

Information and Communication Technology Is Key to Higher Education's Goals

Diana G. Helsel

We are in a time of dramatic change for society — a time that is bringing irreversible changes to our society. Note some changes that have global implications:

- The U.S. is no longer the world's largest creditor but is now the world's largest debtor
- nearly \$135 billion in transactions take place each day in international trade
- experts are predicting we will have a common international currency within 30 years.
- the ten largest banks are Japanese
- of the ten largest corporations, Japan has eight: Nipon is #1, Exxon #2, IBM is #3; the remaining seven are Japanese

Most of us cannot understand all these changes; yet this societal restructuring is affecting our daily lives and the lives of our students.

My underlying premise is: At the leading edge of our future are (1) computer technology and (2) education.

Why Computers?

(1) We have shifted to a high technology society because of the computer. This is one of the major societal shifts of history. In early human history, the transformation from a hunting society to an agricultural one changed society. The next shift was from an agrarian to an industrial system. We have moved from an industrial society to a high technology society; we are in the information age. What ushered in the information age? Information, of course, but rapid, international access to information via computers.

(2) Computers have had a tremendous impact on finance, trade and globalization of our economies. At the heart of this globalization is agriculture.

(3) We need to provide remediation and stimulation to learners, at all educational levels. Computers can provide that remediation and stimulation.

(4) The nature of work has been irreversibly changed by computers. As simple examples, can any of us imagine going back to typewriters instead of word processors or to slide rules instead of supercomputers?

(5) Growing things depends on knowing things, according to Howard K. Smith. Information, again, is the key for agriculturalists. Access to this rapidly expanding information base is oftentimes contingent

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upon computers. Word-of-mouth, textbook learning or experience no longer supply all of our information needs.

The Second Leading Edge

(1) According to Andrew Molnar of the National Science Foundation, an educated populace is the most important infrastructure of a society (1).

(2) Leo Cherne made a statement that I believe is important for us to remember: "In a time of drastic change, the learned are equipped for what no longer exists; the learners adapt to change."

(3) Think of where the U.S. ranks among industrialized nations in pre-college test scores: We are near the bottom.

Educators have a critical role in shaping the leading edge of the future. Frank Newman, in "Choosing Quality", summarizes this role. "The university plays a role in enhancing the functioning of democracy. The university educates those most likely to be society's leaders, serves as an open forum for ideas, encourages social mobility and advances knowledge through research and through cultural development of the statewide community"(2).

What Are We Up Against?

There are seven factors that we must be cognizant of as we face this challenge. These are:

- (1) we are part of a global economy
- (2) we are part of a scientific information explosion
- (3) human resources are changing
- (4) education in agriculture is being restructured
- (5) the growing importance of information and communications technology
- (6) changes in agriculture
- (7) education in crisis

We are part of a global economy. The use of computers and telecommunications allows us to move records, resources and technology rapidly across the globe. The daily \$135 billion in financial transactions would be impossible without technology or international interdependence. This volume of electronic transactions is 35 times the actual daily trade of goods and services. Because commodities move so easily across borders, it is no longer our natural resources that set us apart, it is our intellectual and creative power. What is our stature in this global economy? Among major banks and corporations, the U.S. is no longer the leader.

We are part of a scientific information explosion. It is the information explosion that has fueled our industrial economy. Biotechnology is just one example of the new industries created by information. How big

is this information explosion? Consider that our scientists and engineers have access to over 3,000 databases. To put the volume of information we deal with in perspective, another example will help. The body of recorded scientific knowledge will double in the next 12 years. Sixty years ago, a scientist would have had to read for 25 minutes each day to stay on top of his/her discipline. Today, it would require 13 hours of reading per day, 365 days each year. In a few years, reading 24 hours a day 365 days a year won't keep us abreast of the new information (1).

This information explosion impacts our educational programs, not just our research specialties. New undergraduate subjects are appearing about once every other year at American colleges and universities. The degree requirements are changing on a biennial basis, also. The impact of this is that part of a student's knowledge will be obsolete by the time he or she graduates. Furthermore, our graduates may lack the scientific and technical background to enter emerging fields, thereby making them prisoners of obsolete specialties (1).

To capsulize these observations of Molnar, it is pertinent to ask if we are in an information explosion or an **ignorance** explosion.

Human resources are changing. The labor pool has changed. The "baby bust" means that fewer young people are entering the labor market: Those dominating the labor force are older. Consider the impact of ethnicity. By 2020, minorities will comprise 35% of all Americans. Ninety percent of the growth in the labor market will be made up of women and minorities. Also note that we face a shortage of scientific and technical manpower.

Where will the human resources come from? We have seen a 38% decline in the number of science and engineering students in the last decade (4). We will experience a 22% decline in the college-age population over the next 10 years. The minority population is increasing, but the college going rate for blacks and hispanics has dropped.

If we rely more on older workers instead of new college graduates, what can we expect? Consider that the educational half-life of our disciplines is short. In computer science, the half-life is 3 years, in engineering it is 5 years (1). What is the half-life in agriculture? A professional has a 40-year career, thus individuals will make several shifts, whether predicated by preference or technology, which require significant retraining.

Molnar's contention is that an educated workforce is the most critical infrastructure this country can possess. An educated workforce is critical to (a) economic growth, (b) individuals acting as responsible citizens and (c) individuals performing as employees. Unprecedented demands are being placed on the intellectual skills of the American worker. Is our educational system meeting those needs?

Restructuring of education in agriculture. Educators, often share frustration due to the research enterprise taking precedence over instruction. This campus attitude should be re-examined in light of the fact that we realize economic return only when our investment in research knowledge is used. "Supporting research without supporting education is like transforming the unknown into the inaccessible" (1). Our students must learn of our research efforts while they are on our campuses, not after they leave.

Another factor in educational restructuring is the growing interdependence between educators and high technology companies. One outgrowth of this is that corporations do more education than educational institutions. The rate of technological change (and shrinking budgets) has left colleges at a disadvantage in exposing students to current techniques and working environments.

Creating and communicating knowledge is a people process. When we go to improve our courses, we tend to delve deeper into technical information rather than into the human processes. To be much more effective educators we need to focus on people, not technology alone.

Growing importance of information and communications technology. Television and telecommunications are currently used to deliver instruction in over 35 states. Over 2 million computers are in our schools. Computer-based instruction is effective in elementary, secondary, college and adult education. Results indicate that students perform 10-20% better with computer-based instruction and learn in one-third less time (6). Note that computer-based instruction is not at odds with focusing on learning as a people process. A great deal is possible using technology. To quote from an Office of Technology Assessment (OTA) report: "A system that allows any person, anywhere, with any background and any assorted gaps in education, to access training on any subject is within the state-of-the-art existing technology" (3).

Education is in crisis. Numerous reports and studies have indicated that education is in crisis. Rather than focusing on "the crisis", we should focus on the three key goals of education: (1) information, (2) integration and (3) application. To improve the educational experience for undergraduates, our largest population of students, Ernest Boyer states that we must focus our efforts in four areas: (1) language, (2) core curriculum, (3) essentialness of teaching and (4) the quality of campus life (7).

What Do We Do About It?

In agriculture, we have a strong tradition to build on as we strive to address these challenges. The elements of our tradition to capitalize on are:

- problem-solving
- concern for the individual
- creativity
- self-reliance
- production agriculture

“Traditions” that we should re-think includes:

- always doing the teaching in person
- being concerned only about the U.S.
- feeling secure in our accountability

As educators in agriculture considering ways to address our future, recall that computer technology and education are pivotal issues. In creating a mindset to face the future, consider adopting the following precepts:

- (1) Expect to be challenged
- (2) Engage the world
- (3) Prepare to lead
- (4) Question your assumptions
- (5) Serve your community and nation
- (6) Be thoughtful do-ers

With these precepts, the following strategies can be adopted to help us plan our future rather than being overtaken by it.

Use technology to help us master information. There is a great deal available via computer technology that can help us assimilate and distribute information to those who need it — faster and more efficiently than we do with traditional means.

Continually retrain ourselves. How many professionals take advantage of sabbaticals? research leaves? development leaves? Many are too busy to attend courses or participate in lectures that would help them stay abreast of the changing environment. Can we afford to be too busy to prepare for the future?

Accepting accountability. In many states, the legislature has mandated that educators be accountable for what occurs on campus. Part of the reason is that they do not understand what faculty do or how to measure the effectiveness of their labors. If education is to be valued and supported, legislators must be convinced that educational institutions are critical in developing the educated populace that is our most important infrastructure.

Promoting agriculture. Agriculture, education and technology are poorly understood. There are at least two reasons for the lack of understanding: we are not effective listeners and we do not promote ourselves. As a solution, consider giving a 30-second commercial for your university, your discipline or something you consider vitally important every time you have a chance to speak. Everyone can afford to listen. Even in 30 seconds we can learn a great deal about each other. The public could learn about agriculture, about education and about our future, if we all took 30-second initiatives.

Become university leaders. It is a universal feeling that we aren't appreciated. Agriculture is an under-recognized, under-appreciated discipline. Part of the reason is that a strong stereotype exists about who we are and what we represent. To break those negative stereotypes, agriculturalists must be visible, be unique and be leaders. We teach our students leadership. We have the skills to be leaders in our academic communities if we make it a priority.

Cooperating with government and industry. No sector can resolve our technological and educational problems alone. Rather than thinking of government and industry as higher education's adversaries, we should challenge ourselves to become a team. Corporations are as concerned with education and international competitiveness as universities. The inherent differences among government, industry and universities allow each to contribute unique assets to a joint cause.

Being global citizens. It is natural to be more concerned for what happens in the U.S. than elsewhere in the world. Yet, it is time to broaden our scope and share global concern with those around us, especially students. In an internationally competitive arena, one in which the U.S. no longer dominates, an insular perspective is archaic.

What citizens need to know is not appreciably different from what our students need to know. The lack of public information surrounding recent pesticide scares, the animal rights movement or acid rain underscores the public's need for accurate information on agriculture. Educating the public must be a goal if we are to be understood, appreciated . . . and funded. With problems of staggering magnitude facing our society (e.g., AIDS, the drug war), we cannot wait for citizens to approach us with questions. The extension service has gone to the public with touch-screen kiosks in malls to provide them with information. Considering our tradition of creativity and problem-solving, should we mount similar efforts to educate the public?

Emphasize internships and externships. There is no teacher like the real world, and no better source of motivation. Industry can help educate our students in the nuances of the work-world in a fashion that cannot be emulated on campus. We all should learn to cooperate if we are to educate our students and future leaders.

Emphasis on freshman courses. An educational euphemism is that the newest faculty member (or the worst teacher) is relegated to introductory classes. In the liberal arts, scores of TAs are assigned to first-year classes. This critical first year is the time of a student's life when he/she is empowered to succeed or becomes discouraged. Concerned educators can motivate and encourage students. Considering what we stand to lose, nationally and internationally, we must put our best teachers in introductory classrooms. We should also value the teachers as much as researchers; recall that “supporting research without supporting education is like transforming the unknown into the inaccessible”.

Be willing to allow expertise to reside in another state. Declining resources and an expanding clientele will someday compel us to admit that we cannot be all things to all people. Expertise can be shared among states. If we can trade \$135 billion each day using technology, we can make use of the satellites and the 2 million computers in schools to transfer information and expertise from state to state. If we share technical

resources perhaps we will have more time for the human aspects of education.

Below, some tactics are enumerated that might address this global challenge. Some may have already been implemented on various campuses. We should challenge each other to think of new and creative tactics to make an impact.

- (1) Encourage students to become campus leaders
- (2) Encourage agriculture faculty to become campus leaders
- (3) Give a 30-second commercial for agriculture any time you get the chance
- (4) Teach more science courses for non-science majors
- (5) Develop partnerships with industry
- (6) Organize faculty tours each year
- (7) Provide training/orientation for new faculty
- (8) Educate business managers about science and technology so they can institute innovations
- (9) Develop industry mentorships
- (10) Use technology to deliver/assist instruction

(11) Develop consortia for course development

(12) Share expertise across the U.S.

There are many useful models for addressing our educational, technical and international challenges. Share your ideas and models with each other so that all of education and agriculture will benefit.

References

- (1) Molnar, Andrew R. 1988. "Information and communications technology: Today and in the future." Speech delivered to the Royal Swedish Academy of Engineering Sciences (IVA), Stockholm, Sweden, October 27, 1988.
- (2) Newman, Frank. 1987. *Choosing Quality*. Commission of the States, Denver Co. 121 pp.
- (3) "Technology and the American Economic Transition: Choices for the future". Office of Technology Assessment (OTA), Washington, DC. 1988.
- (4) "Demographic trends and the scientific and engineering work force," OTA, Washington, DC. 1985.
- (5) "Power On!: New tools for teaching and learning". OTA, Washington, DC. 1988.
- (6) Kulik, James. Center for Research and Teaching and Learning, University of Michigan, Ann Arbor, MI.
- (7) Boyer, Ernest. 1987. The views expressed are those of the author and do not necessarily represent the view of IBM. *College: The Undergraduate Experience in America*. Harper and Row, New York.

Facilitating Development of a Sense of Self

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I recently had the chance to talk with two students at a college I was visiting. We were discussing their experiences in certain key courses in their academic programs. Each began by stating that he or she got more out of this or that course than the grade received indicated. I asked what they meant, for I hear that from my own students sometimes and at times from others. They told me about how their experiences in these courses allowed them to grow, how affirmed they felt in their attempts to reach out in new directions or to try new skills. They spoke of new selves, richer and deeper, able more effectively to engage the world.

One told me how he came for the first time to value deeply his own heritage, the writings and customs and social patterns of his region. He spoke of coming to know them in ways that made him proud. And then he said that this allowed him truly to understand and value the heritage of others, to respect traditions and ways of life that he would before have held at arms length and even scorned as odd. "When you respect and understand yourself you can respect and understand others as well," captures the essence of what he said.

The other student told me of reading and writing about the world of one of her grandparents, whom the family rarely mentioned and of whom it seemed a bit ashamed. She said, "I can now imagine what she must have been like. And I like her, and like myself because I like her and find some of myself in her as I imagine

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her." As she discovered new roots she found a more fully nuanced self in herself.

I then asked each student what the grades were that they received. One was a B+ and the other a B. But they felt that what they got out of these courses was more than these grades indicated. In fact, it was of an order and type that cannot be neatly summed up in a grade.

I was struck that what these students spoke of was not simply information that they memorized, although they spoke of that. Nor did they center on basic skills attained, although these were mentioned as well. Behind the stuff and skills of course content they spoke of "self," of what they were and were becoming. They spoke less of the attainment of the basic skills and details of presentation needed for research papers. They talked of an "empowering," of being able to shape questions about our lives in our world, or to recognize and define problems, and then address them with answers or solutions.

For the last several years I have taught a course with UTK's Chancellor. It is called "The Sense of Self." In it we explore that slippery thing we call a "self." We look in the readings at some selves that are small, miserly, cramped; we look also at some that are expansive, rich, alive and enlivening. We look at some that seem stuck or frozen and at others that are growing and dynamic. And we explore what some of the factors are that shape and reshape, that expand or constrict, a self and sense of self.

Two things have struck me as we explore the sense of self in the readings and writing we do and as we talk