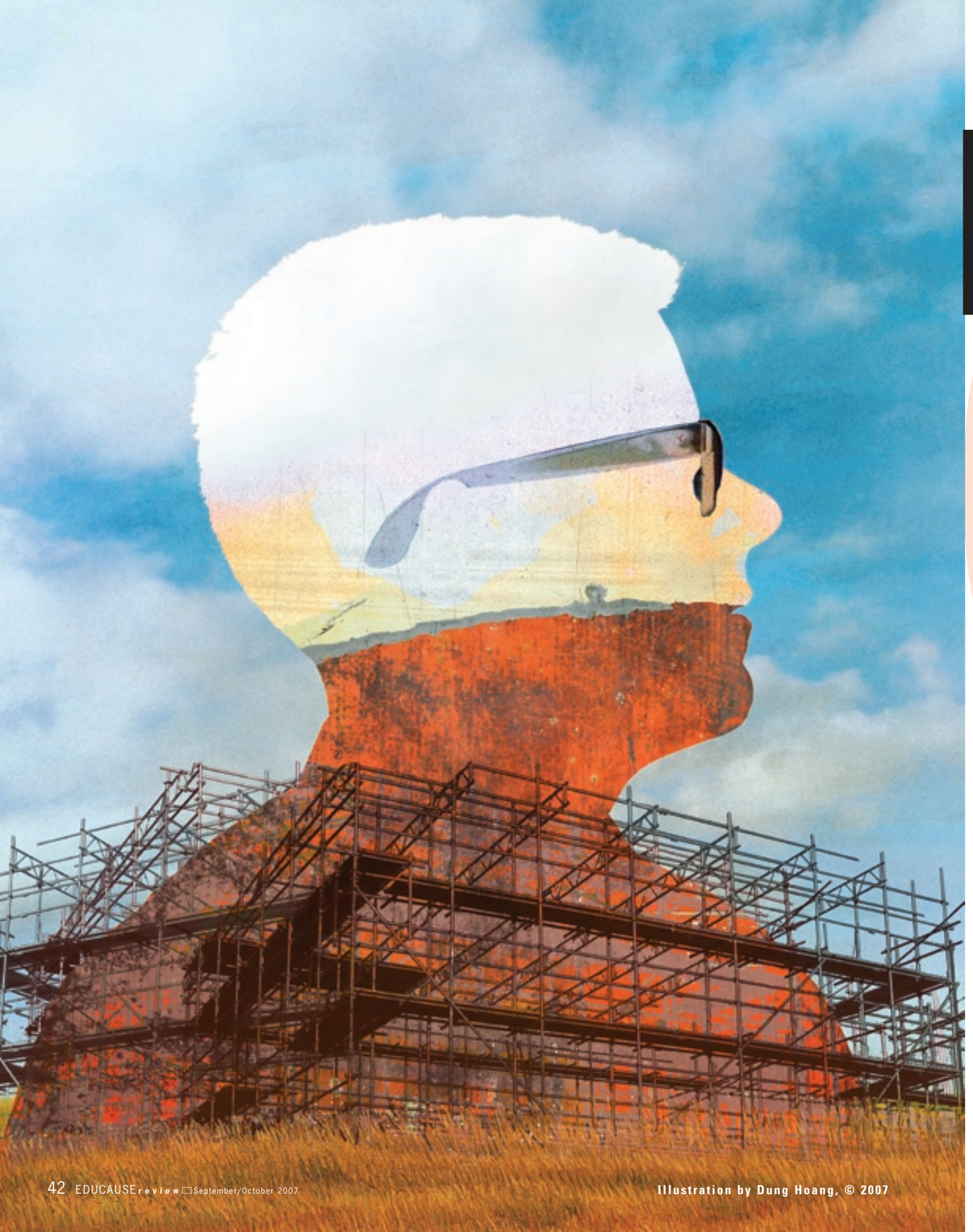

Illustration by Dung Hoang, © 2007

ACTIVE LEARNING AND TECHNOLOGY:

DESIGNING CHANGE for Faculty, Students, and Institutions

By Anne H. Moore, Shelli B. Fowler, and C. Edward Watson

Much of the rhetoric about contemporary higher education suggests that colleges and universities need to embrace change due to advances in knowledge, technology, transportation, and more—advances that have dramatically shifted the way we all function in the modern world. But what manner of change for learning itself do the public narratives suggest? Commission reports, report cards, and public agenda profiles of U.S. requirements for higher education seem to be asking for substantive change. Many years ago, Chris Argyris and Donald Schön described such transformational shifts as double-loop learning, the kind that ultimately brings about changes in an institution's structure and processes.[1] Double-loop learning is quite different from its single-loop cousin, which often looks like piecemeal changes on the margins of institutional behavior, the isolated shifts in rules or regulations of an institution. Both single- and double-loop learning can be parts of a substantive change process.

Anne H. Moore is Associate Vice President for Learning Technologies at Virginia Polytechnic Institute and State University. Shelli B. Fowler is Director of the Graduate Education Development Institute at Virginia Polytechnic Institute and State University. C. Edward Watson is Assistant Director of the Faculty Development Institute at Virginia Polytechnic Institute and State University.

More to the point, however much the public rhetoric champions transformative change—the kind of organizational learning that signals a marked shift in the way colleges and universities behave—the reality is that most mature organizations and the individuals they employ resist change; and they especially resist the double-loop variety. One way to overcome such resistance is to lower learning anxiety through development programs designed to create new capabilities that people might find useful for personal, professional, or institutional reasons.

Lowering Learning Anxiety

Transformational learning at an individual, organizational, or community level is difficult and rarely occurs—except by coercion—unless desired, indeed invited, by the learner(s). Edgar Schein's research on transformational learning suggests that despite much press to the contrary, very few institutions are truly learning organizations. "Learning and the change that inevitably accompanies it is a complex process," he warns, "often more a source of frustration than achievement for groups and for individuals."[2] He says that radical re-learning induces anxiety and guilt in most people. For individuals and for organizations, if re-learning is desired, it is necessary to find ways to provide safe environments in which to experiment with change, ways in which people and the organizations they cherish do not risk embarrassment. Schein also says that it is important to distinguish between asking people to learn something that they see as practical—such as learning new computer skills—and asking them to learn something that is questionable to them or beyond their comprehension at a particular moment. If people accept the need to learn, such tactics as training, coaching, community support, communication strategies that provide feedback on progress, and incentive programs are necessary for the change process.

For at least ten years, colleges and universities have attempted practical, though difficult, change interventions aimed at integrating technology into teaching and learning activities. Faculty across the United States have found recognizable reasons for learning basic, contemporary computer skills and for keeping those skills current. Just as important, some faculty have become catalytic agents for change within their institutions and also advocates for change in their professional organizations and personal lives. These faculty (the early adopters) and associated faculty-development professionals set out to fully engage their communities in the give-and-take of change by inviting others to join in broadening and deepening the development, support, and communication efforts necessary to diffuse change across academic community sectors and institutional boundaries—all within time-honored, if slowly paced, academic processes.

If people accept the need to learn, such tactics as training, coaching, community support, communication strategies that provide feedback on progress, and incentive programs are necessary for the change process.

These change agents have achieved a modicum of success in launching and sustaining two of the three knowledge and skill-development areas that the National Research Council (NRC) says are required for fluency with information technology in higher education: (1) *learning contemporary skills*, such as learning how to use computers and networks (arguably, single-loop learning efforts); and (2) *advancing foundational concepts*, such as testing and differentiating the advantages and disadvantages of using various electronic media to achieve stated aims (also mostly single-loop activities). The third knowledge and skill arena involves *acquiring, extending, or adapting intellectual capabilities*—such as problem-solving, critical thinking, communication, and more—in the context of IT-enabled environments. In practice, this third area of change remains elusive even to those with the best intentions of engaging in the double-loop learning required. Initiatives designed to closely associate appropriate technologies with content-specific information to achieve defined teaching and learning aims are still largely creative, experimental endeavors. Also, the activities involved in creating new technology-assisted teaching strategies are time-consuming and labor-intensive because of the personal and organizational re-thinking involved in the effort.[3]

In *Our Underachieving Colleges: A Candid Look at How Much Students Learn and Why They Should Be Learning More*, Derek Bok suggests that if improving education is an important goal requiring change, then faculty need to use the body of teaching, learning, and student-development research results at hand and build on this plethora of evidence about what works.[4] What seems to be lacking is the will to apply what we know. Interestingly, the considerable literature on faculty development in higher education lists few research experiments on interventions that improve teaching; but it does contain a multitude of program

evaluations, case studies, white papers, surveys, and descriptive analyses full of data relevant to this end.

Good information notwithstanding, other factors complicate development activities aimed at helping faculty acquire or even renew capabilities that will allow them to design technology-assisted learning activities for students. First, the technologies are changing rapidly; approaches to instructional development are changing in tandem; and disciplinary and interdisciplinary areas of study are evolving rapidly too. Second, and as a result, there are no historic benchmarks against which to gauge success and no obvious, widely accepted standards to ensure excellence in technology-enriched teaching and learning. Third and perhaps most important, change agents face the challenge of ensuring that they do no harm to student learning—or to their own, for that matter—while trying to implement truly innovative strategies in a quickly evolving, contemporary idiom.

The antidote, writes Bok, is grounded in more institutionally sponsored activities aimed at acquiring local knowledge that will give direction to curricular and pedagogical design and evaluation: "So long as this kind of work remains undone, colleges run the risk of continuing to rely on familiar methods of instruction and curricular policies that do far less than they should to develop the very cognitive abilities that faculties endorse so strongly as the principal aim of a college education."[5]

Developing Local Knowledge

A review of the literature on faculty development offers six broad strategies—best practices—that ensure program longevity and increase the likelihood that faculty will participate, learn, and ultimately change: (1) manage institutional issues; (2) implement adult learning practices; (3) offer incentives to participate; (4) deliver workshops; (5) utilize colleagues and peers; and (6) provide ongoing support.[6] In addition, and as Edgar Schein points out, such transformations do not necessarily emerge from rational processes. Creating an atmosphere of trust, providing environments in which faculty can fail without losing face, offering rewards for risk-taking and for creativity, and encouraging open, frank discussions of the issues will help enable both double-loop learning and transformation.

Next comes a local community's acknowledgement that beyond providing support for risk-takers and atmospheres of trust, these efforts will fall short if the institution does not change structures and processes appropriately to support and sustain the individual learning asked of and emerging from faculty, staff, and students. Many scholars have effectively pointed to the links between individual and organizational learning and to the stages in decision processes where transformational learning breaks down both for an individual and for an institution. A robust, sustained faculty-development program is at the heart of transformational individual and institutional change. Portions of the program may be "on demand" in staffed centers, with walk-in facilities where learners of all types can go for occasional and continuous just-in-time help. But for substantive change to occur, transformational development efforts must involve systematic, goal-directed, sustained activities that are integral to the daily work of academic community members.

For substantive change to occur, transformational development efforts must involve systematic, goal-directed, sustained activities that are integral to the daily work of academic community members.

Pedagogy First, Then Technology

Much of the current literature on contemporary pedagogy advises that to best prepare twenty-first-century learners for the increasingly complex and interconnected global society in which they live and work, institutions should implement, across all disciplines, pedagogical practices that involve interactive, inquiry- or problem-based, technology-enriched teaching and learning. Nearly fifteen years ago, the Wingspread Group on Higher Education sounded the alarm that students were not being prepared to function effectively in twenty-first-century society and that significant changes in teaching practices would need to occur. The report recommended a focus on learning and on how learning actually takes place, adding that what was discovered about students' learning processes could help in (re)envisioning and revising approaches to teaching and learning.[7]

Since then, research in the science of learning has indicated that active learning is one of the most important and essential components of the learning process. In *How People Learn*, John Bransford and his colleagues convincingly argue that active, rather than passive, learners are better able to understand complex material and can more effectively transfer information and concepts learned in one setting to the process of solving problems encountered in another context.[8] In other words, when students are actively engaged in their learning process and when they are required to apply what they have learned, they retain that knowledge. Conversely, short-term, passive learning

(such as memorizing information for exams)—what students routinely refer to as "stuff and dump"—does not result in students' retaining the knowledge. Pedagogical approaches should help develop what Marcia Baxter Magolda calls "independent and contextual knowers" who are confident in their higher-order problem-solving abilities.[9] Pedagogical practices should also drive faculty decisions about the technology tools best suited for specific learning objectives in a specific learning environment. Donna Harp Ziegenfuss notes: "Pouring a solid foundation of good pedagogical design before adding on the layer of technology can become a critical factor in the success rate of technology integration."[10]

A variety of discipline-specific pedagogical strategies that require students' active engagement and that develop their problem-solving and problem-posing skills in the context of technology-enabled learning environments should be standard practice in academe at this point; yet in large measure, such is not the case. Although most departments likely have an innovative teacher or two, widespread pedagogical and curricular innovation is not the norm. Few institutions position learning spaces as public sites or "research labs" where faculty are asked to discover, implement, and assess effective technology-enriched teaching and learning practices. Some institutions do delegate such activities to seed-funded, grassroots initiatives; however, these tend to be viewed as isolated interventions.

Even without widespread support mechanisms and goal-oriented incentive programs in place to sustain pilot efforts, shifts in pedagogy are beginning to occur as faculty members' perceptions of students' interests, needs, and abilities change. Many faculty recognize that for today's students to acquire complex problem-solving, critically reflexive analytical thinking, and succinct communication skills in appropriately technology-assisted contexts, the faculty will have to approach teaching differently in order to bring their own expertise to bear in meeting students' learning needs.

Some faculty have changed teaching strategies simply to recapture the attention of students who are net-surfing, IM-ing, and text-messaging during scheduled meetings. But reexamining pedagogical practices to curb students' inattentiveness ought not be the principal aim of change. Rather, creating learning environments that challenge students to become actively engaged, independent, lifelong learners inside and outside of formal learning spaces should be the critical aim of change in teaching strategies. Some basic questions frame what faculty might do: (1) What do achievements in critical thinking, problem-solving, and communication (and in other higher-level capabilities desired across areas of study) look like in technology-enriched environments? (2) What teaching strategies might be used to help students attain the achievements identified?

Few institutions position learning spaces as public sites or "research labs" where faculty are asked to discover, implement, and assess effective technology-enriched teaching and learning practices.

Resistance Is Futile and Harmful to Your Health

Some resistance to such change will come from students. Not all contemporary students are eager to have faculty disrupt known approaches to teaching, including the "stuff and dump" learning that even they criticize, to become critically engaged, self-reflexive, sophisticated problem-solvers and producers of knowledge. Maryellen Weimer, a leading scholar-practitioner of learner-centered pedagogy, explains that most students come from primary and secondary public educational systems that have shaped them into "passive learners who are neither confident nor empowered."[11] For many students, standardized testing has often worked to derail their innate intellectual curiosity and their desire to know the "whys" and "hows" of a given topic or subject area. Standardized testing and the concurrent teaching-to-the-test that occur in far too many schools result in students who are skilled at test-taking but who are not skilled at, or much interested in, the development of higher-order thinking and complex problem-solving skills. These are the students who want to know exactly what material will be on the exam. Faculty who construct interactive, technology-enriched learning environments that focus on applying learning to real-world issues can cause students to lose interest in "stuff and dump" learning, but doing so will require an intentional, concerted effort on several fronts.

Actively Engaged, Actively Learning

One way to mitigate students' resistance to accepting responsibility for learning is to actively involve them in understanding why a particular approach to pedagogy underpins a learning experience. Often students don't know *why* faculty are doing *what*. Explaining to students that an interactive teaching approach to a curriculum or a course develops skills needed to apply knowledge in real-world settings offers a platform for participation that invites understanding. In the past, faculty may have bypassed interacting with students about the "why," the "how," and the "what" of the learning objectives.

Active learning environments may also include lecturing as a viable pedagogical strategy. In fact, interactive lectures can be a staple component within an active learning pedagogy.

Today, helping students make the transition from passive to active learners means engaging them in the conversation from the beginning.

Active learning environments may also include lecturing as a viable pedagogical strategy. In fact, interactive lectures can be a staple component within an active learning pedagogy. In "The 'Change-Up' in Lectures," Joan Middendorf and Alan Kalish provide a series of strategies for making traditional monologue lectures more interactive. For example, a series of mini-lectures with active engagement components, all scheduled in 15- to 20-minute segments, can keep students and faculty more alert, engaged, and productive for an entire 50 or 75 minutes of class time.[12] Thoughtfully integrated, electronic response systems might assist such activities.

Indeed, within an interactive lecture format there are numerous ways to guide students' use of the technologies that they often have at their fingertips—ways that focus students' attention on the learning activities at hand and that at the same time take advantage of students' everyday technological savvy. For example, the once-common, static PowerPoint presentation suitable for traditional lectures is fast being replaced by a dynamic and skeletal PowerPoint presentation ideal for interactive lecture settings. Either individually or in small groups, students are asked to contribute by completing parts of the PowerPoint slides that the instructor has intentionally left blank—requiring students to draw on readings, lab work, or previous information delivered in a mini-lecture. In other examples, tablet

PCs allow students and faculty to interact in large- or small-group settings and to share information among all participants simultaneously. Tablet PCs can thus be very useful for group problem-solving and for problem-posing exercises. Using wikis and blogs can help build collaboration and communication skills and assist in analyzing idea generation and development over time. When artfully designed, electronic games provide opportunities for encouraging problem-solving and information mastery.[13] When guided by pedagogical objectives, such small-scale shifts to using relatively common technology tools can increase interactivity. They also increase the likelihood of information and concept retention because students are focusing more attention on the application of knowledge and have more opportunities for real-time feedback within formal learning sessions.

Interactive teaching and learning approaches that focus more intently on inquiry- and problem-based learning will continue to shift over time. Gary Natriello suggests that as the twenty-first century progresses, learning may well "occur through multiple discovery networks that blend research and teaching to address real world problems in environments supported by robust software infrastructures." An evolving understanding of effective teaching and learning practices will need to account for and wrestle with several upcoming trends. Natriello argues that learning will increasingly take place in "multiple settings and contexts," requiring the development of "a social structural understanding of learning environments" that are less discipline-bound and that make more effective use of the new technology tools that "support knowledge creation, knowledge gathering, and knowledge sharing" inside and outside of institutional settings.[14]

Using wikis and blogs can help build collaboration and communication skills and assist in analyzing idea generation and development over time.

Transformative Faculty Development

To continuously improve and sustain shifts in pedagogy requires ongoing support of faculty development. For example, Virginia Tech's Faculty Development Institute (FDI) joined with the university's Center for Liberal Education (CLE) and Center for Excellence in Undergraduate Teaching (CEUT) to offer a workshop entitled "Fostering Student Engagement, Learning, and Development" in May 2007. This effort sought to promote learner-centered pedagogy for faculty who teach courses that are part of students' first-year experience. Active learning strategies that encourage student engagement took center stage in the workshop. To support faculty development, FDI also offers a new computer each year to one-quarter of university faculty as an incentive for participation in its summer institute. Faculty are asked to bring a project to work on as they learn about approaches to using new technologies; the

Applying new, often technology-enhanced practices to their own content enabled faculty to see how they might function within their disciplines, within their courses, and with their own course content.

projects may be personal, departmental, or institutional. Faculty may select from sixteen different workshops, and FDI managers often make seats available for others. To fill open seats in the May 2007 "Student Engagement" workshop, the CLE offered stipends to those faculty not slated for the current FDI cycle. As a result, all seats were filled and a lengthy waiting list was developed, providing contacts for future workshops and follow-on activities.

Although sharing sponsorship of the workshop among three administrative units ensured a full audience for the message, it was clear that traditional workshop methodologies needed to be reconsidered. First, key leaders from all three sponsoring units attended the majority of workshop activities. Their presence provided a consistency of message and underscored a unified desire to foster specific types of pedagogy on campus. Second, the presenters were carefully selected: they were knowledgeable exemplars of the desired pedagogy; they modeled the pedagogy in their workshop activities; and they were opinion leaders within the university.

With administrative unit leaders and faculty exemplars providing content and direction for the workshop, modeling the recommended pedagogies became the *modus operandi* for workshop activities. Attendees engaged in active learning strategies by participating in related activities and then evaluating and discussing their perceptions afterward. At the end of the second day of the workshop, attendees received a homework assignment: they were asked to take a small part of their own course content and develop a five-minute lesson plan using strategies that foster student engagement. The next day, participants "taught" the transformed content to their workshop colleagues. Everyone practiced in a computer-integrated faculty-development lab to reduce any barriers to sharing content in as authentic a fashion as possible. Applying new, often technology-enhanced practices to their own content enabled faculty to see how they might function within their disciplines, within their courses, and with their own course content, while at the same time they gained insights from colleagues in other disciplines who were using alternative approaches to engage the same population of learners.

The willingness of the faculty to participate in an open, experimental activity with colleagues from other disciplines speaks largely to the safe, trusting, and collegial environment fostered during the workshop. Although creating a favorable atmosphere is often seen as an intangible goal, the careful selection of key leaders and presenters for the workshop no doubt contributed to the successful interactions in immediate and longer-term exchanges.

Many scholar-practitioners have offered practical guidance for creating a safe and satisfying workshop environment. Raymond J. Wlodkowki's synthesis and extension of existing adult- and faculty-development theory and practice suggests four guiding principles for faculty-development workshops. The first is inclusion. A welcoming tone of inclusion promotes intrinsic motivation and underscores a climate of respect. The second principle involves ensuring personal relevance of the workshop content. Peer modeling is one way to foster participants' interest. The final two principles reference instructional strategies that engender participants' competence. According to Wlodkowski, problem-based learning, role-playing exercises, and games are workshop activities that can increase intrinsic motivation and deepen learning; he adds that authentic assessment activities that allow participants to perform the tasks or skills they are being taught can also bolster participants' self-efficacy and provide experiences with which they can gauge their own capabilities.[15]

Authentic assessment activities that allow participants to perform the tasks or skills they are being taught can also bolster participants' self-efficacy and provide experiences with which they can gauge their own capabilities.

Good Reasons for Change

Daniel Pink argues that knowledge workers in an increasingly global economy will need "a very different kind of mind," one that combines critical analysis with the type of big-picture thinking that was previously associated with "creators and empathizers, pattern recognizers, and meaning makers." Pink maintains that education will need to develop "high concept" and "high touch" skills in addition

to the mastery of domain knowledge(s).[16] A recent report on the state of graduate education agrees. According to the report, the economic competitiveness of the United States will depend on its ability to educationally foster the development of "knowledge workers who exhibit not just the mastery of a subject area, but the creative ability and drive to reshape the boundaries of knowledge and navigate between geocultural boundaries. As globalization makes geography matter less and technology matter more, those workers with 'high concept' and 'high touch' abilities will become increasingly valuable."[17] For faculty to create and use teaching strategies that move in this direction, sustained faculty-development efforts are key. Developing, internalizing, and applying such local knowledge involves hands-on, minds-on creativity that is well worth the effort. Indeed, making the curricular changes required today is more than a reasonable institutional aim; it is a strategic, reasoned step toward meeting students' present and future needs.

Notes

1. Chris Argyris and Donald A. Schön, *Organizational Learning: A Theory of Action Perspective* (Reading, Mass.: Addison-Wesley, 1978).
2. Quoted in Diane L. Coutu, "The Anxiety of Learning: An Interview with Edgar H. Schein," *Harvard Business Review*, vol. 80, no. 2 (March 2002): 100–106.
3 National Research Council, Committee on Information Technology Literacy, *Being Fluent with Information Technology* (Washington, D.C.: National Academy Press, 1999).
4. Derek Bok, *Our Underachieving Colleges: A Candid Look at How Much Students Learn and Why They Should Be Learning More* (Princeton, N.J.: Princeton University Press, 2006).
5. Ibid., 145.
6. C. Edward Watson, "Self-Efficacy, the Innovation-Decision Process, and Faculty in Higher Education: Implications for Faculty Development" (PhD diss., Virginia Polytechnic Institute and State University, 2007).
7. Wingspread Group on Higher Education, *An American Imperative: Higher Expectations for Higher Education* (Racine, Wisc.: Johnson Foundation, 1993).
8. John D. Bransford, Ann L. Brown, and Rodney R. Cocking, *How People Learn: Brain, Mind, Experience, and School* (Washington, D.C.: National Academy Press, 1999).
9. Marcia B. Baxter Magolda, *Creating Contexts for Learning and Self-Authorship: Constructive-Developmental Pedagogy* (Nashville, Tenn.: Vanderbilt University Press, 1999).
10. Donna H. Ziegenfuss, "By Instructional Design: Facilitating Effective Teaching and Learning with Technology," in *Integrating Technology in Higher Education*, ed. M. O. Thirunarayanan and Aixa Perez-Prado (Lanham, Md.: University Press of America, 2005), 19–45.
11. M. Weimer, *Learner-Centered Teaching: Five Key Changes to Practice* (San Francisco, Calif.: Jossey-Bass, 2002).
12. Joan Middendorf and Alan Kalish, "The 'Change-Up' in Lectures," *National Teaching & Learning Forum*, vol. 5, no. 2 (1996): 1–5.
13. For more ideas about relevant ways to use technology in teaching and learning activities, see the New Media Consortium and the EDUCAUSE Learning Initiative, *The Horizon Report, 2007 Edition* (Austin, Tex.: New Media Consortium, 2007).
14. Gary Natriello, "Imagining, Seeking, Inventing: The Future of Learning and the Emerging Discovery Networks," *Learning Inquiry*, vol. 1, no. 1 (April 2007): 7–18.
15. Raymond J. Wlodkowski, "Fostering Motivation in Professional Development Programs," in *New Perspectives on Designing and Implementing Professional Development of Teachers of Adults*, issue no. 98 of *New Directions for Adult and Continuing Education*, ed. K. P. King and P. A. Lawler (San Francisco: Jossey-Bass, 2003), 39–47.
16. Daniel H. Pink, *A Whole New Mind: Why Right-Brainers Will Rule the Future* (New York: Berkley Publishing Group, 2005).
17. Council of Graduate Schools, *Graduate Education: The Backbone of American Competitiveness and Innovation* (Washington, D.C.: Council of Graduate Schools, 2007).