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INNOVATIONS IN THE UNDERGRADUATE CURRICULUM

During the last decade of the twentieth century, significant changes occurred in American higher education generally and in the undergraduate curriculum in particular. These changes were propelled by several developments. Together they provided the momentum to enable higher education to make unprecedented strides. Educational leaders debate whether these changes are primarily additive and limited to small scale programmatic innovations or truly transformative for institutions and higher education. Nonetheless, there is widespread agreement that the academy and the undergraduate curriculum have evolved in significant ways.

Defining Curriculum

An undergraduate curriculum is a formal academic plan for the learning experiences of students in pursuit of a college degree. The term *curriculum,* broadly defined, includes goals for student learning (skills, knowledge and attitudes); content (the subject matter in which learning experiences are embedded); sequence (the order in which concepts are presented); learners; instructional methods and activities; instructional resources (materials and settings); evaluation (methods used to assess student learning as a result of these experiences); and adjustments to teaching and learning processes, based on experience and evaluation. Although the term *curriculum* is variably used, this definition is sufficiently inclusive and dynamic to account for the many innovations in the undergraduate curriculum that involve instructional methods, sequencing, and assessments as well as instructional goals and content, all of which have been implemented in order to improve learning.

Forces for Change

During the 1980s critiques of American higher education were increasing in frequency and stridence. Reports such as *A Nation at Risk* (1983) and *Integrity in the College Curriculum* (1985) underscored the need for reform, citing a lack of accessibility, quality, and coherence. Business and industry leaders decried the inadequate skills of graduates who were unable to problem-solve, communicate through writing and speaking, engage in ethical decision-making, work in teams, and interact effectively with diverse others. Citizen groups noted the disengagement from civic life of recent graduates, citing low voter participation.

Calls for increased accountability came from outside the academy, including government agencies, state boards, regional and professional accrediting bodies, and professional associations. Their concerns resulted in mandates for assessment of student learning outcomes and the growth of the assessment movement in higher education. Against a backdrop of fiscal constraints, competition for students from for-profit educational vendors was considered a threat to colleges and universities, further fueling the impetus for reform.

Demographic changes led to increased participation by students with varied academic preparation, declining student enrollments, and falling retention rates. The pool of students pursuing science and math was shrinking, and women and minorities were underrepresented. Scientific literacy was weak among non-science graduates, posing a threat to the economy as well as the future of scientific and technological endeavors.

Concurrently, there were great strides in research on effective college teaching and learning, with shifts in emphasis from what teachers *do* to what students *learn*. New conceptions of learning that emphasize the social construction of knowledge gained advocates. New interdisciplinary fields were burgeoning (e.g., women's studies, ethnic studies). The publication of Ernest Boyer's *Scholarship Reconsidered* in 1990 promoted the re-conceptualization of faculty roles and rewards, giving legitimacy to the scholarship of teaching. From the mid-1980s, faculty development emerged as a field of practice to assist faculty in their instructional efforts; during this time, numerous institutions founded teaching and learning centers. Last but not least, new technologies had implications for new fields of study and their use in instruction and research. Taken together, these forces enabled significant reforms to develop and proliferate in higher education.

Trends

Many of the curricular innovations and reforms during the last decade of the twentieth century reflect three shifts in emphasis: (1) from learning goals that focus on mastery of content and content coverage to demonstration of broad competencies; (2) from learning in disparate disciplines to integrative learning experiences across the curriculum; and (3) from changes in subject matter as the primary means to improve learning to innovations in instructional methods and assessments as integral to curricular reforms. Diversity and global competency have emerged as major undergraduate curriculum issues, as well.

From content to competencies. In the first years of the twenty-first century, the undergraduate curriculum continued to consist of general education or liberal studies (averaging 37.6% of bachelor of arts degree requirements), a major specialization, minors, and electives. The rationale for this configuration has been to ensure breadth through distribution requirements and depth through the major. At the structural level, this model is holding fast at most institutions. What has changed are the goals for learning–from emphasis on knowledge of disciplinary facts and concepts (what students know) to broadly defined competencies (what students are able to do with what they know) to ensure that graduates have the skills needed by citizens in the twenty-first century.

The expanding list of proficiencies commonly identified by colleges and universities include: critical thinking and problem-solving; multiple modes of inquiry in the natural sciences and mathematics, social sciences, humanities, and arts; communication skills, including writing, speaking, and listening; technology and information literacy; sensitivity to diversity, including multicultural and intercultural competencies for participation in a pluralistic democracy; civic, global, and environmental responsibility and engagement; interpersonal skills, including teamwork and collaboration; self-awareness; moral and ethical reasoning, and integration of knowledge from diverse sources.

Integration across the curriculum. The majority of colleges and universities indicate that general education is a high priority among administrators and faculty, and their institutions are actively engaged in reviewing their general education programs. Given the difficulty of learning all the aforementioned competencies within a general education program, many institutions are blurring the boundaries between general education and the major by infusing these competencies throughout the collegiate experience. This can be seen in the adoption of upper division writing requirements and writing-intensive courses in the major; integrative capstone courses that

require collaborative teamwork and projects; courses in the major that emphasize ethics and civic engagement; and the integration of technology, information literacy, and multiculturalism throughout the curriculum.

Diversity learning. Diversity learning is a high priority, including multicultural and intercultural understanding. Although variably defined, *diversity learning* often refers to sensitivity to difference, including race, gender, socioeconomic class, ethnicity, religion, sexual orientation, and disability. In Debra Humphreys's report of a national survey in 2000, 62 percent of reporting institutions had a diversity course requirement or were developing one; among these, 58 percent require one course and 42 percent require two or more courses. In the most common model among schools with requirements (68%), students select a course on diversity from a list of options. Increasingly multicultural perspectives are also infused throughout the curriculum, particularly in the humanities and social sciences.

Internationalization. Global competencies are often identified as a valued goal of liberal learning, but currently few American students develop intercultural competence during college. Four elements commonly associated with internationalization include foreign language study, study abroad, global studies, and the presence of international students. Foreign language enrollments comprise 8 percent of total enrollments, concentrated in a few languages (55% Spanish, 17% French, 8% German, 6% Asian languages, and less than 2% Middle Eastern). This is in sharp contrast to other developed countries where language study is emphasized.

Participation in study abroad is equally limited. Despite indications from incoming first-year students that they hope to study abroad, only 3 percent of American students study abroad, and increasingly they select programs shorter than a semester. Although global and intercultural courses are available, fewer than 7 percent of college students meet even basic standards for global competence. International students accounted for 3 percent of undergraduates and 11 percent of graduate students in the United States in 1998–1999. The United States enrolls more international students than any other country–most of them from Asia. American higher education is likely to increase its emphasis on global competencies in order to better prepare students to participate in global issues during the twenty-first century.

Curriculum Coherence and Integration

In response to mounting criticism that the undergraduate curriculum is fragmented, burdened with too many isolated bits of information, and lacking coherence, institutions have developed strategies and structures to help students integrate the disparate elements of their college experiences. One strategy has been to clarify, tighten, and sequence requirements so they provide greater coherence. Requirements and prerequisites increased in the 1990s, reversing the trend toward reduced requirements during the 1970s and 1980s. A second strategy has been to provide educational experiences calibrated to the developmental learning needs of students at different stages of their collegiate lives. The most prevalent model is the first-year program, often comprising orientation programs, orientation courses, cocurricular offerings, developmental courses for underprepared students, access to academic support services, first-year seminars, courses of which many are interdisciplinary, and learning communities.

The goal of these offerings is to ease the transition from high school to college, to teach skills and attitudes to enable students to succeed in college, and to improve retention, particularly among at-risk students. K–16 collaborations also support the transition between high school and college by promoting curricular discussions between K–12 teachers and college faculty and by providing collegiate experiences to motivate younger students.

To ease the transition from college to the work world, institutions offer senior seminars and capstone experiences. These are designed to help students integrate intentionally what they have learned in their major specialization and to relate those insights to other disciplinary perspectives, the community, or the work world. Other variants include experiences designed for sophomores and keystone courses that mark the mid-collegiate transition from general education into the major,

providing a supportive environment to assess student readiness to move forward.

Learning communities. Learning communities comprise curricular models that link courses or course work to reinforce their curricular connections, maximize opportunities for students to collaborate with each other and their instructors, and provide interpersonal support. Although often designed for first-year students, learning communities now appear throughout the curriculum. They are designed to build communities of learners, and in many cases, provide the structure to promote interdisciplinary study and integration.

Interdisciplinarity. Interdisciplinary studies, which are considered a major trend in teaching and research, have grown exponentially since 1990. Two widespread innovations are first-year interdisciplinary seminars and courses based on themes or problems, many of which are team-taught. Courses in new interdisciplinary fields are flourishing (e.g., neuroscience, bioengineering) as are courses in multiculturalism, often spurred by diversity requirements. Courses that apply ethics and environmentalism to professional areas, such as undergraduate nursing and engineering, reflect accreditation mandates. In addition, faculty across the disciplines use innovative pedagogies and course structures that promote integration and interdisciplinary perspectives, such as academic-service learning, multidisciplinary group work, internships, fieldwork, and study abroad.

Innovative Instructional Methods

Innovative instructional methods are proliferating in higher education and are integral to curricular reform efforts. Supported by research on how students learn, instructional innovations emphasize active and experiential learning (i.e., learning by doing); inquiry, discovery, and problem-based learning; collaborative and cooperative learning in groups; writing to learn; undergraduate research; academic-service learning; and instructional technology. Although lecture and small group discussions are still the dominant instructional methods, active and collaborative learning is now commonplace in higher education. As reported by George D. Kuh in 2001, 90 percent of seniors polled in a national survey indicated that they had participated in group work in class during college.

Reform efforts in science, math, engineering, and technology (SMET) characterize the integral relationship between innovations in instructional methods and curricular reform in the last decade. In Workshop Physics, for example, lecture and lab sections are integrated. All class instruction is done through hands-on experiments and

demonstrations that rely heavily on microcomputers to assist in data analysis. Students work in cooperative learning groups based on the principles of discovery-based learning, emphasizing problem-solving. Similarly, in Calculus Reform, a curricular innovation with roots in the 1980s, students work in groups to problem-solve, often using story problems that relate to the real world, geometric visualization, and instructional technology. A National Science Foundation study published in 1998 indicates that among the most important innovations in SMET since 1990 are (1) Calculus Reform; (2) undergraduate research in which students work on research projects with faculty; and (3) collaborations among institutions, business, industry, and research labs to promote student learning.

Assessment of Student Learning

Widespread efforts to assess student learning are also having an impact on the undergraduate curriculum. While multiple choice tests are still widely used, new evaluation methods provide opportunities to assess and to promote higher-order critical thinking skills and the competencies now valued in higher education. Methods include self-assessments, student portfolios, student journals, case studies, simulations, poster sessions, group projects, and technology-based innovations, among others–all of which reflect the shifts from content to competencies, from fragmentation to integration, and from passive to active modes of learning. Increasingly, assessment results are being used to improve programs and promote the ongoing process of curricular reform.

See also: ACADEMIC CALENDARS; ACADEMIC MAJOR, THE; CAPSTONE COURSES IN HIGHER EDUCATION; COLLEGE SEMINARS FOR FIRST-YEAR STUDENTS; GENERAL EDUCATION IN HIGHER EDUCATION.

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Innovations in Higher Education? Hah!

College leaders need to move beyond talking about transformation before it's too late

By Ann Kirschner

You can hardly mention higher education today without hearing the word "innovation," or its understudies "change," "reinvention," "transformation." Last summer the National Governors Association opened its meeting with a plenary session on higher education, innovation, and economic growth. We have journals galore (Innovative Higher Education, Journal of the International Council for Innovation in Higher Education,etc.), more conferences on "innovation" and higher education than I can count, and reports about innovation (in teaching, research, university business models, technology, you name it). Even the U.S. Chamber of Commerce recently weighed in with "College 2.0: Transforming Higher Education Through Greater Innovation."

It reminds me of the old joke.

Q. How many academics does it take to change a light bulb?

A. Change? Change? Who said anything about CHANGE?

But there is nothing funny about the need for innovation and the resistance to change. When I re-engaged with higher education after a 20-year absence in the private sector, I felt like Rip Van Winkle: The generations were different, but the landscape remained the same. During my long self-exile, I worked primarily in media and technology businesses, including with Fathom, an interactive knowledge network in partnership with Columbia University and other institutions here and abroad. I thought then that the shift to a global, technology-based knowledge society, as well as competition from international and for-profit institutions, would force innovation.

That was 10 years ago.

I was right that the shifts and competition would create a new playing field for higher education, but the pace of change is stuck somewhere between sluggish and glacial. Those are gross generalities, of course, as you can find hopeful signs everywhere, but when observed from the 20,000-foot level, the basic building blocks of higher education—its priorities, governance, instructional design, and cost structure—have hardly budged.

Even major higher-education projects and government initiatives are just playing around the margins. Take the international-export activity in education: Some institutions have indeed begun ambitious expansions with overseas branch campuses or partnerships, but they are merely transporting the old model to new physical space abroad. Or technology: Although e-learning has been around for nearly 20 years, technology in and out of the classroom is at the discretion of the professor, with rare institutional support or enthusiasm. Online learning has about as much credibility on some campuses as global warming at a Tea Party rally. About the only thing within academe that has moved rapidly is tuition.

A recent spate of books diagnoses the impediments to change and offers a broad menu of recommendations. We have Reinventing Higher Education: The Promise of Innovation, edited by Ben Wildavsky, Andrew Kelly, and Kevin Carey (Harvard Education Press, 2011); the second edition of Higher Education? How Colleges Are Wasting Our Money and Failing Our Kids—

and What We Can Do About It, by Andrew Hacker and Claudia Dreifus (St. Martins Griffin, Reprint Edition, 2011); The Innovation University: Changing the DNA of Higher Education From the Inside Out, by Clayton M. Christensen and Henry J. Eyring (Jossey-Bass, 2011); and Change.edu: Rebooting for the New Talent Economy, by Andrew S. Rosen (Kaplan Publishing 2011). Add to that the previous Crisis on Campus: A Bold Plan for Reforming Our Colleges and Universities, by Mark C. Taylor (Alfred A. Knopf, 2010). Notice the prevalence of those "transformation" words.

Most of the books are written by insiders, i.e., academics in varying disciplines, from economics to political science to business management and the humanities. And most of their conclusions are surprisingly consistent, especially about the ways in which academic culture strangles innovation and reform. Love and respect for our educational mission do not deter these writers from identifying the greatest hurdle to overcome in higher education: inertia.

As Taylor, a philosopher of religion at Columbia University, argues, until colleges accept the need to change, they have little incentive to overcome their natural inclination to stay the same. The reverence for tradition that sends graduating seniors walking out through the gate they entered as freshmen can permeate an institution's entire world view: Honoring the past is a hedge against whatever barbarians are assaulting it in the present. For Taylor, inertia has turned into a crisis because tenure and traditional departments stifle the sharing of ideas.

You might expect such talk from a writer like Rosen, chairman and chief executive of Kaplan Inc. But you will find similar sentiments in almost every one of the excellent essays in Reinventing Higher Education.Wildavsky et al. remind us of how distinguished academics like Ernest Boyer and Derek Bok rang the alarm bell in decades past.

We have been warned.

Leaping like Spider-Man over all the small talk about change are Christensen and Eyring. In his widely read 1997 book The Innovator's

Dilemma, Christensen, a professor at the Harvard Business School, argued that when a mainstream organization encounters a "disruptive technology," place your bet on the upstart. Market dominance and a history of loyal customers delude the big company into complacency and a false sense of invincibility. I saw his theory played out in real life during my years in media, when three network broadcasters ruled the airwaves until new technologies—cable, satellite, home video, and the Internet—shaved their market share into slivers.

Now Christensen and his co-author Eyring, an administrator at Brigham Young University-Idaho, write that higher education is next in line for transformation. Universities have been protected by the prestige of their brands and the lack of any real competition. But online learning is that catalytic technology du jour, they argue, and universities will be committing "slow institutional suicide" if they fail to revolutionize their classroom-based models of instruction.

Before Christensen's "disruptive technology," there was the notion, from Intel's Andrew S. Grove, of a "strategic inflection point," the critical moment when an organization confronts a huge change and must, virtually overnight, adapt or fail. Whichever formulation you prefer, there is no getting around the fact that higher education must navigate an unprecedented series of threats, challenges, and opportunities.

Most people resist change. Most organizations resist change. The hard-working and deeply committed administrators and faculty of our colleges are not unique in seeking ways to make progress, while still preserving the status quo. The status quo, however, is already disintegrating. Higher education is facing a future that looks terrifyingly like the American tragedy known as our elementary and secondary schools.

The sky is indeed falling: Once No. 1 in college degrees held by 25- to 34-year-olds, by 2010 the United States was 12th among 36 developed nations. Graduation rates (except for the handful of students at our most selective institutions) lag; tuitions rise, while the unemployment rate is at record highs

for recent college graduates. Imagine, $1-trillion in student debt—and then our graduates enter the worst job market in years. Meanwhile, Academically Adrift, a controversial but oft-quoted 2011 study by Richard Arum and Josipa Roksa, demonstrates that after four years, about a third of students have not significantly improved their writing, critical thinking, or analytical thinking.

Higher education is hardly to blame for the collapse of the economy, but we should be held accountable for our inability to control costs, our inadequate graduation rates, and our students' lack of preparedness for the modern work force.

Ideas are everywhere, and innovation, technology, and accountability are their critical components. But they require tough choices and thick skins to survive the attack of the antibodies against change. Some university constituents hear the dreaded word "productivity" as a euphemism for bigger classes or just more classes taught on the backs of already overworked, underpaid adjuncts. In defense of the university, they head to the ramparts to demand increased state financing and cuts in administrator salaries, as if those were the only solutions.

I am often struck by how critics of university reform evoke "privatization" and "corporatization" as the twin demons that threaten to destroy the fabric of higher education. It would indeed be a sad world if the lofty goals of creating and transferring knowledge were reduced to the rhetoric and mechanics of the marketplace. However, surely we can learn something from the way commercial enterprises are driven to continual improvement by competition, consumer demand, and responsibility to their stakeholders. Students and their families, as well as taxpayers, legislators, and donors, pay dearly for the services of the university. There is nothing shameful or anti-intellectual or soulless in acknowledging that we are accountable to them.

Competition is growing, especially from the for-profit sector of higher education. The New York Times recently noted that from 1998 to 2008, enrollment in public and private universities went up less than 25 percent. Enrollment in for-profit colleges went up 236 percent. The federal

government estimates that 7,500 for-profits enroll some 670,000 students each year in degree programs. There will continue to be serious concerns about academic rigor, recruiting, and the use of financial aid. But for-profits are not going away, nor is their challenge to traditional higher education. (I write with a continuing position in both sectors, as a board member of the Apollo Group and a dean at the City University of New York. We all have work ahead of us.)

Public financing for higher education is not likely to increase anytime soon. Stability is about the best we can expect from our state budgets. That reality makes it crucially important to consider new approaches—like streamlining pathways to degrees, redesigning models of instruction, competency-based programs, better advising, shutting down or consolidating underperforming programs, and more comprehensive and efficient support services focused solely on getting students to graduation. Many of those were put forth in a recent McKinsey & Company study, "Winning by Degrees," of strategies to expand enrollments and increase graduation. I saw little reaction to its extremely practical strategies. Perhaps McKinsey's recommendations, couched in consultantspeak phrases like "reduce nonproductive credits," strike the academic ear so harshly that the truth of the message simply doesn't get through.

But even if the strategies were deemed worthy, putting them into effect would have to survive the slow death by the decentralized decision making that is a fact of life in higher education. No wonder most presidents focus more of their time on fund raising and burnishing the prestige of their brand than on the dangerous work of reinventing the university.

Where is the enlightened university leader to find the courage and backbone to explore those avenues or find ones of her or his own? Not from alumni, who are enthusiastic cheerleaders but usually prefer everything to be the way it was when they were young. Not from accreditation agencies, which are the watchdogs of the status quo (remember their cousins, the financial ratings companies). And not from trustees, who are loving guardians but shun the role of agent provocateur (except perhaps in politically volatile states, a situation

with its own problems). A recent study, "Still on the Sidelines," by Public Agenda (on whose board of directors I also serve) shows that most university trustees believe their role is to support the administration in solving short-term challenges, rather than to engage with broader issues of higher-education reform. In fact, most respondents consider the biggest challenges to the university to be external, especially declining state support and poorly prepared students, as opposed to any internal problems, such as obsolete models of education or unresponsive systems of governance.

As the creators of new knowledge, faculty should be in the vanguard of change, and sometimes they are. But they are also fierce guardians of the status quo. Hacker and Dreifus identify "the Professorial Campus" as representative of a fundamental misalignment between faculty incentives and institutional goals. Faculty are rewarded as individual performers for their research and their contribution to their field, but have no incentives for institutional loyalty or accountability for student success. How many faculty even know the graduation rates of their colleges, or consider it their problem? Scholarly activity tends to distance professors from undergraduate teaching and learning, as the former Harvard College dean Harry R. Lewis has argued in his 2006 Excellence Without a Soul: How a Great University Forgot Education. In fact, the reward for good faculty behavior is less contact with students—tenure equals less teaching.

We have changed too little in how we prepare fledgling college professors to become great teachers. While there are many excellent faculty-led efforts, and others supported by important institutions like the Carnegie Foundation for the Advancement of Teaching, participation is voluntary and tends to draw from the same small circles. "People who like this sort of thing," as Abraham Lincoln supposedly said, "will find it just the sort of thing they like." Imagine if improvements in outcomes through teaching became a significant factor in the tenure process, and if faculty were required to attend professional-development training.

Technology provides ways for great teachers to refresh their own scholarship and pedagogy and bridges the gap between how our students experience their

college curriculum and how they learn everything else. Nearly one-third of all college students have chosen to take at least one online course. When they graduate, they will find online learning already fully integrated into the workplace. Many professional-certification programs—for doctors, lawyers, and accountants, for instance—have moved online, as have options for high-end master's degrees at globally focused institutions such as Johns Hopkins's Bloomberg School of Public Health.

Following Christensen's prediction, online courses are getting better all the time. If you play video games, you will have no problem fantasizing that we could someday get to the point where online courses have a smidgeon of the immersive power of, say, Skyrim. But even in their still rudimentary form, and despite a self-selection bias (students sufficiently motivated to attempt self-paced online courses), those courses are already worthy alternatives to the classroom. In fact, a 2009 U.S. Department of Education study demonstrated that elementary and secondary students who took all or part of a class online did better on average than those taking the same course through traditional face-to-face instruction.

Online courses are an important component of higher education's productivity tool kit, one of the few that offers an intellectually rigorous, measurable, and fiscally responsible way to serve more students while making better use of physical space. We could have tremendous impact by shifting first-year, entry-level courses wholly or mostly online, developed cooperatively but taught locally. Sounds radical, but it's a pretty old idea, put forth by Carol A. Twigg in 1999, and validated by trial programs over five years with 30 two- and four-year institutions. Her research documented that when institutions redesigned their large lecture courses, retention and learning outcomes improved, and costs went down. It is akin to hospitals discovering that cleanliness reduces bacteria and saves lives.

However, it is easier to wash your hands than it is to design a first-rate online course. It takes a different skill from classroom teaching, and it is more expensive than chalk. It can be accomplished by faculty working in teams or in conjunction with experienced instructional designers who understand how

to create large-scale projects like MOOC's huge, open online courses, which have been pioneered by Stanford and other universities. Either way, most faculty will need help in becoming students again. While more-effective teaching should be its own reward, a major professional-development effort would provide a new opportunity to realign institutional and faculty goals. A radical expression would be to change the rules of tenure to require faculty to teach online or otherwise demonstrate their facility with 21st-century methodologies, as virtually every other employer now requires of their work force.

Widespread adoption of online courses is, however, just the most obvious next step. We should be agreeing on what standards of data collection make sense for advising our students and tracking their progress, and then moving rapidly at all levels of the university to adopt new technologies that demonstrate improved outcomes (e.g., mobile apps, tablet-based e-textbooks, and game-based learning). Ph.D. candidates should be encouraged to pursue alternatives to the traditional burnt offerings of scholarly monographs and books. In some graduate school somewhere, a diligent student is probably creating the 2012 equivalent of my own doctoral thesis on "The Return to Paradise Hall: Orphans in Victorian Literature." Instead of one more unread thesis, the English department of my dreams has the imagination to approve a George Eliot app, an interactive timeline, a digital repository of manuscripts, an online concordance of Middlemarch, or a Google mash-up of real and fictional settings in Victorian fiction—which could then become great tools for undergraduate teaching.

Many worthy projects in the digital academy are indeed moving in that direction. In the generally bleak picture for Ph.D.'s in the humanities, some digitally savvy humanists are piercing the gloom by finding positions in departments that specifically prize facility with technology. At my university, we have a cadre of "instructional technology fellows," who are doctoral students assigned to work with faculty and students on technological enhancements to the curriculum. We have to do more in that direction: As Anthony Grafton, former president of the American Historical Association, and others have recently stressed, our graduate schools are producing too

many Ph.D.'s for nonexistent jobs, and yet are resistant to the idea of changing their curriculum or retrofitting young scholars to a more flexible definition of employment. Of course, that was already true when I received my Ph.D. in 1978, but never mind: It is even truer now.

Here again, an openness to change is an essential prerequisite to change. The next step is a consistent and broad-minded strategy that embraces technology and learning at all levels, beginning with faculty who teach with digital gusto, and who are themselves qualified to direct technology-rich projects that will characterize an exciting new generation of scholars and teachers.

No discussion of change in higher education should omit international study as a key component of a comprehensive undergraduate program. In addition to better tools, more effective teaching, and a flexible curriculum, we need to connect more students to a meaningful global experience. Only about 14 percent of American college students study abroad, and few of them are students of color or low income. At my own institution, where 60 percent of our high-achieving students are immigrants or from immigrant families, we require all of our students to complete internships, or conduct independent research, or study abroad. Most students do all three. We guide their choices with academic advising that ties their program abroad to their course of study at home, and aid them with financial support. Their experience has proven time and again to be a vital and transformative part of their education. But we have the advantage of being a relatively young institution, with leadership that emboldens us to think that change can be a very good thing.

Running like a vein of gold through much of the recent writing on change in higher education is the comforting theme that universities are more important than ever, since society needs educated citizens more than ever. Only we can issue an accredited degree, the precious entry ticket to the knowledge economy.

We will not have that advantage forever. The value of the diploma is symbolic, backed not by gold but by the graduate's sense of its worth and the

employer's willingness to accept it as the currency of competency. Sometimes symbolism is simply too expensive.

The ultimate threat to universities could come from the disaggregation of the degree, as students take advantage of the growing availability of open-source learning networks to present evidence of competency to prospective employers. It is already true that more than one-third of college students attend multiple colleges, cobbling together credits from various places. The infrastructure to facilitate the creation of a personalized degree is not yet in place; students still end up with the last institution's name on the diploma. The transfer process is often a nightmare, as one faculty committee may reject a course taken elsewhere, even if the course is taken from another fully accredited institution—sometimes even from an institution within the same university system. Some disciplines have already begun "tuning" and standardizing their majors à la Europe's Bologna model. But an even more radical change is on the drawing board, courtesy of entrepreneurs who will force our crazy quilt of half-hearted articulation agreements to give way to an international network of course and credit exchanges.

Open-source courseware from traditional universities is already widely available. The Massachusetts Institute of Technology has been the one to watch here; after following early forays like Fathom into open-enrollment e-learning, MITx will soon offer paying customers a certification of competency in various fields. (Perhaps bowing to internal constituencies, MIT apparently does not plan to offer the certificate in its own name. Too bad.) MIT is just one of many open-courseware sites: You can study Shakespearean comedy from the University of Washington, astronomy from Yale University, and physics from Utah State University.

Some of the most interesting work begins in the academy but grows beyond it. "Scale" is not an academic value—but it should be. Most measures of prestige in higher education are based on exclusivity; the more prestigious the college, the larger the percentage of applicants it turns away. Consider the nonprofit Khan Academy, with its library of more than 3,000 education videos and materials, where I finally learned just a little about calculus. In the last 18

months, Khan had 41 million visits in the United States alone. It is using the vast data from that audience to improve its platform and grow still larger. TED, the nonprofit devoted to spreading ideas, just launched TED-Ed, which uses university faculty from around the world to create compelling videos on everything from "How Vast Is the Universe?" to "How Pandemics Spread." Call it Khan Academy for grown-ups. The Stanford University professor Sebastian Thrun's free course in artificial intelligence drew 160,000 students in more than 190 countries. No surprise, the venture capitalists have come a-calling, and they are backing educational startups like Udemy and Udacity.

All of those are signposts to a future where competency-based credentials may someday compete with a degree.

At this point, if you are affiliated with an Ivy League institution, you'll be tempted to guffaw, harrumph, and otherwise dismiss the idea that anyone would ever abandon your institution for such ridiculous new pathways to learning. You're probably right. Most institutions are not so lucky. How long will it take for change to affect higher education in major ways? Just my crystal ball, but I would expect that institutions without significant endowments will be forced to change by 2020. By 2025, the places left untouched will be few and far between.

Here's the saddest fact of all: It is those leading private institutions that should be using their endowments and moral authority to invest in new solutions and to proselytize for experimentation and change, motivated not by survival but by the privilege of securing the future of American higher education.

The stakes are high. "So let me put colleges and universities on notice," President Obama said in his recent State of the Union address. "If you can't stop tuition from going up, the funding you get from taxpayers will go down." Because of the academy's inability to police itself and improve graduation rates, and because student debt is an expedient political issue, the Obama administration recently threatened to tie colleges' eligibility for campus-based aid programs to institutions' success in improving affordability and value for students.

Whether the president's threat is fair or not, it will not transform higher education. Change only happens on the ground. Despite all the reasons to be gloomy, however, there is room for optimism. The American university, the place where new ideas are born and lives are transformed, will eventually focus that lens of innova-tion upon itself. It's just a matter of time.

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