Most students entering our colleges and universities today are younger than the microcomputer, are more comfortable working on a keyboard than writing in a spiral notebook, and are happier reading from a computer screen than from paper in hand. For them, constant connectivity—being in touch with friends and family at any time and from any place—is of utmost importance. And they will be assuming responsibility in a world of incredibly rapid change. Will television and the Internet be distinguishable in ten years? Will the U.S.

By Jason L. Frand

Jason L. Frand is Assistant Dean and Director, Computing and Information Services, and Adjunct Professor of Information Systems, Anderson School of Management, UCLA. A Web discussion board to explore additional attributes of the information-age mindset has been set up at http://www.anderson.ucla.edu/faculty/jason.frand/researcher/info_mindset.
Mint still print ‘money’? Will anyone go to a “bank” if the U.S. Post Office still exists, what will be the role for colleges and universities? Will libraries be only electronic, what will it deliver? Will textbooks be printed? How will journals be distributed? Will libraries be only electronic collections? Where will our alumni go to upgrade their knowledge and skills? Perhaps most important, what will be the role for the profession of librarians and universities in this new environment?

The Information-Age Mindset

Over the past three decades I have observed many new “new” meaning different, not better) attributes of student behavior that I believe will have a profound impact on our colleges. For the past few years, only a small number of students with these attributes have entered our doors. However, over the next few years these students will become the majority, spreading like a tidal wave across higher education and demanding changes in the way we operate.

I have identified ten attributes reflecting values and behaviors that make up what I call “the information-age mindset.” These are the characteristics of people of today who have entered our doors. However, over the next few years, only a small number of students with these attributes have entered our doors. However, over the next few years these students will become the majority, spreading like a tidal wave across higher education and demanding changes in the way we operate.

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From December 2000 issue of EDUCAUSE Review

Film: The Screen as Primary Source

For those of us with an industrial-age view of knowledge as a product—a body of facts accumulated by the hands of others, verified by experts, and reexamined in the past, the half-life of information was measured in decades and centuries, certainly longer than most individuals’ life span. College and university students could learn skills and information by dedicating time to them through their careers. Our awareness of change was small (local and national news), and the changes we did see were often viewed as the natural history of the world.

But today we live in a world in which digital technologies have altered time and space so that events occur in real time, effects are immediate, and reactions are frequent. These are the attributes of globalization, and the information age has also advanced the half-life of information is measured in months and years. From this perspective, what a person can do is more important than what degree they obtained. (Bill Gates, a college dropout, is an icon for many in the information age.) As our students enter the workforce, the ability to deal with complex and often ambiguous information will be more important than simply knowing a lot of facts or having an accumulation of knowledge.

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Doing Rather Than Knowing

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Nineteen Eighty-Five, the VCR to an incredibly sophisticated digital television that today is an icon for many in the information age. Professor Jeff Cole at UCLA is involved in a worldwide study of the impact of the Internet on society. One of the findings is that during 1998, for the first time since television was introduced fifty years ago, the number of hours young people spent watching TV decreased. This time was transferred to the computer, with its Internet connectivity. Cole believes it’s the interactional quality of electronic communication that has drawn them from one tube to the other. These students are using the Web as their primary (if not sole) information source: what movie to see, what’s on TV, where to shop and what to buy, as well as what to say, what to think, and what to believe.

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they approach a new software package. Do they check out the menus and manual first, or do they begin typing and then search for what they want whenever they need it?

This observation leads to an entire set of difficult questions: How does trial-and-error apply to identifying trends and penetrating inconsistent data? What happens when students can’t derive “the answer” from trial-and-error? Are they prepared to engage in more in-depth analysis? What are the implications of such a risk-adverse perspective toward events in general? Does this attitude transfer to other situations?

Trial-and-error learning may provide a more thorough understanding of a market—although the implications. However, it should not be the only approach used. A balance is needed between didactic and discovery approaches.

Multitasking Way of Life

Many young people today are accustomed to watching TV, talking on the phone, doing homework, eating, and interacting with their parents all at the same time. The power behind the “typing” that is so important today.

Typing Rather Than Handwriting

A mother recently gave her high-school-age son a gift from her grandmother and asked him to write a thank-you note. He said he would type it. She said, “No, it’s not as nice, so please hand-write it!” (This represents an industrial age mindset clashing with an information-age mindset.) When she pressed him a couple of days later, he said, “Mom, I don’t know how to write.” Listening to this story, I realized that my children (both in their mid-twenties and outstanding “writers”) prefer key-boards to graphite, and why shouldn’t they? We installed our first home computer in 1985, and they “typed” everything from then on. The hundreds of hours my generation spent practicing penmanship were spent by our children at the keyboard. And maybe even more important, typed prose is always easy to read, even weeks after being typed; it can be checked for spelling errors, searched for key words, retrieved after filing, and easily manipulated for reuse.

But the power of the word-processing package goes well beyond simple improvements in legibility, spelling, and filing. Word-processing holds the power to easily manipulate the data—the words—to obtain a significantly better output. In many ways it becomes an extension of our own memories, enabling us to capture and retain material for use in more critical problem-solving and decision-making situations. For example, I could never compose at the typewriter (I’m definitely not a linear thinker). However, I can bounce all over the screen with a word processor. I can put down an idea, expand it, take it apart, and then reassemble it in a more meaningful way. Similarly, spreadsheet applications enable us to create models to evaluate situations, solve problems, and make decisions. It’s not the “typing” but the power behind the “typing” that is so important today.

Staying Connected

Advanced telecommunication connectivity is a natural part of living for information-age students. Beepers, cell phones, and PDAs are standard operating equipment. The idea of not being in touch anywhere, anytime—even in the middle of a classroom or a movie theater—is unthinkable. Yet “staying connected” is driven by Metcalfe’s Law. Robert Metcalfe, another of the 1970s Xerox PARC team and the inventor of Ethernet networking technology, observed that the value of the network increases exponentially as the number of users grows. (For example, telephones wouldn’t be of much value if only two people had access.) Metcalfe’s Law applies to “connectivity” in general: the greater the number of people involved, the more valuable will be the communication technology. Beepers and cell phones increase in utility as more and more people use them. As more and more homes and offices are connected to the Net, the more valuable that means of information distribution becomes.

Ubiquitous connectivity, then, drives

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Zero Tolerance for Delays

It is human nature to want the immediate gratification of our desires, not just physical but informational as well. Having grown up with automatic teller machines, information-age students expect banking services 24 x 7. We’re all vulnerable to this desire for immediacy. It is human nature to want the immediate gratification of our desires, not just to answer questions and provide information, often without taking adequate time to think through the consequences of their actions. The whole concept of time (and time compression) has changed dramatically. When one speaks of an Internet year like a “dog year” (i.e., one human year is equivalent to seven dog or Internet years), this is time compression at light speed. Voice mail and e-mail are more efficient and less formal, which implies “I want a quick response.” On the other hand, they create time-expansion capabilities. We can store and retrieve messages until we’re ready to reply, which also implies “at your convenience.”

Customer/Creator Blurring

When one of my students wrote a term paper in the late 1980s, she typed some material into the computer directly from an encyclopedia. When I told her that one of these days we would have the encyclopedia on a disk, she replied, “Do you mean I could then just cut and paste?” The updated version of this timeless story occurred in my class this past year when a student asked, “Rather than rewrite what I’ve found on a Web site, can I just put in the link and you can read the original?” These situations are clearly the forerunners of the current MP3 fiasco. In today’s parlance, there is no distinction between the owner, the creator, and the user of information. Web protocols are such that if you see something you like, you just cut and paste it from the Web page. After all, the tools for doing this are built into the Web editors. The entire structure of HTML supports this sharing/borrowing/ taking (dare I say “stealing”?) of others’ intellectual property. In the physical world, dual-cassette recorders make copying an audio- or videotape easy. Why should copying a CD, a computer application program, or material from an encyclopedia be any different?

There is an interesting twist to this concept in the commercial world of computer programs. A common practice of software vendors is to release a product that is known to be “buggy” and have the users “de-bug” it (by calling it a beta-test version). The open-source movement blurs the creators/users relationship even more by formally extending the development process to the entire programming community.

So What Does All This Mean for Higher Education?

Given the mix of new attitudes and behaviors—the information-age mindset—what should we as individual educators, and collectively in our institutions, do (if anything)? I would like to answer this question by sharing a vision for higher education. In this vision, we will combine the potential of computer, communication, and information technologies with the pedagogical changes that need to occur in light of the prevalence of the information-age mindset.

To develop the vision, I would like to draw on an important lesson from the commercial sector. During the 1970s and the early 1980s, the business world experienced an interesting paradox: companies that invested heavily in information technology went out of business at about the same rate as those that did not invest in information technology at all. Those that did not invest were as successful as those that did invest. How could this be explained?

The research findings are very revealing. As computer, communication, and information technologies entered businesses, companies concentrated their initial investments on gaining efficiencies with traditional processes. For example, companies replaced bookkeeping clerks with computerized accounting systems and replaced stock clerks with automated inventory systems. But these investments had no positive impact on the bottom line. By the late 1980s, however, a few major breakthroughs not only yielded a positive return on information technology investments but previewed the changing dynamic that has since swept the entire business world. A couple of pioneering successes were American Airlines’ frequent flyer program and American Hospital System’s customer-controlled inventory management system. In each case, the value added came from changing the nature of the relationship between the company and its customers. The company not only did things differently but did different things. The focus of these programs was external effectiveness rather than internal efficiency. They created new partnerships between their organizations and their customers. They changed the rules of transaction from mass marketing to one-to-one marketing and from mass production to mass customization. These changes are being reflected in every business today: for any company to compete, it must be willing to challenge everything that has gone before and to completely rethink the relationship between the company and its customers—to reconsider its customer services, its organizational structure, and its business processes.

Higher education is experiencing a similar paradox. If teachers continue to teach in the same way that they have always taught, there will be little value added from classroom and campus networks. If students approach learning in
the same way that they always have, computer labs and laptop programs will be unnecessary expenses. Until the nature of the educational relationships change in the classroom and at the institutional level, we will not realize the full value of the computer, communication, and information technology investments that we are making today. We need to think in terms of transforming the educational experience so that it is meaningful to the information-age learner.

This conceptual change must embrace a substantial modification in the nature of the relationship between the student and education and, therefore, between the student and the institution. Let me give an analogy. University computer networks today consist of nodes at every office, classroom, and library seat. But this network concept can be expanded. We need to build an extended educational infrastructure that parallels our physical network infrastructure. When viewed from the perspective of a human network—a community of lifelong learners—the educational infrastructure becomes a means for broadening and deepening the educational experience of students and for enhancing and extending the educational experience of alumni. Each of our current and past (and future?) students is a “node.”

Baccalaureate students spend about four years on campus and then perhaps another forty years or so in their various occupations. So for less than 10 percent of their student and professional life, they are in direct, physical contact with our schools. But throughout their entire career, they can benefit from that 10 percent of time on campus. From this perspective, one goal of higher education needs to be to provide on-campus students with the tools, knowledge, and skills they need to continue to participate as members of our learning community long after they graduate. The exact skill set needed is yet to be determined. A challenge is to introduce new learning and teaching approaches that prepare students to integrate their personal aspirations, career goals, and educational experiences and to continue to do so throughout their lifetimes. Through the continuity of links back to the academic base, the individual will have opportunities to grow through and benefit from extensive alumni and professional networks. (And as a secondary but important benefit, the institution may have the kind of alumni network that most schools only dream of today.)

This vision challenges our institutions not only to look at new ways of doing what we have always done but also to look at doing new things. Students with an information-age mindset expect education to emphasize the learning process more than a canon of knowledge. They want to be part of learning communities, with hubs and spokes of learners, rejecting the broadcast paradigm of television (or the note-taker in a lecture hall). Our institutions need to expand their primary focus from the internal, on-campus, temporal experience to include the external, global, lifelong experience. For example, alumni need to be able to “attend” classes as virtual members, participating both as peers and as mentors for their on-campus counterparts. Distributed education, a combination of in-class and “distance learning” options, will become a natural part of higher education.

We have the pedagogical opportunities to build on the various attributes of the information-age mindset and prepare students to participate in a community of lifelong learners. Replacing the phrase “sage on the stage” with “guide on the side” reflects the idea that the instructor needs to play a more supportive role, posing questions and guiding the learning process, rather than taking an ecclesiastical approach, providing the “true” or “right” answer on a subject on which the student is to “learn” (memorize) and repeat back in some format. Evolving educational techniques, such as the studio approach to learning mathematics and science, have shifted the emphasis away from faculty-centered lectures to cluster learning environments intensely supported by computer, communication, and information technologies. The use of e-mail dialogues for students in basic language classes forces real-time use of the language, greatly enhancing students’ acquisition of language skills.

Field-based research projects, which include peer-review components (analogous to faculty peer-review processes) before “publishing” on the Web, force students to engage real-time data from a comprehensive multidisciplinary perspective. This is not to say that we should replace all our current practices with something new (“new” meaning different, not better). There will always be a role for the lecture format, and there are learning situations in which computer use is totally inappropriate. The goal must be to match the appropriate use of technology with the content, the instructor’s personal style, and the students’ learning style.

The outlook of those we teach has changed, and thus the way in which we teach must change. The world in which we all live has changed, and thus the content we teach must change. The industrial age has become the information age, and thus the way we organize our institutions must change, as must the meaning we attach to the terms “student,” “teacher,” and “alumni.” The challenge will be for educators and higher education institutions to incorporate the information-age mindset of today’s learners into our programs so as to create communities of lifelong learners.

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