between professional and private life
- Rising costs for uses of technology
- PC use increases the expectation for perfection
- Addiction to use of technology
- Increased accentuation between haves and have-nots
- Increase in destructive hacking
- Dealing with stress and mental breakdowns as a result of information overload
- Increased feeling of being less socially active and more isolated
- Danger in the abundance of inappropriate material available
- No privacy and a loss of personal identity
- Loss of the capacity to judge information and an increase in deferring to the computer
- A loss of caring and sense of community
- PC use may create a loss of reality
- A decrease in interpersonal relationships
- A loss of enjoyment in the simple pleasures
- A loss of family values and a dehumanisation of one's world
- Computers could control humans
- Not being able to keep up with information and people
- Alienation of our youth
- Others may be in a position to control our future
- Becoming dependent on technology
- Schools may become obsolete

Best Hopes

- All will learn better, faster and more
- Technology will be the equaliser regardless of social status and income
- People will work more efficiently and have more leisure time
- Increased exploration of micro and macro worlds
- Increased opportunities to celebrate our students' work with their communities
- Teachers will share ideas and knowledge

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