Historical Perspective

In his defense of general education against the purely technical, the psychologist and pragmatist philosopher William James wrote,

> You can give humanistic value to almost anything by teaching it historically. Geology, economics, mechanics, are humanities when taught with reference to the successive achievements of the geniuses to which these sciences owe their being. Not taught thus, literature remains grammar, art a catalogue, history a list of dates, and natural science a sheet of formulas and weights and measures. (1968, p. 312)

Today, we might say that without a historical consciousness, our understanding of the new media remains a list of software features. We risk being swept away by novelty and unable to critique what we see in terms of past experience.

This section contains an opening set of columns that raise historical questions, although they make no claim to providing thorough answers. "New Literacies" asks whether the transformation in literacy practices that some foresee is comparable to others we have experienced. "Constructing a Once-and-Future History of Learning Technologies" relates the story of a Web-based time line for literacy and learning technologies, one that welcomes the reader's contributions. "A Friendly, Welcoming Attitude Toward Change" addresses both positive and negative aspects of change and asks how we can prepare for an uncertain future.

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New Literacies

Editor's Message

First, let me welcome readers to the inaugural column of the Technology department of the *Journal of Adolescent & Adult Literacy*. My hope for this department is that it will increase dialogue about new communication and information technologies and explore what these media mean for literacy and literacy educators. It's time for everyone in this field to engage with these rapidly evolving literacy practices—to embrace, reject, or work with them to understand what they imply for literacy education.

I imagine that *JAAL* readers vary greatly in terms of how comfortable they feel with new technologies but that nearly all of you are aware that they pose new challenges and opportunities for becoming literate in today's world. Most of us are just on the cusp; we see some of what is going on but find ourselves surprised again and again by new developments and often at a loss to keep up.

The Technology department will examine various aspects of the new literacies and their implications for teachers and students. Month by month it will focus on changing literacies, learning, equity, school and work, censorship, globalization, language, or other issues that we need to rethink in light of our changing technological world. I hope that readers will contribute website suggestions and questions to explore.

I want each column to suggest something of the hypertextual, multimedia world we are entering. In addition to my monthly message, most columns will have an Issue of the Month, a Data View (about new technologies), Interpretations, a Literacy Website of the Month, Websites to Visit, a Glossary, and other components, each with links to more information on the World Wide Web.

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Issue

Will the Information Age Transform Literacy?

We don't notice the technologies of literacy because we treat our literacy technologies as natural and inevitable: How else could one write except with a pen and paper, or a typewriter? But when we look at literacy cross-culturally, or historically, it becomes difficult to ignore the means and the media by which people communicate. That we often conceive literacy without mentioning its technologies tells us mostly that these technologies are deeply embedded in our daily practices.

If we could go back in time, we would see the earliest human communities employ simple symbol systems. The nature of early literacy within those communities is closely tied to the available technologies of oral sounds, drums and flutes, gestures, facial expressions, petroglyphs, or the display of artifacts. As with the Internet today, there is a strong emphasis on visual images, icons, and brief sound segments. It is difficult to express certain ideas using these first media for literacy without the complex narrative structures that accompany later, more sophisticated oral language use.

Literacy transformations

primitive symbol systems
⟹ complex oral language
⟹ early writing
⟹ manuscript literacy
⟹ print literacy
⟹ video literacy
⟹ digital/multimedia/hypertext literacy
⟹ virtual reality

Adapted from Bruce, B.C. (1997). Literacy technologies: What stance should we take? *Journal of Literacy Research*, *29*(2), 289–309.

As societies move to more complex oral language, extended stories become possible. Later, early writing means that more ideas can be retained in permanent forms. At each stage (see Literacy transformations, above), new technologies afford new possibilities for communication and knowledge representation, making possible history as a field, formal schooling, the mercantile system, and many other changes. The technologies at each stage—devices, artifacts, methods of

reproduction, distribution systems, and so on—evolve along with the changing conceptions of literacy and its role in social practices. In this way, the evolution of literacy is demarcated by a series of changes that are neither simply social, nor technical, but sociotechnical.

What can we say about the latest set of sociotechnical changes? Some would argue that we are about to embark on a communal journey into cyberspace, a world in which traditional conceptions of text will give way to virtual reality theater; that it will be a world where relations among people will be enhanced through their mediation by computers, and where global democracy will flourish as writers share their every thought through the universal hypertext. We could add that this cyberspace will mean prosperity for all as machines take over mundane work and embedded systems transform every object in our environment into intelligent companions.

Others counter that these changes will create a rigid class system as they reward the symbolic analyst elite and relegate everyone else to serving roles, or that relations between people will be replaced by relations with machines. But perhaps, as others claim, none of this is true; the cyberworld is merely another commercial blitz devised to make us purchase electronic gadgets and shop forever in a digital mall. Is the information age bringing, as Dickens might say, the "best of times" or is it bringing the "worst of times," or must we conclude from all the hyperbole that it is "so far like the present period" that we can do nothing but speak of it in contradictory superlatives?

It seems clear that technological changes neither determine nor are determined by social relations. What happens with new technologies depends in large part on how we interpret and respond to them, how we appropriate them into daily practices, and how we alter them to fit our needs. As a result we often overestimate the magnitude of changes in the near future. We expect transformations and find only "more of the same."

But as we become blasé about the latest gadgets, we find ourselves engaging in new practices made possible by the new technologies. These new ways of communicating, of relating to one another, and of accomplishing our daily lives create possibilities that go beyond what even the designers of the new technologies envisage. It is this yet to be designed world that we seek to understand.

Data

- The Internet now has more than 30 million hosts. See Network Wizards at http://www.nw.com.
- Traffic on the Internet has been doubling every 100 days. See The Emerging Digital Economy at http://www.ecommerce.gov.
- In the United States, 73% of white high school and college students have access to a home computer; only 32% of black students do. See Bridging the Digital Divide (1998) at http://www.2000.ogsm.vanderbilt.edu.

Interpretations

> [C]omputers are, inevitably, culturally relative objects; unlike rocks and whales, they cannot be said to exist without people who possess culture, in which to recognize and use them. This is an important realization, because it brings us back to the mysterious thing called "meaning" after technocentrism has threatened to banish it. (p. 23, Jaron Lanier, "Moving Beyond Muzak," *Harper's*, *296*(1774), 22–24, March 1998)

> Thus email is not the same one social practice and conception of giving and receiving meanings via digital text. Like "literacy," "email" is an umbrella term for a diverse and ever growing array of technological literacies. (p. 146, Colin Lankshear, *Changing Literacies*, Buckingham, UK: Open University Press)

> Technology is making life easier and more convenient and enjoyable, and many of us healthier, wealthier, and wiser. But it is also affecting work, family, and the economy in unpredictable ways, introducing new forms of tension and distraction, and posing new threats to the cohesion of physical communities. (http://www.technorealism.org)

Over 60% of the citizens and 70% of the local businesses of Blacksburg, Virginia, USA, use the Internet on a regular basis. This is a result of a collaboration between the town, Virginia Tech, and Bell Atlantic to create one of the first electronic villages at http://www.bev.net.

Websites to Visit

Organizations

Some organizations based in the United States concerned with adolescent and adult literacy:

- International Reading Association, http://www.reading.org
- Literacy Volunteers of America, http://www.literacyvolunteers.org
- The National Council of Teachers of English, http://www.ncte.org
- National Center on Adult Literacy, http://www.literacyonline.org

Glossary

Cyberspace: as coined by science fiction writer William Gibson, a computer network in which users mentally traverse large data matrices; now commonly used to describe the Internet or the Web.

E-mail: a service that allows users to send and receive messages via computer and network; many services now support styled text, graphics, audio, or video.

Embedded systems: computer processors that work in appliances, cars, telephones, lights, and other devices; they are often invisible to the user and mean that nearly everyone is becoming a user of computer technologies, even without realizing it.

Host: a computer connected to the Internet with a registered name, such as http://www.reading.org. The term is used to refer to any single machine on the Internet, but a single machine can act as multiple systems, each with its own domain name and IP address, so the definition now typically includes virtual hosts as well.

Hypertext: a text in which "hot links" allow the reader to move to another text; these texts can be sounds, images, and video, as well as familiar printed texts. Hypertext blurs the line between author and reader, as each collaborates in the construction of the text to be read. It is the format for World Wide Web resources.

Internet: the global communications network that supports the World Wide Web and, increasingly, voice and video communications.

Sociotechnical analysis: an approach to the study of human activity that explicitly accounts for both social practices and the influence of material objects, such as artifacts, tools, and communications media.

continued

Glossary (cont.)

Virtual reality: systems that give the user the illusion of viewing or participating in a 3-D artificial world; current systems include 360-degree, 3-D visualization, surround sound, and even physical touch effects (haptic sensations).

World Wide Web (WWW): an Internet service based on hypertext links to organize and connect to Internet resources; as the Web begins to incorporate e-mail, telephone, recorded music and movies, radio, and television, it appears poised to become the all-encompassing communications media framework.

Constructing a Once-and-Future History of Learning Technologies

Editor's Message

When I think about learning technologies, I usually think of the latest device and what opportunities it affords for new modes of learning. So, the wireless portable device that a student could take on a visit to a museum fits my ideal, but not the stationary, messy, and dull chalkboard, despite the fact that it is, of course, a learning technology as well. I want the future to be fresh and unencumbered by the less than ideal realizations of the past.

However, as I think more about future possibilities, I realize that they are always shaped by present realities. We construct our stories of the future out of the materials of the present—the hopes and beliefs that nourish and limit our vision. For that vision to grow, we need to delve deeper into our past, for only there can we find the stuff to build a better future.

In the fall of 1999, I taught a course on the use of technologies for learning. We studied the World Wide Web, multimedia, communication and collaboration software, tutoring systems, virtual reality, and other new digital technologies. The more we became immersed in all these new developments, the more it seemed important to understand their antecedents and to evaluate them in the light of past successes and failures. In our effort to understand and build a better future, we found it increasingly valuable to turn to the past. Thus began our time line project. This month I explore what we are beginning to learn from this investigation of the past and future of learning technologies.

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Issue

How We Built the Learning Technologies Time Line and What We Learned Doing It

The students involved in the time line project were a diverse and interesting group. There was an on-campus section of the course, which included both undergraduate and graduate students in computer science, education, and other fields. Some of the students held jobs in which they were developing or implementing learning technologies. For one student, the project work he completed in the course led directly to his obtaining a job in the French department to develop language-learning software. There was also an online section, consisting of students enrolled in Curriculum, Technology, and Educational Reform, a master's program for teachers, administrators, and technology coordinators interested in new learning technologies.

I knew the students possessed a collective resource of knowledge about the development of learning technologies and that they had the research skills to discover more through reading and personal contacts. But I could not anticipate how rich their collaboration on this history project would become or how much I would learn from it.

To get things started, I asked the students to construct a webpage for some event that they thought was significant, or simply interesting, in the history of learning technologies. I agreed to place those entries on a collective time line so that we could look for patterns among the events. You can see a small portion of the Learning Technologies Time Line (Middle Ages) we created below. Each underlined phrase is a hyperlink to a webpage, and each one was created by a different student.

600 "Arabic" Numerals developed by the Hindus

1453 The printing of the Bible with movable type by Gutenberg transforms society

1564 Graphite is discovered

1608 Hans Lipperhey's patent application for the telescope to the government of Zeeland

1635 Founding of Boston Latin, the first public school in the US

1651 John Dury invents the modern library

The first entries matched my expectations; they described technologies that had been designed explicitly for teaching and learning. For example, there was an entry for the development of the programming language Logo (Abelson & diSessa, 1981; Goldenberg & Feurzeig, 1987; Logo Foundation, 2000; Papert, 1980). Logo was important because it showed that even young children can understand and make use of sophisticated ideas in computing such as decomposing complex problems into simpler ones, thinking in terms of recursion, and representing data in arbitrarily complex structures. It was also an early example of the link between constructivist philosophy of learning and new technologies.

There were a couple of entries related to the even earlier PLATO system. PLATO was developed in the United States at the University of Illinois at Urbana-Champaign in the early 1960s, as one of the first computer-assisted instruction (CAI) systems (Bitzer, Lichtenberger, & Braunfeld, 1961). It eventually included thousands of course modules. Ten years before the Arpanet (forerunner of the Internet), 15 years before the personal computer, and 30 years before the Web, PLATO supported networked instruction using touch-sensitive screens, graphical interfaces, e-mail, and online chat spaces with multiple windows for multiple participants.

Examining these early developments helped us all to see current innovations in an appropriate historical perspective. In some cases, we saw that today's novelties were not so new after all; in others, we came to appreciate how much things had changed. Soon, there were entries for other key early systems, such as Scholar, HyperCard, and the graphing calculator. All the aforementioned might be considered tools designed explicitly for teaching. But before long there were other technologies that did not fit so neatly within the "learning technologies" label. Students saw that the Apple II computer was a major learning technology, even if it had other uses as well. The Web became an entry, as did technologies associated with it such as the Internet.

The activity opened up the question, What important learning technology might I describe? Once that happened, it was not long before one student decided to make the case that if the Apple II of 1977 were classified as a learning technology, then the Remington No. 2 typewriter of a century before should be too. Soon, we saw the pencil appearing on our time line, and then graphite; its discovery in 1564 made the pencil possible.

The time line stretched further and further into the past. I decided to ask my fall 2000 class to extend the time line. This time, I had a mix of students as well.

There were teachers again, also full-time doctoral students, and many were current or future librarians. They were enrolled in an online course on learning technologies offered through the Library Education Experimental Program (LEEP) http://www.lis.uiuc.edu/gslis/degrees/leep.html. Then, I asked the students in my course for undergraduates, called Literacy in the Information Age, to make their contributions. These students all added to the time line, bringing in the Rosetta Stone from 196 BCE and Ashurbanipal's Royal Library at Nineveh from 650 BCE. Today the time line goes back to 40,000 BCE, when cave paintings were first used as a means of communication.

One student asked whether we should not add the telescope, because it can be used to learn about the stars. Another added the stethoscope, which helped people learn about the human body. We now had tools for representing information, for communicating, for collecting and analyzing data—essentially a conception that includes all information and communications technologies. We also had organizations, such as the first public school in the United States, the first library, and the first university. Soon, the question arose, Is there anything that is not a learning technology? One student said, "Surely, we can't include the automobile!" But others pointed out that we use a car to get to class; we learn how to use a car; we learn about gasoline, construction materials, traffic laws, distance/rate/time, and many other things as we use cars. It became difficult to draw the line that clearly demarcated learning from nonlearning technologies. We began to see that it was the way we used a tool rather than its inherent properties that determined its capacity to support learning. Our conception began to move toward John Dewey's view of technology as a way to resolve a problem (Hickman, 1990).

I also asked the students to look ahead: What events will occur in the future history of learning technologies? Again, their creativity and resourcefulness surprised me. You can read now that virtual reality training becomes a requirement for all healthcare professionals in 2004; the Power Pencil, which stores the information that is written with it, appears in 2040, and holographic teaching comes in 2065. Entries such as this continue up to 3922.

As we looked at the time line as a whole, a number of characteristics stood out. I noticed first that events in the future often occur in years ending in zero. Note, for example, the interesting set of events proposed for 2010, as shown in another excerpt from the following time line. Again, each hyperlink (underlined) led to a webpage, and each page was created by a different student.

2010 The e-Trapper is introduced as the "all-in-one school tool"
The Internet is accessed entirely through wireless, handheld, pocket computers
The first widespread use of electronic textbooks in U.S. schools
House Co. starts production on the fully automated house for the consumer market
Children's Interactive Easy Reader Series debuts in book format
625 million homes now own DVD players

In contrast, past events happen all over the place. The placement of future events at decade and century boundaries correlates with a sense of their significance. In the past, every event is part of a long chain of developments so that it is difficult to identify the essential turning point. For the future, the opposite problem occurs. We have only essential events, and it is difficult to construct the chain of events in which that event should reside.

This situation leads to the somewhat paradoxical result that there is more disagreement about the past than about the future. When, for example, was the printing press invented? Should we mark the years 1453–1455 when Gutenberg printed the 42-line Bible? Or should it be the year he began work on it? Should we perhaps mark the year he formed a partnership with the wealthy burgher, Johann Fust, to build the press?

Alternatively, should we count the earlier printing done by others of less significant books or the much earlier printing in Korea or China, even if it did not involve movable type? Often there are conflicting claims, especially when we ask about "the first" of anything in an important sequence. Because we have not visited the future yet, our vision of it is shaped by literature and the broader literature of film, television, and Web genres. The past, of course, is also shaped by imaginative literatures as well as by documentary accounts. However, the literary accounts of the past are somewhat constrained to conform to documented happenings.

When events occur in the described construction of the future, they not only happen in isolation but also tend to have their effects all at once. Whereas the printing press required additional technologies of paper production and transportation to realize its power, such is not true of future devices. More often, just as in science fiction, they simply appear and work their wonders. Their work is little constrained by the social, cultural, and economic factors that play such an important role in the adoption of past technologies.

Nevertheless, the story of the future that we see in this time line does give us a visual aid for understanding the past and present uses of technologies for learning. We see there both the utopian and the dystopian visions of the technological world we are creating every day. In a small way, it may serve to inform scenario planning or future studies as applied to learning technologies.

Interpretations

A friend was cleaning out files in a library in Amherst, Massachusetts, when he came across a document that intrigued him. The document contained a list produced for a course taught in 1946. I was equally intrigued when he sent me a copy of the list. Gwladys Spencer was the instructor for the course, Library Science 54, which was taught at the University of Illinois Library School, Second Semester, 1946–1947. Much of the list, reproduced as is below, is unremarkable.

Types of Audio-Visual Materials and Equipment to Be Utilized by Libraries in the Educational Program

1. Blackboards and bulletin boards
2. Posters, cartoons, clippings
3. Dramatics: pantomimes, playlets, pageants, puppet shows, shadow plays
4. Trips, journeys, tours, visits
5. Models, objects, specimens
6. Charts: organization or flow, table, tree or stream
7. Graphs: area, bar, diagram, line, pictorial statistics
8. Maps: flat, relief, projected, electric, globe (celestial or terrestrial)
9. Microscopes
10. Microprojectors, reading machines; microfilms, microphotographs, microprint
11. Stereoscopes; hand, binocular, televiewers; stereographs, disc for televiewers
12. Flat pictures; photographs, prints, postcards, positive transparencies
13. Still pictures projectors and projected-opaque, filmslides, slides (glass, cellophane, ceramic, etc.)
14. Sound filmslides projectors; sound filmslides
15. Motion pictures projectors and projected: silent films, sound films
16. Sound recorders: transcriptions
17. Phonographs; disc, wire; recordings
18. Talking books
19. Radios, loudspeakers, public address systems, intercommunicating systems
20. Television

But several things struck me as I went through Spencer's list. One was that she included television in a course in 1946, showing that she had foresight about its eventual prominence as a communications medium. Another thing was that

she included tools for investigation, such as microscopes, and "Models, objects, specimens." She clearly saw that audiovisual materials were more than simply devices for transmitting information. But more striking still are numbers 3 and 4 on her list. Among audiovisual materials and equipment, she included "pantomimes, playlets, pageants, puppet shows, shadow plays" and "trips, journeys, tours, visits." The presence of these says that she saw all the elements of her list as opportunities for enriching experiences, rather than simply as media for transmitting information.

Aside from the details of which tools she had available, the list tells me that Spencer had a broad view of how libraries could support learning and, more important, a vision of what learning could be. Today, we are excited about multimedia in education. But what we often mean is simply that a computer display can show students moving pictures with sound. Interactivity is an important additional component. But our vision of what that multimedia really means for learning needs to go beyond the technical features of the display to consider what students can do and how they can extract meaning from their own experiences.

Spencer saw that there were many tools and media that could enhance learning. She drew from traditional as well as emerging technologies to lay out a spectrum of possibilities for teaching and learning. Her list suggests an openness to diverse ways of learning and, moreover, a view of learners as active constructors of meaning.

Website of the Month

In 1996, the U.S. Public Broadcasting System produced a television special called *Triumph of the Nerds: The Rise of Accidental Empires*. According to PBS Online (http://www.pbs.org), the three-part show "zooms backwards on the information superhighway to show in vivid detail how youthful amateurs, hippies and self-proclaimed 'nerds' accidentally changed the world." The companion website http://www.pbs.org/nerds offers a variety of resources, such as a time line for the history of the personal computer, facts about some of the "nerds" featured on the television program, and the program transcript. You can also try out an interactive "pick the computer" game, which lets you test your nerd quotient.

> It's hard to believe that twenty years ago there were no personal computers, now it's the third largest industry in the world, somewhere between energy production and illegal drugs but the most amazing thing of all is that it happened by accident because

> a bunch of disenfranchised nerds wanted to impress their friends. This is the story of how a handful of guys launched an industrial revolution. How they changed the culture of business, how they made history.
>
> Robert X. Cringely, Part I of *Triumph of the Nerds*

How You Can Participate

The time line project exists on a public website: http://www.lis.uiuc.edu/~chip/projects/timeline. Please come visit it to see some interesting student work and to learn a little about the history of learning technologies. I would be interested to hear what you see in the entries and what you learn from your exploration.

Beyond simply reading the time line entries, you might like to add one of your own. There is an online form at the end of the time line, which you may use to add an entry. You just need to give it a headline, a date, and a description, either as a URL or as text you send.

Glossary

Future studies: a form of inquiry in which futurists forecast a variety of alternative possible futures (see Dator, 1998). The goal is to help people invent and then move toward a preferred future. One approach to this is called scenario planning.

Learning technology: a tool or medium that helps learners construct new knowledge. It usually refers to a new information or communication technology such as visualization software, virtual reality, electronic bulletin board, simulation, tutorial, or interactive game. Depending on the use, practically any technology can be considered a learning technology.

The term *learning technology* is ambiguous in at least four ways. It can mean (1) the tool that helps one learn and thus enables *learning through* technology, (2) *learning how to use* technology, (3) *learning about* technology, or (4) a technology that itself learns. In (4) for example, genetic algorithms in effect learn how to perform more effectively in some environments based on feedback about their success and failure; thus, they are *technologies that learn*.

Logo: a programming language, essentially a version of the language Lisp, which was designed as a tool for learning. It is notable for its emphasis on modular design, extensibility, interactivity, and flexibility, all features that enhance its potential for learning. Wallace Feurzeig at Bolt Beranek and Newman led a team that created the first version of Logo in 1967. Seymour Papert, who had worked with Feurzeig and also with Jean Piaget in Geneva, led further developments of Logo at the Massachusetts Institute of Technology, Cambridge.

continued

Glossary (cont.)

Logo has been used across the curriculum, notably in mathematics, language, music, robotics, telecommunications, and science. The most popular Logo environments have involved the turtle, either as a robot that moves around on the floor or as an icon that moves about a computer screen and can be used to draw pictures.

Additional developments have included LogoWriter (adding word processing), LEGO Logo (connecting Logo to machines built out of LEGO bricks, motors, and sensors), MicroWorlds (adding drawing tools, a shape editor, and a melody maker), the Programmable Brick (with a computer inside it), and StarLogo (a massively parallel version of Logo in which thousands of turtles can carry on independent processes and interact with one another).

Scenario planning: "an approach to planning that starts from the assumption that, much as we try, we simply cannot predict or control the future. We can only imagine different ways in which the future might turn, stake out a course that makes sense today, and try to be flexible and alert when the unexpected inevitably occurs," according to the website http://www.marin.cc.ca.us/scenario. The site, Scenario Planning at College of Marin, provides a good introduction to scenario planning and shows its application to planning in the context of uncertain levels of state funding for California's community colleges.

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A Friendly, Welcoming Attitude Toward Change

Editor's Message

After September 11, 2001, many people who had once celebrated change became all too familiar with its dark side. Most crushing, of course, was the loss of loved ones, but soon people around the world began to experience material losses of various kinds, divided communities and increased racism, the loss of civil liberties, and war, not to mention a diminished peace of mind.

Nearly everyone was affected by the declining economy, and many lost jobs, not only in New York City but around the world. The World Bank (2001) saw the economic downturn as "condemning as many as 10 million more people to live in poverty next year, and hampering the fight against childhood diseases and malnutrition." It further estimated that "an additional 20,000–40,000 children under 5 years old could die from the economic consequences of the September 11 attack as poverty worsens." Meanwhile, ideas such as torturing people suspected of terrorism to force them to talk became commonplace, and alliances with rogue nations and groups that abuse human rights were fully acceptable.

Change—which once associated itself with new clothes or the latest movie, with growth and improvement, and with enticing possibilities for the future—suddenly became a monster to be feared. People in the United States talked as if the once-hailed revolutions in computers and medicine had ended along with the destruction of the World Trade Center in New York. They wanted to turn back the clock on immigration or at least stop it. There was an understandable desire to bring everything to a halt and rewind to an earlier time.

Without dwelling on one of the most reported stories ever, it is fair to say that few people were happy about the changes wrought by the events of September 11. Even accepting or understanding these changes seemed impossible. It may still seem incomprehensible to speak of a friendly, welcoming attitude toward change. However, that is exactly what I would like to argue; such an attitude is necessary if we are to make sense of the world and our place in it. Moreover, it is the only way we can grow. This type of attitude applies not only to the catastrophic events, but also to the mundane experiences in our lives. It applies to the ways we teach and learn and to our efforts to understand new technologies.

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Issue

Coping With and Welcoming Change

"Research," Charles F. Kettering said, "is a high hat word that scares a lot of people. It needn't. It is rather simple. Essentially, research is nothing but a state of mind—a friendly, welcoming attitude toward change" (Kettering Foundation, 2001, http://www.kettering.org).

Near the end of the fifth century BCE, the Greek philosopher Heraclitus pointed out, "You cannot step twice into the same river" (Fieser, 2001). He even went so far as to say that the one who steps is not the same person from one moment to the next. Heraclitus saw that unified things in the world inevitably break apart into a multiplicity of opposing phenomena. At the same time there is a way back to unity through harmony and peace. Phenomena in nature are constantly dividing and uniting in this way.

For Heraclitus, change was a fundamental constant in the way he conceived the world. If we accept his account it is not surprising that we see change as fundamental to our definition as human beings. We change along with the world around us, and who we become is determined by how we react to change. When a change occurs, it is often disruptive. Although change is rarely as disruptive as the events of September 11, any change can nevertheless upset the course of life. We know the world as it is, not as it might be. These perturbations can be purely destructive or they can be opportunities for growth.

It is no accident then that major theories of learning center around how an organism responds to disruption. For Piaget (1970/1972), the drive of the mind to assimilate new information periodically results in a condition of imbalance termed *disequilibrium* or *cognitive dissonance*. This conflict between expectations and experiences is essential for learning or development of cognitive structures. In Dewey's (1938) account, it is difficulty, especially a felt difficulty, that provides the raw material for learning. As we seek to overcome a difficulty, we are forced to modify our previous ways of thinking and acting. Similarly, Vygotsky's (1934/1962) zone of proximal development is that space in which an individual cannot succeed alone but can succeed with additional cultural mediation (e.g., artifacts, texts, and social structures). In each of these theories learning is essentially the trace of a successful response to change.

The processes of coping with the change that an individual undergoes are analogous to those that we see in disciplinary inquiry. In his well-known analysis of knowledge construction in science, Kuhn (1972) argued that normal science proceeds by working on problems within a paradigm or schema, much as an individual learns through small but generally expected changes. A revolution in science, meaning a shift in paradigm, occurs as the result of a crisis, something that cannot be assimilated (Piaget's term) into the dominant paradigm. Similarly, developments in educational practice can be viewed as paradigm shifts occurring in response to disequilibrating events. Hairston (1982) described this process in the field of composition that took place in the 1970s.

Coping With Change in Education

We see education today as a system that needs to respond to dramatic changes. These changes deriving from September 11 are set against a backdrop of economic, demographic, and technological developments in society at large. As we address them, we typically adopt one of many stances, spanning the spectrum from denial to celebration (see Glossary).

The most common stance toward change, and the one we nearly all adopt from time to time, is the utilitarian. Changes are seen instrumentally—as things to be analyzed and utilized. In the realm of new technologies most people emphasize the need for everyone to improve their skills. It is believed that if we learn how to control new technologies we can cope with change and make effective use of new tools. The clearest example of this approach is the development of standards for technology skills. These include defining the competencies needed to use a particular technology, specifying what students need to know to sign up for a subject of study or to graduate from a program, and articulating what teachers need to know or teach.

In the United States, official bodies such as the International Society for Technology in Education (ISTE) are concerned with accrediting teacher preparation programs and promoting appropriate technology use in education. They have developed guidelines for students, teachers, technology specialists, administrators, and programs (ISTE Accreditation and Standards Committee, 1996; National Educational Technology Standards Project, 1999). Individual states have developed similar standards, in many cases working from the ISTE and National Council for Accreditation of Teacher Education (NCATE) model. The ISTE and NCATE standards

cover a broad area. In the case of foundations for all teachers there are standards for the following:

- Technology operations and concepts
- Planning and designing learning environments and experiences
- Teaching, learning, and the curriculum
- Assessment and evaluation
- Productivity and professional practice
- Social, ethical, legal, and human issues

These standards can be quite useful as a heuristic to promote dialogue about what is most important in teaching.

However, there are several problems that are quite familiar to anyone who has served on a standards committee. Sometimes, individual standards are far too specific (e.g., that people should know how to use a particular piece of software to do a given task). It is likely that the software in question is only one of many ways to accomplish a task, and would be superceded by the time the standards are actually implemented. On the other hand, a standard can be quite general, as in the ISTE/NCATE III. B: "Use technology to support learner-centered strategies that address the diverse needs of students." Representing what someone needs to know is difficult when circumstances vary and the type of knowledge needed is multifaceted.

Beyond the problem of representation is the underlying issue that the world is changing. We would like to prepare students and educators to cope well with the world they are about to enter, but as Dewey (1938) showed, the idea of education as preparation for life is self-contradictory. What one learns to satisfy a specific aim is too often compartmentalized—unavailable when one needs to react to a new situation. Learning how to learn is far more important than obtaining any specific skill or bit of knowledge.

Welcoming Change

If change is inevitable as Heraclitus said, if it is unpredictable as much of our recent experience tells us, and if it is traumatic as September 11 emphatically declared, we naturally seek some framework for response. The standards movement started with these premises, intending to provide us with tools to accommodate change.

Ultimately it is a reductionistic approach that attempts to categorize the modes of response, showing us only what we need to know and do.

Limitations of the standards and of other conventional process technologies—benchmarks, performance indicators, scope and sequence, and so on—are well known and perhaps best by those who work with them on a daily basis. Is there any alternative? How else might we think about a changing world and its implications for teaching and learning?

I suggested that Kettering's "welcoming attitude toward change" might be what is needed not just for research, as he says, but for response to any situation. But should we welcome all change? Aren't there times when we should say no either to disasters or to newness that undermines values we hold dear? That answer depends on what we mean by the word welcome.

If, by the word *welcome* we mean to accept without question or to embrace in all its dimensions, then the answer is clearly yes. We all need to develop the critical faculty that can help us look at something new and assess its strengths and limitations. However, there is another sense of welcome that Kettering probably intended. It is closer to the way one might interact with a visitor, for example, someone who has just moved to your neighborhood. In this second sense, welcoming means graciousness and openness to difference. There are several key aspects.

Listening. A welcoming attitude toward change requires listening and making the strange familiar. Rather than compartmentalizing experiences as good or bad it asks how meaning can be derived from the experience. Through listening, it attempts what Gadamer (1960/1994) called "fusing horizons," a process in which we stretch from our current understanding and our very personal history to understand the perspective of another.

Respect for diversity. Welcoming implies a respect for diversity. It recognizes that no one individual has the source of all knowledge and that every individual possesses knowledge no one else has. Thus, diversity becomes a resource for growth and not a problem to be overcome.

Humility. A welcoming attitude incorporates a strong dose of humility as well. Rather than emphasizing the accumulation of chunks of knowledge and skills, it assumes a continual incompleteness in knowledge and skills. It sees each situation as an opportunity to learn more. Thus, the teacher is a learner.

Growth through overcoming difficulties. In welcoming change, we seek to discover new connections and open new possibilities. When experiences are negative they still provide opportunities for growth, often more than positive ones

do. Thus, the emphasis shifts from a model of things as they are to a dynamic one in which each experience brings with it the chance to grow. In the case of new technologies, a welcoming attitude would not include seeking mastery. Instead, the focus is on being open so that one is able to learn more easily.

(I would like to thank Ellen Knutson for pointing me to the Kettering Foundation's work and Christine Jenkins for discussions that enlightened my conception of change and inquiry.)

Other Views

For Gadamer (1960/1994), understanding can never be complete or total, but there can be partial understanding through which we can grow.

> [O]ne intends to understand the text itself. But this means that the interpreter's own thoughts too have gone into re-awakening the text's meaning. In this the interpreter's own horizon is decisive…[as] a possibility that one brings into play and puts at risk, and that helps one truly to make one's own what the text says. I have described this above as a "fusion of horizons." (p. 388)

Website of the Month

The Pew Research Center is an independent opinion research organization (sponsored by the Pew Charitable Trusts) that studies attitudes in the United States toward the press, politics, and public policy issues. It publishes widely cited research on the use of the Internet and other media by various groups, including adolescents (see http://www.pewinternet.org). Following September 11, the center tracked public attitudes about the events. Pew studies are an important resource for politicians, journalists, scholars, and public interest organizations. All the current survey results are made available free of charge on their website. The research program includes five principal areas of investigation.

- The People & The Press—explores public attitudes about the credibility, social value, and salience of the news media.
- The People, The Press & Politics—features a typology that divides the American electorate into distinct voting groups and identifies the basic values and attitudes that animate political behavior.

- The News Interest Index—measures on a regular basis how closely the public follows the major news stories and links this to views about politics and policy issues.
- America's Place in the World—a series of in-depth surveys and analyses of the public and opinion leaders on international policy in the post–Cold War era.
- Media Use—major surveys that measure the public's use of, and attitudes toward, the Internet and traditional news outlets.

Glossary

Stances Toward Change

I have argued that there were several classic stances concerning how new technologies should change education (Bruce, 1997). These stances apply to our attitude toward change in general.

Aesthetic: Others adopt an essentially aesthetic stance toward change. They believe change should be described and commented on but not fully engaged. This stance is similar to what Rosenblatt called the "aesthetic response" to reading.

Neutrality: Some say no specific stance toward change is needed, implicitly advocating a neutral stance. They fear the allure of today's fashion, stressing instead what they see as enduring values. Thus, they give little consideration to how events might alter their practices. In traumatic changes, it is often difficult to distinguish neutrality from denial.

Opposition: Others go beyond the neutral position to stand in active opposition to change. In many cases, their concern is that humanistic values will be subsumed by technocratic or economic forces. Kaufmann (1977) used the term *dogmatic* in a similar way in his discussion of the art of reading.

Skeptical: The pessimistic side of utilitarianism is practical skepticism. Proponents point to past unfulfilled promises and to the inertia of large systems as justification for their doubts.

Transactional: Dewey and Bentley's (1949) theory of transaction provided one more way to respond to change, whether that be in the form of new ideas in a text, a new technology, another person, or events in the world. In this theory, a transaction is the encounter of a person's unique, situated history with something new. Every transaction is different and holds the seeds of new meaning (see McDermott, 1981, p. x). A transactional stance means a welcoming attitude toward change, opening oneself to the significance inherent in such encounters.

continued

Glossary (cont.)

Transformational: In contrast to the oppositional position is the transformational one, especially when that stance conceives the transformation as positive. In extreme versions, we get what Kaufmann called the "exegetical response," a faith in the transformative powers of the new. The transformationalist argues that our task is to understand and guide the transformation.

Utilitarian: Some argue for a utilitarian stance (for Kaufmann, agnostic), saying that new tools or ideas need to be incorporated intelligently into practice. The utilitarian stance toward change is much like Rosenblatt's (1978) efferent stance in reading—a view of the text as a repository of information.

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