MOORE'S LAW

and the Conundrum of Human Learning

In 1965 Gordon Moore, the co-founder of Intel, theorized that the computing power of a semiconductor chip would double every year—a doubling rate that indeed held true until the late 1970s, when it slowed to every eighteen months. This theorem, known as Moore's law, continues today. As a result, our technology prowess is developing computational devices that will produce artificially intelligent devices in twenty-five years, according to some experts (e.g., Ray Kurzweil, Bill Joy, and Larry Smarr). Even today, colleges and universities are equipping their students with computers that challenge both our imagination and our ideas on learning. This contrast—between the human capacity for learning and the radically expanding growth of computational power—provides a focused lens through which we can view our increasing sense of connectedness and the implications for higher education. In the following articles, four contributing authors look through this lens, answering six related questions to report on what they see.

As he explains below, Phillip D. Long, Senior Strategist for the Academic Computing Enterprise at MIT, first selected the contributors and proposed the six questions for this discussion in 2001, for sessions at the EDUCAUSE-affiliated Fourth Annual Ubiquitous Computing Conference and the national EDUCAUSE Annual Conference:

Charles Kerns
Stanford University

Constellations for Learning

When considering the dangerous mission of technology forecasting, one often looks through a glass, darkly. Thus it helps to have a band of intrepid explorers who have not only relevant experience with but also diverse backgrounds in technology and teaching. The authors for the following discussion were selected precisely for these qualifications. In addition, as the organizer, I had the opportunity to pick people from whom I felt I could learn the most. For these reasons, I selected Charles Kerns, Howard Strauss, and Newton Smith to join me as members of this technology futures prognostication team.

Charles Kerns has a wonderfully broad background anchored in instructional design and software tool development. From his early days with Apple Computer, where he engaged in videodisc and multimedia projects, through his tenure at the Stanford Learning Lab, until his present position in the Academic Computing group at Stanford University, Charles has expressed his curiosity and ingenious creativity by designing and building digital tools that extend human learning. Howard Strauss, from Princeton University, is well known in academic technology circles as an engaging speaker and technology provocateur. He approaches technology with innovative thinking that is not just outside the box but outside the building. Having someone like Howard, who challenges the fundamental assumptions of a technology or an approach to teaching with that technology, on this team was essential. Newton Smith, a faculty member from Western Carolina University, labors in the "trenches" in his role as an English professor. For him, technology is neither esoteric nor inherently attractive. Rather, technology must make his teaching better and his work, if not easier, at least more rewarding. Any team that looks at how future technologies will affect teaching and learning in colleges and universities needs to include a member who has the job of standing in front of a class of inquiring students several hours each day,

Howard Strauss
Princeton University

The Right Train at the Right Station

two or three days a week, and challenging them to think about, learn from, and engage with the world of ideas.

Crafting the questions was easy. The six topics that appear below have undoubtedly come up in numerous conversations about the future of technology in higher education on campuses across the country. The context for the questions came from my conversations with Steve Gilbert—who, more than anyone else I know, spends considerable time thinking about the intersection of technology and the practice of teaching and learning.

The topic of which future technologies might have the greatest effect on teaching certainly deserves serious reflection, as does also the value proposition for technology investments. After the dot-com bust, many in higher education are understandably skeptical of any technology that does not help to make an enterprise successful. Perhaps the most visible change in technology across campuses has been the growth of wireless network access, now extending off-campus to hotels, airports, and even Starbucks coffee shops! This development and the corresponding emergence of the "information grid" both demand our focused attention. Deriving value out of all of these technologies is essential for colleges and universities to leverage their core mission: providing the best learning/research environments to advance knowledge and society. Finally, at the 1999 national EDUCAUSE Annual Conference, General (now Secretary of State) Colin Powell spoke about the digital divide and the efforts he was promoting to bring technology to all students, regardless of their schools' location. His presentation brought forward interestingly divergent views on how to solve this problem and on whether there was even a problem to solve.

Newton Smith
Western Carolina University

Teaching as Coaching

All of us in higher education must continue to strive to find the best ways to leverage the wonderful potential for technology to make our insights richer and our lives more meaningful. I hope the observations and reflections in these four articles will serve as a guide in the contemplation of these and similar questions.

—Phillip D. Long

Phillip D. Long
MIT

Needed: Creative Teaching and Commitment

The Questions

1 New Technologies in Teaching and Learning

In the next two to three years, how will the technologies available now and those on the drawing boards change the nature of classroom instruction in colleges and universities? What are the two or three most likely implications that new technologies will have for teaching? Are there "left-field" technologies that have the potential to swoop in and change the entire nature of our current work?

2 Return on Investment

Many faculty today are skeptical of the value of technology to positively influence teaching and learning. Some feel that the same fiscal investments would have been better spent in traditional teaching practices. Where is the return on this massive investment?

3 Mobility and Wireless

Much technology attention is focusing on mobility. Many campuses are starting to utilize wireless LANs (802.11b, soon 802.11a) and Bluetooth-enabled devices. Is this much ado about nothing?

4 The "Information Grid"

The emergence of the "information grid" portends to be more influential than the power grid is today. How will enveloping the physical world with a more entwined cyberspace affect higher education?

5 Leveraging Technology for Teaching

What guidance would you offer to college and university leaders as they consider where to focus their efforts to enhance learning in pervasive computing environments? How might they best leverage technology for teaching?

6 The Digital Divide

The "digital divide" has been described as the civil rights issue of the twenty-first century. Is this hyperbole or fair warning? How helpful are remedies such as busing the disenfranchised to wealthier schools to guarantee access to resources?