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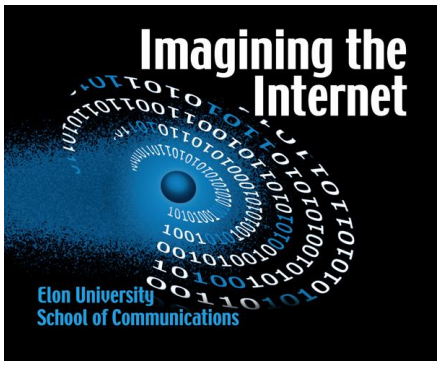

The future impact of the Internet on higher education: Experts expect more-efficient collaborative environments and new grading schemes; they worry about massive online courses, the shift away from on-campus life

Tech experts believe market factors will push universities to expand online courses, create hybrid learning spaces, move toward 'lifelong learning' models and different credentialing structures by the year 2020. But they disagree about how these whirlwind forces will influence education, for the better or the worse.

Janna Quitney Anderson, Elon University
Jan Lauren Boyles, Pew Research Center's Internet & American Life Project
Lee Rainie, Pew Research Center's Internet & American Life Project

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Pew Research Center's Internet & American Life Project
An initiative of the Pew Research Center
1615 L St., NW – Suite 700
Washington, D.C. 20036
202-419-4500 | pewinternet.org

THE FUTURE OF THE INTERNET

This publication is part of a Pew Research Center series that captures people's expectations for the future of the Internet, in the process presenting a snapshot of current attitudes. Find out more at: http://www.pewinternet.org/topics/Future-of-the-internet.aspx and http://www.imaginingtheinternet.org.

Overview

For a millennium, universities have been considered the main societal hub for knowledge and learning.[1] And for a millennium, the basic structures of how universities produce and disseminate knowledge and evaluate students have survived intact through the sweeping societal changes created by technology—the moveable-type printing press, the Industrial Revolution, the telegraph, telephone, radio, television, and computers.

Today, though, the business of higher education seems to some as susceptible to tech disruption as other information-centric industries such as the news media, magazines and journals, encyclopedias, music, motion pictures, and television. The transmission of knowledge need no longer be tethered to a college campus. The technical affordances of cloud-based computing, digital textbooks, mobile connectivity, high-quality streaming video, and "just-in-time" information gathering have pushed vast amounts of knowledge to the "placeless" Web. This has sparked a robust re-examination of the modern university's mission and its role within networked society.

One major driver of the debate about the future of the university centers on its beleaguered business model. Students and parents, stretched by rising tuition costs, are increasingly challenging the affordability of a college degree as well as the diploma's ultimate value as an employment credential.

A March 2012 study by the Pew Research Center for the People & the Press found that 60% of American adults viewed universities as having a positive effect on how things are going in the country and 84% of college graduates say that the expense of going to college was a good investment for them.[2] Yet another Pew Research Center survey in 2011 found that 75% of adults say college is too expensive for most Americans to afford.[3] Moreover, 57% said that the higher education system in the U.S. fails to provide students with good value for the money they and their families spend.

This set of circumstances has catalyzed the marketplace. Universities are watching competitors encroach on their traditional mission. The challengers include for-profit universities, nonprofit learning organizations such as the Khan Academy, commercial providers of lecture series, online services such as iTunes U, and a host of specialized training centers that provide instruction and credentials for particular trades and professions.[4] All these can easily scale online instruction delivery more quickly than can brick-and-mortar institutions.

Consequently, higher education administrators—sometimes constrained by budgetary shortfalls and change-resistant academic cultures—are trying to respond and retool. The Pew Research Center 2011 study found in a survey of college presidents that more than three-fourths (77%) of respondents said their institution offered online course offerings. Half said they believe that

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[1] The modern universities of Europe first came into existence at the end of the 1000s with the University of Bologna in 1088. See http://www.eng.unibo.it/PortaleEn/University/Our+History/default.htm

[2] See http://www.people-press.org/2012/03/01/colleges-viewed-positively-but-conservatives-express-doubts/?src=prc-newsletter

[3] Is College Worth It?" Pew Research Center Social and Demographic Trends. Available at: http://www.pewsocialtrends.org/2011/05/15/is-college-worth-it/#executive-summary

[4] See http://www.nytimes.com/2011/12/06/science/daphne-koller-technology-as-a-passport-to-personalized-education.html?pagewanted=all & http://www.computerworld.com/s/article/9223593/Apple_s_new_vision_of_education

most students at their schools will be enrolled in at least some online classes within the next 10 years.[5]

The debate about the urgency for change and the pace of change on campus was highlighted in recent weeks at the University of Virginia. The school's governing body, the Board of Visitors, voted to oust school President Teresa Sullivan, arguing that she was not pursuing change quickly enough. After a faculty, student, and alumni uproar, the Board reversed course and reinstated her. Still, the school announced within a week of her return that it was joining Coursera—a privately held, online instructional delivery firm. That meant it would join numerous other elite research institutions, including Duke University, Johns Hopkins University, Princeton University, Stanford University, the University of Pennsylvania, and others as part of Coursera's online consortium.[6] As of mid-2012, Coursera's massively open online courses (MOOCs) were provided free to its students—enabling unfettered, global access for millions to engage with some of the country's most prestigious universities.[7] Other start-ups such as MITx, 2tor, and Udacity are attracting similarly staggering, six-figure student enrollments.[8]

Experimentation and innovation are proliferating. Some colleges are delving into hybrid learning environments, which employ online and offline instruction and interaction with professors. Others are channeling efforts into advanced teleconferencing and distance learning platforms—with streaming video and asynchronous discussion boards—to heighten engagement online.

Even as all this change occurs, there are those who argue that the core concept and method of universities will not radically change. They argue that mostly unfulfilled predictions of significant improvement in the effectiveness and wider distribution of education accompany every major new communication technology. In the early days of their evolution, radio, television, personal computers—and even the telephone—were all predicted to be likely to revolutionize formal education. Nevertheless, the standardized knowledge-transmission model is primarily the same today as it was when students started gathering at the University of Bologna in 1088.

Imagine where we might be in 2020. The Pew Research Center's Internet & American Life Project and Elon University's Imagining the Internet Center asked digital stakeholders to weigh two scenarios for 2020. One posited substantial change and the other projected only modest change in higher education. Some 1,021 experts and stakeholders responded.

39% agreed with a scenario that articulated modest change by the end of the decade:

> *In 2020, higher education will not be much different from the way it is today. While people will be accessing more resources in classrooms through the use of large screens, teleconferencing, and personal wireless smart devices, most universities will mostly require in-person, on-campus attendance of students most of the time at courses featuring a lot of traditional lectures. Most universities' assessment of learning and their requirements for graduation will be about the same as they are now.*

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[5] See http://www.pewinternet.org/~/media//Files/Reports/2011/PIP-Online-Learning.pdf
[6] See http://www.nytimes.com/2012/07/17/education/consortium-of-colleges-takes-online-education-to-new-level.html?_r=2&hp
[7] See http://www.nytimes.com/2012/07/17/education/consortium-of-colleges-takes-online-education-to-new-level.html?_r=2&hp
[8] See http://www.insidehighered.com/news/2012/01/24/stanford-open-course-instructors-spin-profit-company & http://www.insidehighered.com/news/2012/04/06/how-could-mitx-change-mit

60% agreed with a scenario outlining more change:

> *By 2020, higher education will be quite different from the way it is today. There will be mass adoption of teleconferencing and distance learning to leverage expert resources. Significant numbers of learning activities will move to individualized, just-in-time learning approaches. There will be a transition to "hybrid" classes that combine online learning components with less-frequent on-campus, in-person class meetings. Most universities' assessment of learning will take into account more individually-oriented outcomes and capacities that are relevant to subject mastery. Requirements for graduation will be significantly shifted to customized outcomes.*

Respondents were asked to select the one statement of the two scenarios above with which they mostly agreed; the question was framed this way in order to encourage survey participants to share spirited and deeply considered written elaborations about the potential future of higher education. While 60% agreed with the statement that education will be transformed between now and the end of the decade, a significant number of the survey participants said the true outcome will encompass portions of both scenarios. Just 1% of survey takers did not respond.

Here are some of the major themes and arguments they made:

Higher education will vigorously adopt new teaching approaches, propelled by opportunity and efficiency as well as student and parent demands.

- Several respondents echoed the core argument offered by **Alex Halavais**, associate professor at Quinnipiac University and vice president of the Association of Internet Researchers, who wrote: "There will be far more extreme changes institutionally in the next few years, and the universities that survive will do so mainly by becoming highly adaptive…The most interesting shifts in post-secondary education may happen outside of universities, or at least on the periphery of traditional universities. There may be universities that remain focused on the traditional lecture and test, but there will be less demand for them."

- **Charlie Firestone**, executive director of the Communications and Society program at the Aspen Institute, wrote: "The timeline might be a bit rushed, but education—higher and K-12—*has* to change with the technology. The technology will allow for more individualized, passion-based learning by the student, greater access to master teaching, and more opportunities for students to connect to others—mentors, peers, sources—for enhanced learning experiences."

- **Mike Liebhold**, senior researcher and distinguished fellow at The Institute for the Future, predicted that market forces will advance emergent content delivery methods: "Under current and foreseeable economic conditions, traditional classroom instruction will become decreasingly viable financially. As high-speed networks become more widely accessible tele-education and hybrid instruction will become more widely employed."

- **Jeff Jarvis**, director of the Tow-Knight Center for Entrepreneurial Journalism at the City University of New York Graduate School of Journalism, placed the debate in broader

historical context: “Will there still be universities? Likely, but not certain…[there is] the idea that our current educational system, start to end, is built for an industrial era, churning out students like widgets who are taught to churn out widgets themselves. That is a world where there is one right answer: We spew it from a lectern; we expect it to be spewed back in a test. That kind of education does not produce the innovators who would invent Google. The real need for education in the economy will be re-education. As industries go through disruption and jobs are lost forever, people will need to be retrained for new roles. Our present educational structure is not built for that, but in that I see great entrepreneurial opportunity.”

- **P.F. Anderson**, emerging technologies librarian at the University of Michigan-Ann Arbor, predicted seismic shifts within the academy, writing, “The very concept of what a university is, what academia is, what adult learning is, all of these are changing profoundly. If you think back to the original purposes of universities, what they have been doing recently has pivoted roughly 180 degrees.”

Economic realities will drive technological innovation forward by 2020, creating less uniformity in higher education.

- **Donald G. Barnes**, visiting professor at Guangxi University in China and former director of the Science Advisory Board at the U.S. Environmental Protection Agency, predicted, “The high and growing cost of university education cannot be sustained, particularly in the light of the growing global demand for such education. Therefore, there is already a rush to utilize the new medium of the Internet as a means of delivering higher education experience and products in more economical and efficient modes.”

- **Tapio Varis**, professor emeritus at the University of Tampere and principal research associate with the UN Educational, Scientific, and Cultural Organization, maintained that heightened inequalities may arise based upon instructional delivery formats. “The economic reasons will determine much of the destiny of higher education,” he wrote. “Traditional face-to-face higher education will become a privilege of a few, and there will be demand for global standardization of some fields of education which also will lower the level in many cases.”

- **Sean Mead**, director of solutions architecture, valuation, and analytics for Mead, Mead & Clark, Interbrand, noted that institutions will stratify based upon their respective concentrations of teaching, research, or service. “Forced into greater accountability at the same time as Baby Boomer retirements revitalize the faculties, universities will undergo widespread reformation,” he said. “Some will refocus professorial metrics from running up publication counts to the profession of teaching and delivering strong educations. Others will engage the community in outreach efforts to make learning more accessible. More universities will follow the MIT and Stanford examples of serving the public with free access to course materials and courses…There will be increasing corporate involvement in universities, including better communication of the knowledge that is developed and housed there. Research will increasingly be driven out from behind the high-premium-pay walls of academic journals and into the open, where scholars and the public can more easily benefit from federally funded and grant-supported research projects.”

"Distance learning" is a divisive issue. It is viewed with disdain by many who don't see it as effective; others anticipate great advances in knowledge-sharing tools by 2020.

- Online course offerings generally fail to mirror the robust face-to-face interaction that occurs within the physical classroom, warned **Sam Punnett**, president of FAD Research Inc. "On-screen learning is appropriate in some instances, particularly as a supplement to the classroom," he said, "but it will always be inferior in the quality of information exchange and interaction. In 2020 it is my hope that programs that employ instructors who are 'in the room' will be generally acknowledged to be in a separate tier."

- On the other hand, **Peter Pinch**, director of technology for WGBH, a public media company, predicted renewed innovation in remote learning platforms will mark the university by 2020. "As communications technologies improve and we learn how to use them better, the requirement for people to meet face-to-face for effective teaching and learning will diminish," he predicted. "Some institutions will focus on facilitating virtual environments and may lose any physical aspect. Other institutions will focus on the most high-value face-to-face interactions, such as group discussions and labs, and will shed commodity teaching activities like large lectures."

- **Fred Hapgood,** technology author and consultant, and writer for *Wired*, *Discover*, and other tech and science publications, said, "*The* key challenge of the next five years—I say '*the*' because of the importance of education for the entire global labor force and the importance of reducing its crushing costs—will be developing ways of integrating distance learning with social networking. I am confident this challenge will be met."

'Bricks' replaced by 'clicks'? Some say universities' influence could be altered as new technology options emerge; others say 'locatedness' is still vital for an optimal outcome.

- An anonymous survey respondent noted, "The age of brick-and-mortar dinosaur schools is about to burst—another bubble ready to pop. The price is too high; it's grossly inflated and the return on investment isn't there. Online learning will be in the ascendant. There will be more international interactions; I believe we will see somewhat of a return to a Socratic model of single sage to self-selecting student group, but instead of the Acropolis, the site will be the Internet, and the students will be from everywhere."

- Another anonymous survey participant wrote, "Several forces will impact this: the general overall increase in the levels of education globally, the developing world using Web and cell technology to jump over intermediate technologies, the high cost of face-to-face instruction, the improvement of AI as a factor in individualizing education, the passing of the Baby Boomers as educators in the system, the demand for Millennials and beyond for relevant learning models, China will develop a leading learning format, first to educate its population and then expand it to teach the world."

- **Matthew Allen**, professor of Internet Studies at Curtin University in Perth, Australia, and past president of the Association of Internet Researchers, visualizes 2020's ivory tower through a socio-cultural lens: "While education is being, and has been already, profoundly influenced by technologies, nevertheless it is a deeply social and political

institution in our cultures. Universities are not just portals where students access learning, they are places in which people develop as social beings, in some quite specifically institutional ways. Therefore technology will change the way learning occurs and the way it is assessed, and it definitely means there is more blending of learning activities on- and offline, but it will not—for the majority—change the fundamental locatedness of university education."

- There were also people who said technology should never drive change. An anonymous respondent wrote, "Technology is no substitute for traditional education. 'Vir bonus dicendi peritus' or the good man who can speak well will not be brought about by techno-based thinking."

Frustration and doubt mark the prospect of change within the academy.

- Numerous respondents bemoaned higher education's historically glacial rate of change. An anonymous respondent said, "From the 1960s book *The Peter Principle*, the system exists to perpetuate itself. Regrettably large universities lack the nimbleness to be able to adapt to rapidly changing realities. The system of higher education (as someone who has spent the last 20 years at major universities) is already broken, but instead of changing to make a university education more relevant, we herd students into larger and larger lectures and ask them to regurgitate esoteric facts."

- **Hugh F. Cline**, adjunct professor of sociology and education at Columbia University, noted, "Higher education is one of the most resistant social institutions ever created. Many of the innovations you mention are under way in universities around the globe, but it will take a long time before significant numbers of students in colleges and universities will have these advantages."

- **Mary Starry**, an assistant professor at the College of Pharmacy of the University of Iowa, similarly explained, "Research has provided us much information on how people learn and what approaches to education are best to produce critical-thinking, lifelong-learning graduates. Yet, we continue to describe as 'innovative' the different techniques and approaches that we've known about for much longer than ten years. Technology now provides new and exciting ways to incorporate these approaches into the classroom, but our education system structure is too mired in historical lecture and 'brain dump' methodology."

- An anonymous survey participant wrote, "The 'university' has not changed substantially since its founding in about 800 AD or so. Other than adding books, electricity, and women, it is still primarily an older person 'lecturing' to a set of younger ones…There will be both a large number of largely traditional universities and an ever-expanding range of alternatives in both technology and organizational form."

- Another anonymous respondent complained, "Universities are awfully slow to adapt. And why should they? At present they have a lucrative monopoly. In what other industry do you see such runaway price increases? They'll ride that for as long as they can and only change when on the cusp of irrelevance."

Change is happening incrementally, but these adjustments will not be universal in most institutions by 2020.

- **Jonathan Grudin**, principal researcher at Microsoft, observed, "Institutional inertia should not be underestimated, so whether 2020 will see 'mass adoption' of the features described above could depend on how one defines 'mass.' But it has, of course, already started to happen."

- Many survey respondents, including **Mark J. Franklin**, director of computing services and software engineering for the Thayer School of Engineering at Dartmouth College, do not anticipate massive upheaval in the academy by 2020. "My gut reaction is that in 2020 higher education is entrenched in its current format," he predicted. "I believe teachers and textbook companies will resist—and even now are resisting—modern technology that could be helping students. When I see iPads and Kindles in every student's backpack instead of fifty pounds worth of textbooks, I'll know there has been a change. When I see every campus completely and speedily wired—or providing wireless—for the Internet, I'll know things have changed. When I see computers in the libraries and assistants helping students navigate to computers and libraries around the globe, I'll know things have changed. I just don't think it will happen by 2020. Maybe 2050."

- **Steve Jones**, distinguished professor of communication at the University of Illinois-Chicago and a founding leader of the Association of Internet Researchers, echoed that thought. "It's commonly and rightly believed that universities change slowly," he said, "and in a difficult economic environment, particularly for public institutions, change comes more slowly than usual. Simply put, few universities can afford to change from the way they are today. While a riposte is that they cannot afford not to change, inertia is powerful, and taking the long view is hard. By 2020 not much will have changed."

- **Richard Holeton**, director of academic computing services at Stanford University Libraries, added, "Change in higher education, as they say, is like turning an aircraft carrier. In eight or nine years we will continue to see incremental changes, but not the more radical transformations described."

Universities will adopt new pedagogical approaches while retaining the core of traditional methods.

- **Richard D. Titus**, a seed-funding venture capitalist at his own fund, Octavian Ventures, predicted, "The future is a hybrid of both of the approaches. No one can disagree that higher education needs—no, requires—a complete rethink. Our current toolsets and thinking are over 400 years old and give little regard to the changes in society, resources, or access, which facilitate both greater specialization and broader access than at any time in the previous two centuries."

- Face-to-face instruction, complemented by online interaction, makes up a hybrid model that many survey participants foresee. **Melinda Blau**, a freelance journalist and author, wrote, "The future will hold *both* outcomes. It depends on the course of study and the college."

- **Susan Crawford**, a professor at Harvard University's Kennedy School of Government who previously served as President Obama's Special Assistant for Science, Technology, and Innovation Policy, wrote that she expects an influx of customized course content will be fused with the traditional elements of a multidisciplinary college education. "We've got to move to much more individual, hyperlinked learning experiences," she said. "At the same time, modeling good behavior and good thinking style remains something useful that teachers do for students…I'm hopeful that we'll find a way of educating that inculcates the values a true liberal arts education was supposed to support—lifelong learning, lifelong foolishness (hymn to Stuart Brand), and lifelong awe."

- An anonymous participant wrote, "I expect a huge movement towards knowledge-management tools that enhance the learning practice and focus on each individual path while maintaining engagement at a social level. This could make the learning experience tailored to each individual and at the same time aggregate responses and perceptions from a large group of students in order to direct toward specific learning goals."

- Another anonymous respondent predicted, "Universities will continue their transition to hybrid classes using online learning components and occasional in-person meetings, while smaller colleges will both adopt online capabilities and technologies to promote access to remote resources while maintaining a focus on in-person, on-campus attendance of seminars and (some) lectures. The length of the learning period (the traditional four-year degree) may change as a result of the focus on combined learning, with integration of more off-site activities with the traditional scholastic setting. I also think that economic factors over the next few years may promote the evolution of educational institutions along the lines of a transition to hybrid learning, while also preventing any mass adoption of just-in-time approaches."

Collaborative education with peer-to-peer learning will become a bigger reality and will challenge the lecture format and focus on "learning how to learn."

- Autonomy will be shifted away from the sole lecturer in tomorrow's university classrooms, maintains **Bob Frankston**, a computing pioneer and the co-developer and marketer of VisiCalc. "Ideally, people will learn to educate themselves with teachers acting as mentors and guides," he wrote.

- By 2020, universities should re-examine how technology can enhance students' critical thinking and information acquisition skills, noted **Wesley George**, principal engineer for the Advanced Technology Group at Time Warner Cable. "The educational system is largely broken," he said. "It's too focused on the result of getting a degree rather than teaching people *how* to learn: how to digest huge amounts of information, craft a cogent argument in favor of or against a topic, and how to think for oneself. Individuals learn differently, and we are starting to finally have the technology to embrace that instead of catering to the lowest common denominator."

- **Hal Varian**, chief economist at Google, said, "Just-in-Time learning is a very important phenomenon that will have a big role to play in the future…Universities should, and I hope will, focus more on 'how to learn' rather than simply 'learning.'"

- Universities should additionally ensure their graduates are poised for 2020's job market, maintains **danah boyd**, a senior researcher at Microsoft Research. "Higher education will not change very fast, although it should," she wrote. "But what's at stake has nothing to do with the amount of technology being used. What's at stake has to do with the fact that universities are not structured to provide the skills that are needed for a rapidly changing labor, creative force."

Competency credentialing and certification are likely…

- **Rick Holmgren**, chief information officer at Allegheny College, said, "Many institutions, particularly large state institutions, will have shifted to competency-driven credentialing, which may not require traditional class work at all, but rather the demonstration of competency."

- **Morley Winograd**, co-author of *Millennial Momentum: How a New Generation is Remaking America*, similarly argued, "The deflection point for the more fundamental change will occur when universities no longer grant degrees, but rather certify knowledge and skill levels, in much more finite ways as your scenario envisions. Major university brands will offer such certificates based on their standards for certifying various competencies that employers will be identifying for their new hires."

…yet institutional barriers may prevent widespread degree customization.

- Scalability may present a hurdle toward achieving personalization, argued **David Ellis**, director of communication studies at York University in Toronto. "Customizing education is too complicated for large institutions," he argued. "And if outcomes are made too personal, a perception of bias or unfairness is likely to arise."

- **Joan Lorden**, provost and vice chancellor for academic affairs at University of North Carolina-Charlotte, predicted, "Customized assessment is unlikely. There is still a general sense in most university faculties that there are certain foundational elements that must be addressed in a high-quality educational experience."

Survey Method:
'Tension pairs' were designed to provoke detailed elaborations

This material was gathered in the fifth "Future of the Internet" survey conducted by the Pew Research Center's Internet & American Life Project and Elon University's Imagining the Internet Center. The surveys are conducted through an online questionnaire sent to selected experts who are encouraged to share the link with informed friends, thus also involving the highly engaged Internet public. The surveys present potential-future scenarios to which respondents react with their expectations based on current knowledge and attitudes. You can view detailed results from the 2004, 2006, 2008, and 2010 surveys here: http://www.pewInternet.org/topics/Future-of-the-Internet.aspx and http://www.elon.edu/e-web/predictions/expertsurveys/default.xhtml. Expanded results are also published in the "Future of the Internet" book series published by Cambria Press.

The surveys are conducted to help accurately identify current attitudes about the potential future for networked communications and are not meant to imply any type of futures forecast.

Respondents to the Future of the Internet V survey, fielded from August 28 to Oct. 31, 2011, were asked to consider the future of the Internet-connected world between now and 2020. They were asked to assess eight different "tension pairs"—each pair offering two different 2020 scenarios with the same overall theme and opposite outcomes—and they were asked to select the one most likely choice of two statements. The tension pairs and their alternative outcomes were constructed to reflect emerging debates about the impact of the Internet, distilling statements made by pundits, scholars and technology analysts about likely Internet evolution. They were reviewed and edited by the Pew Internet Advisory Board.

Results are being released in eight separate reports over the course of 2012. This is the final report in the series. Links to the previous seven reports can be found here: http://bit.ly/x9I2p0.

About the survey and the participants

Please note that this survey is primarily aimed at eliciting focused observations on the likely impact and influence of the Internet—not on the respondents' choices from the pairs of predictive statements. Many times when respondents "voted" for one scenario over another, they responded in their elaboration that both outcomes are likely to a degree or that an outcome not offered would be their true choice. Survey participants were informed that "it is likely you will struggle with most or all of the choices and some may be impossible to decide; we hope that will inspire you to write responses that will explain your answer and illuminate important issues."

Because the survey's eight-question scenario set primarily tests attitudes about technology issues, a majority of the survey respondents are technology experts, commentators, researchers, or stakeholders in some regard. Survey participants were located in three ways. First, several thousand were identified in an extensive canvassing of scholarly, government, and business documents from the period 1990-1995 to see who had ventured predictions about the overall future impact of the Internet. Second, several hundred of them have participated in the first four surveys conducted by Pew Internet and Elon University, and they were re-contacted for this survey. Third, expert participants were selected due to their positions as stakeholders in the development of the Internet. Because this particular survey included a question about higher education, university administrators

were invited by email to respond, as were participants in the 2011 EDUCAUSE and MobilityShifts: International Future of Learning conferences. The experts were invited to encourage people they know to also participate.

Why you won't find many top higher education administrators' names in this report: Participants were allowed to remain anonymous. In general, across the entire eight-question 2012 survey set, about half of the expert responses were anonymous responses.

The respondents' remarks reflect their personal positions on the issues and are not the positions of their employers; however, their leadership roles in key organizations help identify them as experts. Following is a representative list of some of the institutions at which respondents work or have affiliations or previous work experience: Harvard University, MIT, Yale University, Georgetown University, Oxford Internet Institute, Princeton University, Carnegie-Mellon University, University of Pennsylvania, University of California-Berkeley, Columbia University, University of Southern California, Cornell University, University of North Carolina, Purdue University, Duke University, Syracuse University, New York University, Ohio University, Georgia Institute of Technology, Florida State University, University of Kentucky, University of Texas, University of Maryland, University of Kansas, University of Illinois, Boston College, Google, the World Bank, Microsoft, Cisco Systems, Yahoo, Intel, IBM, Hewlett-Packard, Ericsson Research, Nokia, O'Reilly Media, Verizon Communications, Institute for the Future, Federal Communications Commission, World Wide Web Consortium, National Geographic Society, Association of Internet Researchers, Internet2, Internet Society, Institute for the Future, and the Santa Fe Institute.

While many respondents are at the pinnacle of Internet leadership, some of the survey respondents are "working in the trenches" of building the web. Most of the people in this latter segment of responders came to the survey by invitation because they are on the email list of the Pew Internet & American Life Project, they responded to notices about the survey on social media sites or they were invited by the expert invitees. They are not necessarily opinion leaders for their industries or well-known futurists, but it is striking how much their views are distributed in ways that parallel those who are celebrated in the technology field.

While a wide range of opinion from experts, organizations, and interested institutions was sought, this survey should not be taken as a representative canvassing of Internet experts. By design, this survey was an "opt in," self-selecting effort. That process does not yield a random, representative sample. The quantitative results are based on a non-random online sample of 1,021 Internet experts and other Internet users, recruited by email invitation, Twitter, Google+, or Facebook. Since the data are based on a non-random sample, a margin of error cannot be computed, and results are not projectable to any population other than the respondents in this sample.

When asked about their primary workplace, 40% of the survey participants identified themselves as a research scientist or as employed by a college or university; 12% said they were employed by a company whose focus is on information technology; 11% said they work at a nonprofit organization; 8% said they work at a consulting business, 10% said they work at a company that uses information technology extensively; 5 % noted they work for a government agency; and 2% said they work for a publication or media company.

When asked about their "primary area of Internet interest," 15% identified themselves as research scientists; 11% said they were futurists or consultants; 11% said they were entrepreneurs or business leaders; 11% identified themselves as authors, editors or journalists;

10% as technology developers or administrators; 6% as advocates or activist users; 5% as legislators, politicians or lawyers; 3% as pioneers or originators; and 28% specified their primary area of interest as “other.” A number of higher education leaders were invited to participate in this survey and many of them are likely in that group. The set of identifying terms in this demographic question was established in the Imagining the Internet Center’s initial study of predictions—the Early ‘90s Database: http://www.elon.edu/e-web/predictions/early90s/.

Main Findings: Higher education's destination by 2020

	TOTAL RESPONSES	Tension pair on future of higher education
%	39	In 2020, higher education will not be much different from the way it is today. While people will be accessing more resources in classrooms through the use of large screens, teleconferencing, and personal wireless smart devices, most universities will mostly require in-person, on-campus attendance of students most of the time at courses featuring a lot of traditional lectures. Most universities' assessment of learning and their requirements for graduation will be about the same as they are now.
	60	By 2020, higher education will be quite different from the way it is today. There will be mass adoption of teleconferencing and distance learning to leverage expert resources. Significant numbers of learning activities will move to individualized, just-in-time learning approaches. There will be a transition to "hybrid" classes that combine online learning components with less-frequent on-campus, in-person class meetings. Most universities' assessment of learning will take into account more individually-oriented outcomes and capacities that are relevant to subject mastery. Requirements for graduation will be significantly shifted to customized outcomes.
	1	Did not respond

PLEASE ELABORATE: What will universities look like in 2020? Explain your choice and share your view of any implications for the future of universities. What are the positives, negatives, and shades of grey in the likely future you anticipate? *(If you want your answer cited to you, please begin your elaboration by typing your name and professional identity. Otherwise your comment will be anonymous.)*

Note: The survey results are based on a non-random online sample of 1,021 Internet experts and other Internet users, recruited via email invitation, conference invitation, or link shared on Twitter, Google Plus or Facebook from the Pew Research Center's Internet & American Life Project and Elon University. Since the data are based on a non-random sample, a margin of error cannot be computed, and the results are not projectable to any population other than the people participating in this sample. The "predictive" scenarios used in this tension pair were composed based on current popular speculation. They were created to elicit thoughtful responses to commonly found speculative futures thinking on this topic in 2011; this is not a formal forecast.

Respondents' thoughts

Descriptions of future economic stress and economic divides were prevalent in responses to this survey question on higher education.

While some who chose the first scenario said educational institutions are too static and will not move forward quickly to implement new digitally assisted approaches, others who chose that scenario said such change is costly and institutions will not invest in it. On the other hand, many respondents who selected the second option expressed a belief that online education will be championed as a budget-saving solution for cash-strapped universities and a method for making higher education affordable for more people.

The survey participants were divided over the societal impact of online delivery methods. Some viewed the use of technological tools as class-equalizing, expanding access to global knowledge. Others feared that use of web-based platforms would promulgate automated and impersonal degree programs.

Many who expect a transition to more use of technology-based approaches said they are likely to cause a critical widening of the economic divide. These respondents said they expect that those in the middle and lower socioeconomic classes will be educated through what they consider to be inferior online delivery. These survey participants value traditional, face-to-face methods and said they fear that in the future only elite students will be able to afford to experience a well-grounded, personal education in a campus community.

A distinct difference of opinion also emerged among the survey respondents as to what constitutes human contact and an effective educational connection. Many perceived the term "distance learning" as encompassing impersonal and detached learning environments. At the same time, cutting-edge educators and futurists noted that communication modes are improving so rapidly that by 2020 a lack of geographical proximity will have little to no deleterious effect upon learning.

Some who wrote in support of the second scenario were enthusiastic about the move toward mixed methods—incorporating facets of existing pedagogy with emerging knowledge-acquisition tools. This hybrid approach—combining in-class "seat time" with online and peer-to-peer learning—was extolled as the best approach by numerous respondents.

After being asked to choose one of the two 2020 scenarios presented in this survey question, respondents were also asked, "What will universities look like in 2020? Explain your choice and share your view of any implications for the future of universities. What are the positives, negatives, and shades of grey in the likely future you anticipate?"

Following is a selection from the hundreds of written responses survey participants shared when answering this question. About half of the expert survey respondents elected to remain anonymous, not taking credit for their remarks. Because people's expertise is an important element of their participation in the conversation, the formal report primarily includes the comments of those who took credit for what they said. The full set of expert responses, anonymous and not, can be found online at http://bit.ly/QtrbA2. The selected statements that follow here are grouped under headings that indicate some of the major themes emerging from the overall responses. The varied and conflicting headings indicate the wide range of opinions found in respondents' reflective replies.

Higher education will be significantly influenced by a changeover to new methods driven by opportunity, cost, and student and parent demands.

Some survey respondents said higher education must retool itself in order to remain viable in 2020 and beyond. "If higher education wants to survive, we cannot stay the same," argued **Veronica Longenecker**, assistant vice president of information technologies for Millersville University. "We are no longer meeting the needs of today's learner. Higher education needs to transform and we need to start today."

Such technological transformation is in its nascent stages, says **Lee W. McKnight**, professor of entrepreneurship and innovation at Syracuse University: "The transition has already begun en masse to online and hybrid models for collaborative learning," he wrote. "Residential undergraduate and graduate education is a luxury good, hence the high prices. Parents and young adults will still prize the traditional undergraduate campus experience in 2020, but by the numbers, an increasing number will learn with and through technology, on and off campus. And assessment will take advantage of digital tools as well."

A notable share of experts predict that market factors, including the overall health of the economy, will galvanize universities to employ new delivery methods and new organizational models.

It is expected that economics will be a primary influence on innovation. **Paige Jaeger,** an adjunct instructor at the State University of New York-Albany, proposed, "If the world's economy collapses, cost efficiency will become the model of choice, and 18-year-olds may have to work just to eat. No longer will families be able to afford the luxury of a four-year BA party." An anonymous survey respondent concurred, writing, "I'm an online graduate student with a few required residencies in my program. I believe technology will allow us to customize higher education. The economy plays a role. As much as I am an advocate of 'learning for learning's sake,' it is difficult to justify spending hundreds of thousands of dollars in higher education with the job market so dismal."

Some survey participants said an online education is a cost-effective solution. **Peter J. McCann**, senior staff engineer for Futurewei Technologies and chair of the Mobile IPv4 Working Group of the IETF, said, "The cost/benefit ratio of today's university education is grossly out of balance. A four-year degree today can cost upwards of a quarter of a million dollars and often leaves graduates without the skills needed to compete in the job market. In contrast, efforts like the Khan Academy show that high-quality lectures on undergraduate topics can be compiled and made accessible to everyone in the world for free. The Internet will change the face of higher education, especially in third-world countries where incomes are low but the motivation to learn is high."

As a result of choice in the marketplace, prospective students and their parents may play a hand in charting the future path of university engagement online. **Ed Lyell**, professor at Adams State College, consultant for using telecommunications to improve school effectiveness through the creation of 21st-century learning communities, and host of a regional public radio show on the economy, suggested, "Many powerful existing institutions will try to stay in the dark ages, *however* since higher education is funded by student choice—with money following the student—it is likely that both private and public universities will expand their use of technology and diminish their dependence on everything being based on 'seat time.'"

Digital natives entering academia in 2020 will also push for shifts in pedagogical paradigms, argues **Greg Wilson**, a marketing and public relations consultant who provides organizational change management and service/execution process development services. "Kids are more sophisticated and more tech-oriented with each year," he wrote. "By 2020, if education is unchanged they will have a hard time filling seats…What and how they are taught will be much different."

Some survey participants said higher education might become outmoded if it doesn't move to implement online learning methods that incorporate crowd-sourcing and collective intelligence. **Tom Hood**, CEO of the Maryland Association of CPAs argued this is vital for the future of universities. "I have already seen examples of changes in higher education with new schools built around collaboration and technology-enhanced education," he said. "This gives me hope that they are in the process of evolving. As Darwin said, it is not the strongest of the species that survives, it is the most adaptable. Should higher education refuse to adapt to the changing styles of this younger, tech-savvy generation and the needs of employers, it risks becoming irrelevant."

A selection of related remarks by anonymous respondents:

> "Hybrid classes will proliferate, and the pace of change will be fairly dramatic, accelerating rapidly four to five years from now. We already see greater flexibility in program requirements and different 'unofficial' trends towards individually oriented outcomes. The current system is broken. Both students and societies will be intensifying their demands for relevance, and this will drive rapid and unexpected changes."
>
> "Universities will instead have to focus on the higher levels of Bloom's Taxonomy of application and evaluation, and the learning part will be delivered online."
>
> "Competition for shrinking numbers of undergraduates, threadbare budgets, and access to cheaper technologies that exploit the possibilities of Web 3.0 will combine to revolutionize higher education. Hive models can be masterfully run by talented faculty who join the ranks without the perception of boundaries such as PowerPoint."
>
> "Instructors are finding that they can reach a broader audience in a more efficient manner through the use of technology. The learners are changing the way they choose to obtain their education."
>
> "Right now, student and teacher have access to the same information. That needs to be exploited to turn the teaching/learning paradigm upside down. That should happen by 2020."

Economic realities will drive technological innovation forward by 2020. Yet, that might create a class structure where the rich get an immersive in-person experience, while others get inferior online offerings.

Some survey respondents predicted that by 2020 U.S. universities will be competing to attract enrollees from a shrinking number of potential students. **Rebecca Bernstein**, digital strategist for the University at Buffalo-The State University of New York, wrote, "The change driver will not be demand or technology. It will be economics and a diminishing pool of applicants."

An anonymous respondent wrote, "If traditional universities don't move in this direction, they will find themselves facing daunting, start-up competitors who will deliver educational value at lower prices for students coming from a contracting middle class." Another anonymous survey participant said, "Decades of exorbitant cost inflation will end, probably abruptly, as education

consumers and taxpayers run out of money. Those universities that survive will have learned to live much more efficiently and to be more responsive to the customer (students)."

Entrepreneurial energy—stemming from corporate competition—will reshape higher education by 2020, argues **Robert Cannon**, founder and director of Cybertelecom, and senior counsel for Internet law in the Federal Communication Commission's Office of Strategic Planning and Policy Analysis. "The value equation for higher education is increasingly under pressure," he noted. "If the classic notion of education at an isolated campus with poor dorms and bad food can no longer be justified, then someone will come up with a new model that implodes this."

Peter Pinch, director of technology for WGBH, responded, "Physical access to educators will become a premium experience reserved for the most advanced, the wealthiest and (perhaps) the most needy students. Everyone else will move to virtual experiences, probably with more and more emphasis on just-in-time training instead of long courses of study."

Several respondents said online content delivery will afford a free or affordable education to those least advantaged around the world. **John McNutt**, a professor of public policy and administration at the University of Delaware, said, "From an economic standpoint, we cannot continue business as usual. Without online education, only the wealthy will receive an education. The traditional model is too expensive."

Debbie Donovan, managing partner in an online company and marketing in life sciences blogger, said, "It's well established that education is a great equalizer and elevates society as a whole, especially for women and girls. The only way to make education more widely available geographically and socioeconomically is to deliver university-level course work digitally."

Some point to "open university" programs—such as those created by MIT, Princeton and Stanford—as evidence there will be *more* opportunities for *more* education for millions or even billions of adults by 2020. In fact, some experts say this market could augment the "big brands" in higher education, while crowding out smaller liberal arts colleges. **Rich Osborne**, senior IT innovator at the University of Exeter, commented, "I think the real benefit may well be to those institutions who are already considered amongst the best in the world, and instead of seeing smaller institutions do well under this, they will either go out of business or be swallowed by the larger universities. After all, students who cannot afford to leave home, but can afford to spend time and some money to study, would still wish to choose from the best available—and given that on a distance-learning playing field things may be much more level, it may be better for someone to choose a prestigious university from far away than choose a local one with far less prestige, yet charging similar fees."

William L Schrader, independent consultant and lecturer on the future impact of the Internet on the global economic, technological, medical, political, and social world, wrote, "Many universities will be facing their demise in less than ten years. The demand for higher education will not lessen; however, the source of that knowledge will follow the Internet on a global basis…This is a warning to the university industry: Change with your market or lose them to the Internet."

Some respondents expressed alarm at the prospect of bifurcated instructional quality based upon class status.

Steven Swimmer, a consultant who previously worked in digital leadership roles for a major broadcast TV network, articulated the dichotomy. “Major universities will offer more online programs,” he said, “but there will remain a huge value to the education that continues to have a predominant in-person component. We may see a greater divide along the lines of people with money and people without. The wealthiest and brightest students will predominantly have the in-person education experience.”

An anonymous respondent wrote, “The value of the residential college experience has gone the way of the buggy whip. Residential college will only be for the top 2 to 5% of students who are either intellectually or financially superior. Those students will get access to the network of capital and influence to provide the country's leaders. I think this is very, very sad and will cause lots of class issues, but that is where technology and economics will drive the universities.”

Brian Harvey, lecturer at the University of California-Berkeley, wrote, “It's been a long time since people needed to come to a university to find knowledge or expertise; the Internet is just one step, although a big one, in the process that started with the printing press. What students find at a university is mainly *each other*—a culture of learning.”

An anonymous survey participant said, “I see declining federal and state investment in education leading to ‘customized’ education for people from different class backgrounds. Kids from families with very little money will get mass-produced education where they teleconference with teachers who have perhaps hundreds or thousands of students. Meanwhile, kids from wealthier families will have customized education with lots of valuable attention from many expert teachers.”

A selection of related remarks by anonymous respondents:

> “Only the children of the very wealthy will be able to afford a college education in 2020. Teleconferencing, distance learning, and online courses will be the norm.”
>
> “Public institutions and for-profit schools will be forced to adopt inexpensive ways to prepare students for jobs, but there will be less and less humanistic, liberal arts education built into their curricula. A tenured professorate of teaching scholars will only exist in the private elite sphere.”
>
> “The most unfortunate likely result of ‘distance’ and interactive learning will be the acceleration of the stratification of education by class and income. Those with more income will have access to a richer, less ‘virtual’ educational experience. Those with less income will be slotted into what will be essentially online test preparation.”
>
> “Economics will be of critical importance to which model wins out. Long-term economic stagnation will make it that much harder for ‘working class’ families to send their kids to college (or to see the value of doing so). This might encourage the mainstream appeal of ‘hybrid’ models. It might revert higher education to the luxury that it was prior to 1945.”
>
> “Current institutions will remain very much the same and service those that have the financial means to attend. Outside of the traditional institutions, alternatives, such as those mentioned in the second choice, will grow in numbers. Because they do not rely

as heavily on physical locations, but rely more on Web-based technologies, these schools will be more affordable and more widely available to the middle class."

"There will be strata of higher education, ranging from the full-on residential college to distance learning, and people will be able to choose from that continuum. Ideally, this would not be hierarchical in terms of status, but I suspect the residential college model will continue to be the model for wealthier students with more leisure time and less pressure to work."

"It will be a cost-containment approach that results in a degraded higher-learning experience for all but the most privileged students."

'Distance learning' is viewed with disdain by many who don't see it as effective; others anticipate advances in knowledge-sharing by 2020

Numerous survey participants inveighed against online instructional practices. These respondents particularly derided the term "distance education"—a delivery method they often described as impersonal online videos, automated testing, asynchronous participation in online discussion boards, and/or submission of assignments to a faceless teacher.

An anonymous respondent wrote, "Online interaction has shown too many drawbacks compared to face-to-face interaction: Non-verbal communication cannot be conveyed using online media, and the efficacy/efficiency of offline groups is still too much higher than online groups. The learning experience is also a social experience where students need to grasp not only academic resources, but also share experiences, learn from others, and experience a more cosmopolitan lifestyle. These goals wouldn't be easily reachable in an online setting."

There were many people who expressed sincere alarm at the prospect of mass classes with little to no personal attention for the students. They disparaged "distance education" and said a traditional, on-campus education has value that cannot be matched by any other experiences. **Amber Case**, CEO of Geoloqi, cyborg anthropologist, and professional speaker, said, "I greatly benefited from in-person lectures, and they are still a very important component of life and education."

Survey respondents referenced universities' role as a socializing force. **Steve Sawyer**, a professor and associate dean of research at Syracuse University and expert of more than 20 years of research on the Internet, computing, and work, observed, "College will continue to be a place of advanced adolescence for many, and this requires face-to-face activities."

An anonymous respondent wrote, "You won't get an undergraduate degree from Berkeley or Stanford or Harvard or Yale from your parents' basement. Doing so would belie the real purpose. Universities—where 17-year-olds turn into 21-year-olds and learn to make do for themselves for the first time, buy their first vacuum cleaner and their first cookbook, hold their first dinner party, and negotiate their first lease—these are about making the transition to adulthood and independence and have to be done in the real world."

Some respondents speculated that social networks may close the gap between face-to-face and online interactivity; after all, they are the "place" where college-age adults congregate when class is not in session.

Jonathan Grudin, principal researcher at Microsoft, weighed that prospect. "Whether online social networking will provide mechanisms for youths to shed their high school personas and networks and try out new more mature personas and develop new more challenging and rewarding networks, I don't know," he said. "Universities inevitably brought almost all students into forced contact with sets of people they might or might not have chosen to mix with, but they and society generally benefited from it happening, most people might agree (and I certainly believe so). Many traditional cultures have designed 'rites of passage' into adulthood, a ceremony or accomplishment by which a youth who has assimilated what it means to be an adult in the culture is given license to shed his child persona and adopt an adult persona. These have largely disappeared. We may let people drive at 16, vote at 18, and drink at 21, but on the whole they don't mean that much. Universities were a place some of us could start over, and without it I do not see how to guarantee a perpetuation of adolescence, unless economic adversities between now and 2020 force many people to pull themselves together to survive. I'd like to be more optimistic that some social media development will come along, but it will only happen if we want it to, and the evidence seems to be that prolonged adolescence is something our species can be comfortable with. And maybe it isn't a bad thing, but I tend to think it isn't ideal. So there is a shade of grey for you."

Futurist **John Smart**—professor of emerging technologies at the University of Advancing Technology and president and founder of the Acceleration Studies Foundation—took the notion further and said that by 2020 online social networking will already possess enough value to adequately substitute for the majority of traditional social networking on college campuses: "The other value of college, the social one, meeting others who you network with to do things like start businesses, is the one that is rapidly moving online as social networks, meet-ups, and Internet television advance," he said. "The typical BS holder has just shown they can do something difficult, nothing more. This will remain 90% of the value of a college education (the social value will no longer be exclusive to brick-and-mortars by 2020) and will remain the primary requirement for entry-level work in 2020. With luck, perhaps 20% of online and brick-and-mortar BS students will be engaged in online (more than half) or in-person (less than half) internships at some point during or immediately after BS graduation. Again, MS, technical, certificate, and remediation education will be online both earlier and more extensively."

Even the smell and feel of being face-to-face might be something possible to achieve by distance, contended **Tan Tin Wee**, who is based at the National University of Singapore and a participant and leader in many Internet engineering efforts. He said, "In-person events will become all the more important. Not all subjects can be de-physicalised. Somebody has to be in physical contact as much as we want to believe in telesurgery and tele-remote research in the wet lab. Internet haptics and aromatics will take another few decades."

Even today's inexpensive tools like Skype and the affordances offered by Google Docs allow for greater out-of-class interactivity. **Cyndy Woods-Wilson**, an adjunct faculty member at Rio Salado Community College in Tempe, Arizona, and content manager for the LinkedIn group Higher Education Teaching & Learning, wrote, "There is a need for speed, and fortunately we've got it. Universities are quickly adapting content delivery modes from all face-to-face to using

free online modalities like Facebook groups, Twitter hashtags and Google Plus circles. Not only does it allow higher education to change from costly on-site installations of software (and subsequent upgrades), it allows students to use familiar tools to explore the unfamiliar. Individualized learner outcomes exist naturally within the cloud-computing atmosphere, as students choose their level of commitment and involvement in the group. Should they need to re-visit comments, webinars, etc., they are able to do so at their own time. Students will quickly self-select times they learn best, rather than artificial 'class-times' set by a rigid scheduling need. And really, isn't that what education is all about?"

More-advanced functions—such as Live HD video streaming—are likely to become more affordable, efficient, and easy to use by 2020, joining the older delivery methods of remote learning, according to some respondents. For instance, the world's top genetics researcher could deliver a lecture to billions at once and by answering questions in real time the faculty member might make each participant feel as if he or she is standing in the same room.

David D. Burstein, author of *FastFuture: How the Millennial Generation is Remaking Our World* and a senior at New York University, said, "The biggest change will be the enhancements to connect relevant peers from around the world to the discussions that are taking place in person. Technology will also push universities to become more open-source, have more public livestreaming (with comments) of many classes, offer the ability to enhance collaboration and enhance written work by crowdsourcing will become much more accepted."

Some experts who had directly interfaced with remote education delivery extolled its unique abilities to engage various types of learners.

Ed Lyell, a professor at Adams State College and consultant for using telecommunications to improve school effectiveness through the creation of 21st-century learning communities, commented, "I have taught Internet courses for over a decade now. My interaction with students is often much more involved and significant with the online students than with the classroom students who avoid interaction. Lurkers can get passed in either model unless the professor makes it a point to force students to get involved and expose their ideas to others."

An anonymous survey participant seemed hopeful for the prospects of remote learning by the decade's end, writing, "The 2020 model of higher education will focus on making the student a person who can effectively translate problems into solutions, translate intercultural conflicts into opportunities for innovation, and translate data and information into knowledge products. The move to distance learning is precisely a shift in that direction as universities move to online, fee-based professional programs as revenue-generators while remaining true to their mission to provide a solid liberal arts and sciences education."

A selection of related remarks by anonymous respondents:

> "A good chunk of Scenario B, projected for 2020, has already happened in 2011. A significant percentage of Penn State's 'distance learners' are actually campus residents who take some of their classes online to help manage their schedules. When even residential students start preferring online classes to face-to-face, the shift has happened. This will continue to be masked by national regard for residential liberal arts colleges, but any survey of 1,000 students taking any for-credit course would include only small numbers of that population in the total."

"Just as it is no longer necessary to build or rent a chain of brick-and-mortar storefronts across the country, as with Amazon books, it will no longer be necessary to herd students and teachers together in one physical location. Education, at bottom, is a business just like any other and stands to gain just as much from digital technologies' enablement of the 'long tail' business model."

"Higher education in the developed world will adopt many new technologies and will remain largely in the classroom with face-to-face interactions. In the developing world, information will be distributed largely through electronic networks. Strong communities will emerge, fueled by talent and ideas, and there will be a dynamic information-sharing relationship between traditional models and new models of education."

'Bricks' replaced by 'clicks'? Some say universities' influence could be altered as new technology options emerge; many say 'locatedness' is still vital for a quality experience and optimal outcome

Several respondents noted that online delivery methods will be adopted as a cost-containment strategy—particularly by land grant universities/large public institutions which remain largely dependent upon often-volatile sources of public funding.

Alexandra Samuel, director of the Social + Interactive Media Centre at Emily Carr University of Art + Design, noted, "The technology drivers for change in higher education are now being compounded by budgetary considerations that will drive more and more institutions towards heavily online offerings. The budget crunch that is facing most public university systems, and an increasing number of private institutions, makes online learning not only tempting from a pedagogical perspective (after all, how better to reach a generation that has grown up on screen?), but also as a way of managing the otherwise irreconcilable demands to serve more students at a lower cost."

Charlie Breindahl, a part-time lecturer at the University of Copenhagen and the Danish Centre for Design Research, pointed out, "Universities are incredibly conservative when it comes to teaching. The state-funded universities in my country, Denmark, are all trying to squeeze money out of their teaching efforts with methods such as less counseling, shorter semesters, bigger classes, cheaper exam forms, etc."

Jim Jansen, associate professor in the College of Information Sciences and Technology at Penn State University, who sits on the boards of eight international technology journals and serves on advisory boards for three Internet start-ups, presented a parallel argument. "There is already increasing pressure on universities to either show value or add value, with many questioning whether a college degree is worth the cost," he said. "Therefore, there is pressure to keep costs down. With personal costs being 80% or more of a college budget, online and alternative learning (at reduced personal cost) is attractive. Plus, there actually might be value to the student."

Some survey participants urged that universities place a priority on online "space." This will be a major switch because schools have historically placed significant energies into capital campaigns and on-campus development efforts. An anonymous survey respondent noted, "The age of

brick-and-mortar dinosaur schools is about to burst—another bubble ready to pop. The price is too high; it's grossly inflated and the return on investment isn't there. Online learning will be in the ascendant. There will be more international interactions; I believe we will see somewhat of a return to a Socratic model of single sage to self-selecting student group, but instead of the Acropolis, the site will be the Internet, and the students will be from everywhere."

Jeff Jarvis, director of entrepreneurial journalism at the City University of New York, added, "The disruption that has overtaken media will next take on education. It simply does not make sense for thousands of educators around the world to write and deliver the same lectures on, say, capillary action—most of them bad. The best can be shared and found. Then, I believe, in-person education becomes more a matter of tutoring. Think of the Oxbridge lecturer/tutor structure distributed via the Net. This quickly changes the economics of education: The marginal cost of another student learning from the finest lecturers in the world is zero. Teachers will need to see how they are needed and how they add value. In my book *What Would Google Do?* I looked at separating the functions of a university: teaching, certification, research, and socialization. These need not be accomplished all in the same space."

Michel A. Coconis, an assistant professor of social work at Wright State University, wrote, "Higher education will not even need all the buildings they are constructing because it will all be Walmart University. The best professors, based on someone's criteria (I cannot yet specify) will be identified, recorded, perhaps have some enhancements, and then catalogued, and everyone can take those courses for their degree. I fear that everyone will get the same degree as this replaces high school, and perhaps the advanced education will eliminate courses such as liberal arts and focus on the technical aspects of a select few majors. I think most courses will be online with video/audio, and maybe writing will be minimal. It is possible that 2020 brings the move to hybrid and that my scenario is, say, 2040."

A selection of related remarks by anonymous respondents:

> "Telecommunications and bandwidth capabilities will be such that everybody's going to communicate face-to-face in class, even though they need not be all in the same physical location."
>
> "The ability of the Internet to broaden the student body without needing to invest in expensive geography means that top-tier schools can branch out worldwide. They will probably still require some form of residence, but of much shorter duration, say two years, doubling their throughput. The remaining, variable time will be the students' responsibility. Schools will continue to build their reputations through research and even increase the balance in that direction by sharing courses among themselves and creating something like a conglomerate of like schools—think Ivy League conglomerate."
>
> "The saving of fuel, time, and distance play a big part in taking the class out of the classroom. Whether a student is in India, China, or rural West Virginia, they will all have access to a better education."
>
> "Higher education will be in transition, integrating virtual access to experts while forming stronger bonds between advising committees and their students."

"If our economy continues to slide down, if the jobless rate continues to remain high, and if university and college tuition continues to climb, this mix will put further pressure on higher education to look to innovative ways to attract and retain students. Technology and more customizing your experience are two of these ways. Also, young people who are used to on-demand everything and 'I' everything will feel more comfortable crafting individual courses of study for themselves."

"Several forces will impact this: the general overall increase in the levels of education globally, the developing world using Web and cell technology to jump over intermediate technologies, the high cost of face-to-face instruction, the improvement of AI as a factor in individualizing education, the passing of the Baby Boomers as educators in the system, the demand for Millennials and beyond for relevant learning models, China will develop a leading learning format, first to educate its population and then expand it to teach the world."

There were also people who said technology should never drive change. An anonymous respondent wrote, "Technology is no substitute for traditional education. 'Vir bonus dicendi peritus' or the good man who can speak well will not be brought about by techno-based thinking."

Frustration and doubt mark the prospect of change within the academy

While the technical capacity for higher education's advancement will likely be in place by 2020, many experts view universities' complex bureaucracy as a limiting factor toward achieving widespread technological transformation by the decade's end.

Glenn Omura, an associate professor of marketing at Michigan State University, observed, "Universities move as fast as brontosauruses. Nine years' time is insufficient for *most* universities to adopt the new technologies in sufficient scale to make much difference either way. In addition, since professors at leading universities are rewarded on research, not teaching, there is little incentive to learn new technologies and introduce them to the classroom."

An anonymous respondent made a similar argument: "From the 1960s book *The Peter Principle*, the system exists to perpetuate itself. Regrettably large universities lack the nimbleness to be able to adapt to rapidly changing realities. The system of higher education (as someone who has spent the last 20 years at major universities) is already broken, but instead of changing to make a university education more relevant, we herd students into larger and larger lectures and ask them to regurgitate esoteric facts."

Don Hausrath, retired from the U.S. Information Agency, spoke about the silos that comprise the institution's architecture. "The university is organized by departments—cumbersome decision-making bodies—and filled with academics whose major interests are their own research and training students to explore aspects of their academic interests," he said. An anonymous respondent noted that obstacles for transformation are primarily internal, tied to human capital, writing, "Students will have the ability to utilize cutting-edge technologies, but educational institutions will be much slower to have them available. Budgetary limitations are one cause; the faculty not wishing to try something new is a significant additional cause."

A lecturer in sociology at a major public university explained, “While I am seeing a fairly clear shift at both community college and university levels toward teleconferencing and distance learning, the complications of this shift are understood within the system, but management tools to surmount them have not yet really become available. The concept of ‘Just In Time’ teaching is a lovely idea and incredibly impractical in practice. The problem is not the technology but the training in how to use it. Too many faculty members are frankly not equipped to make the shift; they do not have the time or the incentive to learn new ways of teaching. At the community college level, the disjunction is worse—faculty are not compensated for anything but student contact time and thus have zero incentive to learn anything more than the absolute minimum they need to know to conduct their jobs. The problem, frankly, is the lack of respect for teaching as a profession, including the lack of compensation at the basic levels. As a society we reward specialists, not generalists.”

Nikki Reynolds, director of instructional technology services at Hamilton College, presented the counterpoint. “Indeed, the most common complaint I hear from faculty is that they really don't want to have to learn a new version of their favorite tools, whether they are word processors or scientific modeling tools,” she wrote. “Teaching has been part of society since the beginning, and it has mostly relied on language for transmission. I can appreciate that technology is offering us many new ways of connecting to each other and to different expressions of information, but we are still primarily interested in passing what we each personally understand over to young people, whom we hope will develop a similar understanding. That requires a personal connection. Those technologies that deepen those connections will flourish, but not quickly enough to completely remake the educational process in nine years.”

Yet investment in technological delivery tools may reverse the path, other experts say. An anonymous respondent argued, “Instead, how about: Choice One: In 2020, most universities will be bankrupt, tenured professors will be unemployed, and young adults will be walking the streets, looking for work *or* Choice Two: In 2020, colleges and universities will be growing at a fast pace, there will be a shortage of skilled and learned teachers, and student learning will blossom in this environment.”

A selection of related remarks by anonymous respondents:

> “The ‘university’ has not changed substantially since its founding in about 800 AD or so. Other than adding books, electricity, and women, it is still primarily an older person ‘lecturing’ to a set of younger ones…There will be both a large number of largely traditional universities and an ever-expanding range of alternatives in both technology and organizational form.”
>
> “Universities are awfully slow to adapt. And why should they? At present they have a lucrative monopoly. In what other industry do you see such runaway price increases? They’ll ride that for as long as they can and only change when on the cusp of irrelevance.”
>
> “Universities and colleges are not run efficiently by any institutional standards, so traditional brick-and-mortar classrooms with professors like me simply cannot charge public and private payers and continue as we do. There are too many institutions, far too many programs and intellectual duchies that operate primarily to feed academic ego and ‘document’ performance for promotion, and—sadly—the alternative may be wholesale flight to education by computer. Many classes can be very effectively delivered online, but

disciplines within the humanities that require critical thinking, interactive discourse, and effective oral or written expression are a much knottier problem. And it is these very disciplines and exactly this sort of ruminative education that provides the 'glue' for civil society."

"Students will have the ability to utilize cutting-edge technologies, but educational institutions will be much slower to have them available. Budgetary limitations are one cause; the faculty not wishing to try something new is a significant additional cause."

"They have made significant investments in brick and mortar, and unless they stuff those buildings full of students, it's been a waste of resources. I can see small shifts in programs and classes offered, but only from pressure from employers asking for graduates to be more learned in certain areas. I have yet to see a visionary higher education institution embrace the potential of new technologies and the pace of the demand. I think one-year advanced degrees and certifications should be developed; more online and group learning and more leadership in general from universities need to be displayed."

"Universities are big, slow animals that are resistant to culture change, regardless of technological adoptions. A shift to customized outcomes runs counter to the entire idea of a liberal arts education, and faculty will not stand for that. Additionally, cash-obsessed conservatives are slashing education budgets in a way that will prevent universities from making innovative changes—they will struggle just to maintain the status quo."

Change *is* happening incrementally, but it will not take firm hold in most institutions by 2020

A group of survey respondents said while some institutions are making inroads into the online environs, a system-wide metamorphosis will not likely coalesce by 2020.

Alison A. Carr-Chellman, head of learning and performance systems at Penn State University, observed, "2020 is coming very soon for such a significant departure from this current model. It will evolve much more slowly, though there will be an increase in strategic uses of online learning."

A historical perspective was offered by **Dan Ness**, principal research analyst at MetaFacts, producers of the Technology User Profile. "The evolution of higher education might best be measured along a geologic timeframe than mere years or decades," he wrote. "As a former college professor in Silicon Valley (before it was called that), I've seen new technologies emerge which promise to evolve higher education. In the 1970s, we talked about the exciting promises of distance learning and on-campus technology, only to meet the inertia of the administration and educators, as well as students. Certainly, education continues to evolve. However, expecting a dramatic change by 2020 may be a bit sensationalistic."

Stowe Boyd, principal at Stowe Boyd and The Messengers, a research, consulting, and media business based in New York City, similarly predicted, "The institutions that control education are far too conservative to make radical changes at the core of their world view in the decade between [now] and 2020. Given a longer timeline, say 25 years, I would agree, but the people who will be attending colleges in 2020 are alive today and are attending extremely conventional

elementary schools, for the most part. For a change of the sort sketched in the question, we would have to see a fragmenting of the consensus about higher education and a paradigm-based battle between revolutionaries and conservatives of the form that Thomas Kuhn outlined in *The Structure Of Scientific Revolutions*. Once we start to see some significant number of established universities actually rejecting conventional education and adopting an alternative approach, then we'll have a decade or so before it displaces the old model."

Caroline Haythornthwaite, director and professor at the School of Library, Archival, and Information Studies of the University of British Columbia, agreed. "I really wanted to choose the second option—that higher education will be transformed—but 2020 is too close to achieve massive transformation of the type described," she said. "Sadly, we are still in the stage of transferring education from face-to-face to online rather than transforming education. While there are increasing pockets of innovation, this is not pervasive."

Universities will likely embrace online engagement at varying rates, suggested **Marjory S. Blumenthal**, associate provost at Georgetown University, adjunct staff officer at RAND Corporation, and former director of the Computer Science and Telecommunications Board of the National Academies. "2020 is not that far away in terms of the pace at which most existing universities change," she noted. "The trick in this question is the meaning of 'most.' I am at a very selective and traditional university, which is not like most U.S. universities."

David Lowe, an innovation and technology manager at the National Telecommunications Cooperative Association, also argued that change may occur unevenly between institutions and degree programs. "Local educational institutions may be slow to adapt to embrace these telecommunications tools due to cultural and bureaucratic traditions," he wrote. "But the demands of society and the workplace will demand the adoption of telecommunication technologies to span great distances and to enable more global solutions to problems. Undergraduate teaching may be slower to adopt these tools than on the graduate and post-graduate levels of higher education."

Technological transformation of the academy is also predicated upon changes occurring beyond the campus quad. **Ann Mosher**, who serves as a communications officer at a U.S. government agency that specializes in public education, explained, "I do believe we will get there, but two factors will slow this shift: 1) Going to college is a rite of passage that is a deep part of our American persona. Unless the current recession/depression has an even greater effect on society than I expect and people just cannot afford to send kids away to college and start living in multigenerational homes, the demand for an on-campus college experience will continue to be strong. 2) Universities just cannot shift that quickly, culturally. They are ocean liners that take a long time to alter their course to avoid obstacles. Smaller, less prestigious universities and colleges may be more nimble in the water, like a ferry, and embrace technology to support less on-campus time."

Pamela Rutledge, director of the Media Psychology Research Center at Fielding Graduate University, and and instructor at UC Irvine Extension Business School, argued that a broader paradigm shift is in order: "To embrace hybrid forms of learning environments, we have to face the difficult task of dismantling the current structure of our educational system. It is frozen in time, based on assumptions that don't fit the current world. We need a broader vision of what it means to educate, not just how to integrate technology. This means we need to redefine what it means to both teach and learn."

A selection of related remarks by anonymous respondents:

> "It is likely that a significant bubble is building. Tuition is rising too fast, and higher education is on a path to pricing itself out of the market. Already, the earning potential of some degrees in the liberal arts does not justify the costs, particularly in light of crushing student loan debt. In the face of increasing use of Web-based instruction, universities continue to build physical buildings; it seems donors are less impressed with having a website named for them than a chemistry building or art gallery. New technologies make it possible to obtain knowledge on the Web for free or at low cost. However, higher education has a monopoly on degrees and accreditation. This will hold up until employers lose faith in the value of those degrees. There is a precarious bubble; nevertheless, I do not think the bubble will burst by 2020."

> "There are too many professors who will need to retire before higher education changes significantly. It's not to say that they are not trying, but I think the conceptual change shift is too much to recognize. At some point, the changes technology has to offer increase at a speed that creates difficulties for most people."

> "Not by 2020. The traditional universities will eventually be forced to move to these more innovative approaches, but it will take much longer for them to get there."

> "Instead of recognizing the changes in technology and trying to come up with a new education system that can truly reap the benefits of such technology, the current system tries to merely add it on top of what is an antiquated system. Education all the way from bottom to top should be shifting to a more go-at-your-own-pace system to allow for those who are gifted to proceed quickly and those less-so to take it at a pace where they will still continue without being pushed through without the fundamentals."

Universities will adopt new pedagogical approaches, while retaining traditional methods

Many survey respondents said they are expecting a future combining elements from both scenarios.

Mike Newton-Ward, social marketing consultant for the North Carolina Division of Public Health, wrote, "The reality will fall somewhere in between the scenarios. I think there will still be in-person and on-campus attendance—but driven by the students as much as by the universities. The courses I teach are online courses for both residential grad students and working professionals getting an advanced degree. While class members like the convenience of studying when and where they want through technology, there is still a *strong* desire to be able to meet in person, at least occasionally."

While advanced degrees may take more advantage of online delivery tools, traditional undergraduate programs will increasingly employ such hybrid approaches, said **Steve Sawyer**, professor and associate dean of research at Syracuse University. "Many students will combine location-based education with online and on-demand courses to account for their general education," he explained, "as many of these classes are taught poorly and people get little of the potential value these topics might provide. Thus, education is blended, and course selection

is also a decision about course delivery. Specialized courses will stay residential. This pressure is likely to lead to many colleges creating tuition swaps so that they can specialize in mass class delivery or in particular niche areas. The humanities, basic social sciences and general education, will be discounted to the point of being a commodity. For graduate education, and particularly professional graduate education, will have shifted to be more on-demand and online, with limited physical residencies and a huge variety of ways to offer courses."

Speaking to personal experiences with hybrid learning in her graduate coursework, **Marcia Richards Suelzer**, a senior writer and analyst at Wolters Kluwer, an international information provider, wrote, "When I began my master's degree program, it was clear that there had been a dramatic shift in the process of higher education since I graduated from law school. Nearly all students take notes in class using a laptop. Our instructor's PowerPoint lecture notes are posted in an online message board. Exams are nearly always taken over the computer at any time during a five-day period. All assignments are submitted online. (My university, like many, uses Moodle.) During lectures, students will Google additional information on the topic (for example, the latest statistics on video gaming addition) and often will purchase the e-book version of a resource suggested by the teacher. Between Google Books and other online libraries, it is possible for any student to do the type of high-level research that could only be done at the major universities a decade ago. I can sit in my living room at 2 a.m. and access both the latest research and classic works in my field."

Hybrid learning will also reshape the character of research libraries, said **David Saer**, foresight researcher for Fast Future, a consulting business based in London. "The vast majority of elite universities, such as the Russell Group in the United Kingdom, whilst making the best use of technology to augment and support learning, will ultimately continue to rely on the traditional on-campus lecture model, for the sake of tradition as well as the value of communal learning and face-to-face contact with lecturers," he responded. "One of the biggest differences, already occurring, will be the redundancy of the traditional function of university libraries, as the majority of learning content migrates into an electronic format. Libraries will turn themselves much more into quiet study and communal learning spaces for students, making best use of the latest interactive whiteboard and conferencing technology to augment the learning and work experience. I believe there will always be a place for face-to-face tutorials and dusty bookcases, and they will, in fact, be seen as a mark of quality. However, as the higher education market diversifies and lower-end or newer universities struggle to compete, I expect to see a greater utilisation of 'hybrid' and entirely virtual classes or courses, in an effort to cut costs on the part of the universities as well as students, who cannot afford to study in the traditional manner."

Vocational skills will be blended into future hybrid environments, added **Paul Jones**, clinical associate professor at the University of North Carolina-Chapel Hill. "The biggest change will be between training and education," he predicted. "That is between meeting very specific learning goals and more abstract and creative work. Already we've seen that online asynchronous instruction works great for training people for specific tasks but less so for more complex tasks with no clear solutions. That said, more individual initiative in one's own learning and education will be necessary—and more experiential learning than just a classroom or even a computer conferencing situation. In short, more students will be getting their hands dirty—in a very good way."

John Smart, a professor of emerging technologies at the University of Advancing Technology and president and founder of the Acceleration Studies Foundation, seconded the argument:

“Look for some really great Online Internship Platforms to emerge in next ten years, affiliated with the main online jobs communities (Dice, Monster, LinkedIn, etc.). With Online Internships, you don't have to schlep the students to their internships, just bring them periodically to the brick-and-mortar companies (or to meet other team members in person occasionally for virtual companies). Increasingly, companies will work with their interns remotely, and due to online's low-marginal costs, they can work with them long enough (during three of the four college years, for example) to make the cost of training them worthwhile to employers. Again, expect most brick-and-mortar colleges to continue to graduate students who know little to nothing about the working world.”

A selection of related remarks by anonymous respondents:

> “Increased accessibility to educational resources will result in new combinations of coursework and degree requirements.”
>
> “The professor no longer wastes valuable time assessing what his/her students have learned—that is the job of the test grader, a program which examines each student's submission for the percentage of correct answers to multiple choice questions and records the result on the online database.”
>
> “Higher education will progress, leveraging technology to deliver more to students and in a way that may be adaptive to student's learning styles and needs. There will still be on-campus, in-person classes, but technology will enable and facilitate interactions among different classes on different continents and across multiple disciplines. There will be less emphasis at the undergraduate level on specific ‘majors,’ and more on being prepared to master new or otherwise different fields of endeavors.”
>
> “There will be hybrid classes, but it's not about a split between in-class and online. It's more about experiential learning: in class and in the real world. Practicums, internships, and study abroad are growing as students realize the need to have such experiences to be competitive in the tight job market. These practical, in-the-world experiences are being augmented by online meetings and classes, tying together the learnings in the classroom and the learnings in the field.”
>
> “Older students will become a much larger proportion of the overall campus enrollment. Especially for these older students, courses will emphasize applied theory. By this time, some schools will be experimenting with modular classes, allowing students to select components of a class outline, rather than be required to undertake each element in order to successfully complete a specific class.”
>
> “The trend toward multi-channel hybrid college educational programs is already happening and will only increase due to expedience, cost savings, access to more students, and student demand. My hope is that we will use distance education as a good supplement to face-to-face educational programs, enriching the educational process, and not using new technologies to replace more traditional pedagogical methods.”

Collaborative education featuring peer-to-peer learning will become a bigger reality and will challenge the lecture format

A number of survey respondents predicted that higher education's long-standing delivery format—featuring a solitary instructor, a lectern, a lecture hall, and the physical presence of students—will likely be upended by 2020.

Professors cannot merely supplant their lectures to online video, noted **Gina Maranto**, co-director for ecosystem science and policy and coordinator of the graduate program in environmental science and policy at the University of Miami. "The old pedagogical approaches cannot simply be grafted onto the new, online arena," she wrote. "For example, I am currently taking the Stanford University AI course, which has drawn 130,000 or so students. I also have explored the MIT Open Course offerings, and have subjected myself to occasional online lectures. None of these experiences even begins to tap into the potential afforded by the Internet; instead, they graft the old 'stand-and-deliver' pedagogy onto a new medium."

Marti Hearst, a professor at the University of California-Berkeley and member of advisory boards for major search engine companies and consultant to high-tech startups, said one advantage of video is to optimize classroom time. "The idea of having students watch the video lecture and/or read the material at home and then work on problems or case studies together in the classroom with other students and a teacher is a powerful model," she explained. "Such collaborations will increasingly take place with participants who are not geographically co-located. Major universities will continue to provide the lectures themselves, but less prominent colleges will most likely use others' materials primarily. This also speaks to a trend in our culture generally favoring watching video and listening to audio over reading, and I think that trend will also continue growing in the university, albeit more slowly than in the rest of our society."

Marta Lucía Restrepo, an associate professor at the University of Bergen, sees that peer-to-peer learning will yield enhanced collaboration and inclusivity for students. "Classes with no physical barriers will be a regular way to establish and maintain a more expansive and binding student-tutor relationship," she said. "More intercultural groups of students will work together on common projects and research. This will enliven the process of new-knowledge acquisition."

An anonymous respondent similarly noted, "With the new technological tools and new inventions, the world will become one big country, whereby everyone will be able to communicate together virtually. Definitely higher education will change drastically as it will move away from traditional lecturing. Learning will be based on students learning from each other with the existence of a coach."

The peer-to-peer method, with an instructor serving as mentor, will impact life beyond the classroom, predicted **Lisa Mertz**, associate professor of healing arts at City University of New York. "Students working together in teams, contributing to class artifacts, and assessing one another's work could lead to a less stratified, more collective society where people will work together for the common good rather than individualistically for one's own goals at the expense of others," she explained.

Yet **Christian Huitema**, distinguished engineer at Microsoft and active leader in the IETF, pointed out that you don't have to have a formal teacher-student relationship within an instructional setting to learn. "If people have easy access to a great source of information, they will naturally

gravitate towards it rather than towards a mediocre-but-nearby source," he pointed out. "I already observe on-demand learning among many of my colleagues. When faced with a new problem, they will use the Internet to find summaries like Wikipedia, and then original sources from academic papers. It works. I have seen young engineers progress in a year from novice status in a field to being able to interact with researchers expertly on the matter. That 'self-directed learning' may or may not be intermediated by education professionals. There is definitely a value in coaching and guiding, but the traditional classroom is not necessarily the best setting for such coaching."

A selection of related remarks by anonymous respondents:

"There is no doubt in my mind that we will be co-developing modes of learning alongside students more than delivering pre-set learning approaches to them. In areas like mobile adoption, students are racing ahead. Even today there are professors who deliver the lectures online and reserve classroom time for higher value interaction, informed in part by algorithmic analysis of when comments and questions were appended to the video. The in-class experience will include much more peer-to-peer interaction and explanation."

"The old, 'expert as the teacher' model is well worn out. Helping faculty learn how to mentor, facilitate, and guide deeper learning on a much more individual level is key. Technology affords us the tools to potentially do this for larger numbers. If truth be told, those of us that benefited from those critical elements of guidance in our profession know it was only accessible to a chosen few who had the interpersonal skills, support, and drive to make connections with faculty who would then reciprocate."

"With the new technological tools and new inventions, the world will become one big country, whereby everyone will be able to communicate together virtually. Higher education will change drastically as it will move away from traditional lecturing. Learning will be based on students learning from each other with the existence of a coach."

"'Classes' will play smaller and smaller roles, with greater automation and guidance, supported by peer, or near-peer interactions at a more personal level."

"Professors will need to adopt new technologies in such a way that the students become a more active part of the learning experience. More than teaching, professors will need to become an enabler of the learning experience of students."

"We are already used to getting information online. Lectures are inefficient. Good education, in the future, will use live people—students and faculty—for discussion, customization, and for challenging one another, not for simple information dissemination."

"The institutions that win in the long run are those that do not merely tack on technology to existing educational modes, but rather adopt entirely new ways of interacting with learners and enabling collaborative learning."

> "Expertise about facts will not matter as much as expertise about ways to look at problems and solutions, which are harder to communicate than facts. We will increasingly see value in learning how others learn, more than what they learn."

Higher education lags in preparing young people for new kinds of futures in which they will have to learn how to learn

Several experts warned that traditional institutions of higher education are not adequately preparing students for life after college. **Miguel Alcaine**, head of the International Telecommunication Union's area office in Tegucigalpa, Honduras, noted, "A big issue is the relevance of the education to the professional future of a person. Universities need to strengthen the causality between an education and a professional future, and given the nature of the economic recovery we have seen in the previous years, professionals might need to become much more entrepreneurial than in the past."

An anonymous survey participant observed, "By the time someone completes a degree, much of the information he or she 'learned' has changed or morphed; some is already outdated. The focus will be on on-going lifetime learning."

To that end, some say knowledge acquisition will no longer be restricted to traditional undergraduates. "By 2020 we'll be well on our way toward much greater informal learning at all ages," said **Jerry Michalski**, founder and president of Sociate and consultant for the Institute for the Future.

Jeffrey Alexander, senior science and technology policy analyst for the Center for Science, Technology & Economic Development at SRI International, noted, "The implication is that there will be more value placed on 'lifelong learning' and 'nontraditional' higher education, both in the workplace and in personal development. While universities may become less relevant, higher education in general will be more important in the future economy."

Many survey respondents mentioned that a cultural shift to lifelong learning could leverage traditional and non-traditional resources, including emerging technologies. **Richard Lowenberg**, director and broadband planner for the 1st-Mile Institute, proposed: "Today's universities should grow to fulfill their original role as 'communities of learning' and, in developing relationships with rural and urban lifelong networked learning, might become new 'universe-cities.' There is no university in the United States that is yet teaching/presenting an understanding of the evolving 'information environment' within a whole systems ecological framework. Without such an understanding, the digital divide will widen, universities will be contentious and elitist, technology development will be overly stimulated by unsustainable consumerism, and our economic systems will continue to be referred to as 'the dismal science.' Universities are critical microcosms and potential leaders for reconsideration of increased corporate and military support for education, especially as mediated by networked technologies and processes."

A selection of related remarks by anonymous respondents:

> "Custom, lifelong delivery of training resources and information by universities will be key if we want to keep our position in a globally connected world. The downside will be

again a gulf between those who are able to take advantage of these resources and those who cannot due to a widening income gap. The future competition among nations will be for living-wage jobs, and those governments that can motivate and support their communities to participate in lifelong learning will succeed."

"Our students are demanding that their education be more participative and relevant."

"You have to teach people how to think and analyze. The data is only part of what we need as humans."

"There will be more of a transition away from content—which anyone can Google—to learning how to be learners, more of a focus on digital literacies and collaboration, preparation for many careers during their lifetime. There will still be specialization for engineers, scientists, doctors, and so on, but that will be a small minority of the student population. Humanities will suffer."

"Education will be a near-lifetime activity, more oriented toward practice and applications. As was pointed out recently in the field of mathematics, how many college graduates will actually have to solve a quadratic equation in the course of their careers?"

Competency credentialing and certification, possibly allowing a mix of work from multiple institutions, are one prospect

The slow pace of institutional progress often impedes higher education's adaptation to the labor market, noted **Paige Jaeger** an adjunct instructor at the State University of New York-Albany. "By the time universities get their programs planned, accredited, and approved, the industry has changed. Universities must learn to quickly adapt to the needs of the workforce, and in reality, Ivy walls are not quick to adapt," she wrote.

Yet by 2020, some survey participants, including **Anita Salem**, human systems researcher at the Naval Postgraduate School, envision that universities will focus more on cultivating the hands-on professional skills necessary to get a job. "I see higher education becoming more trade-school-like, with shorter times to graduation and more of an emphasis on 'how to' as opposed to theory," she said. "We already see this in graduate schools where executive education programs are financially supporting and often supplanting other programs."

Seth Finkelstein, professional programmer and consultant and 2001 winner of a Pioneer of the Electronic Frontier Award from Electronic Frontier Foundation, agreed. "It's possible that universities will partially be replaced with some sort of more employment-focused vocational certification program (whether or not this is explicitly acknowledged)," he predicted. "But that will be for social reasons, not technological ones."

Such programs may promote connections to industry, noted **Barry Chudakov**, visiting research fellow in the McLuhan Program in Culture and Technology at the University of Toronto. "Educational partnerships will make learning institutions look like multi-logo soccer uniforms, with Harvard-IBM classes or MIT-Apple seminars, as the demands of global competition ramp up the need to innovate and rapidly bring products and solutions to market," he predicted.

An anonymous survey respondent wrote: “As more universities, especially the public universities, invest in more partnerships with technology-oriented corporations, we will see an increase in interdisciplinary programs and centers that will entrain students to think outside the boundaries of the classical disciplines in preparation for problem solving and entrepreneurial thinking.”

Some survey participants predicted that a heightened focus upon certification rather than degrees may metamorphose higher education by 2020. **Jonathan Grudin**, principal researcher at Microsoft, sketched out this prospect, writing, “There are three principal benefits of traditional universities: acquiring knowledge and skills through coursework, acquiring a credential, and acquiring social networking skills and a new social network. Credentialing will be an economic and political negotiation, won't it? Universities will expect to be paid for it, and may be tempted to hold on to residency requirements and the like, but will be threatened as the meaning of the credential comes under pressure from other increasingly digital, although also experiential, forms of assessing the skills and knowledge of a job candidate.”

Some experts, such as **Maureen Hilyard**, development programme coordinator for the New Zealand High Commission, anticipate that students will assemble their own programs of study, choosing complementary courses from various online institutions. “A hybrid approach offering more flexibility among the universities themselves would be helpful, allowing students to mix and match courses from different universities depending on what courses are available at the time,” she wrote.

Others believe that the next incarnation of university credentials will rely upon gamification. Futurist and author **Marcel Bullinga** said, “The new possibilities of and the new global market in education-at-a-distance will greatly shift the educational powers. Pupils…can choose excellent education available via screen—provided the economics of scale are turned into lower costs for students and not into bonuses for managers. Learning and graduating will be like a game: personalized, but in globally standardized modules.”

Michel J. Menou, a visiting professor at the department of information studies at University College London, put the case for customization this way: “One may hope that at least marginally some segments of academia, if not entire universities, will move toward a more open system, allowing for independent learning tailored to the needs and cognition style of individuals, making effective use of distance and presence techniques.”

A selection of related remarks by anonymous respondents:

> “Universities, as well as high schools, will do more pre-assessment of learning to prevent redundancies and boredom for those students ready to move forward.”
>
> “I have been teaching online since 1996, and I know that students can learn in an online setting. Will ‘customized outcomes’ become the norm? I'm still not certain how that might come to pass for most students. With movements like the Open Educational Resources University, we'll see more assessment of prior learning and more mixing and matching of courses, etc., but I'm not sure how that will scale to thousands of students. It's a problem that still needs solving.”

"The shift to assessments and outcomes becoming more individualized will not necessarily be evidenced with the traditional undergraduate, however. I think these changes will be a result of an increasing number of non-traditional students (older adults looking to complete an undergraduate or graduate degree) working toward educational achievement."

"What threatens this is that all Western countries are moving to rigid, assessment-based and prescriptive frameworks based on work roles and economic paradigms, so I'm not so sure about the second bit, i.e. the individually oriented and customised outcomes. Requirements for graduation will be based on dollars and industry-ordained benchmarks."

Institutional barriers may prevent customized education options

While six in 10 survey respondents said the most likely 2020 scenario is one of heightened innovation, many resisted the notion that 2020 will bring customized degree options. **Sandra Braman**, a professor at the University of Wisconsin-Milwaukee, and editor of the Information Policy Book Series for MIT Press, wrote, "The one among the trends described here that may not be a part of the configuration towards which we are moving is evaluating graduation requirements on a customized basis. This is the least developed, most difficult and costly to achieve, and most likely to be questioned from the perspective of social needs as well as disciplinary expectations."

Standardization of degree requirements will likely persist by 2020, even though pedagogy may evolve, said **Marjory S. Blumenthal**, associate provost at Georgetown University. "Changing requirements for graduation is a collective action problem," she explained, "so while there may be differentiation among categories, within at least the top-tier categories of university, significant change is not likely. Assessment of learning, while a vexed topic at selective universities, will continue to evolve, and technology will facilitate the assimilation of new approaches, making it easier and more appealing for faculty who start out confident of their abilities to assess to adopt new techniques."

John Pike, director of GlobalSecurity.org and former director of cyber-strategy and other projects for the Federation of American Scientists, said, "Attendance at elite schools is so focused on children retaining the caste and class position of their parents that it is hard to see a customized outcome for what must be a certification of uniformity, namely that the graduate can predictably and interchangeably perform sets of tasks within large complex organizations. And if the elite schools take this approach, the next tier down cannot be far behind. Schooling is not so much about subject mastery as it is about certifying the capacity to master subjects. And in technical specialties such as law or engineering, and even in these fields, there is a fixed body of knowledge that must be acquired, leaving little room for customized outcomes."

Daren C. Brabham, an assistant professor in the School of Journalism & Mass Communication at the University of North Carolina-Chapel Hill, wrote that such options could be politically charged, "Customized outcomes for graduation are highly unlikely," he wrote. "Critics of higher education (think Tea Party) as a concept and as a state budget item will likely increase the standardization of learning outcomes, not atomize them."

Rob Scott, chief technology officer and intelligence liaison at Nokia, said, “Individualized outcomes, while a fad, will be deemed unreliable due to the lack (or legality) of quality evaluation techniques. Thus an MBA from Wharton or Harvard will still require much what it does today to complete, while undergrad and secondary education diplomas will encompass more of the shifting-sands requirements and outcomes.”

An anonymous respondent said the vibrancy of a traditional liberal arts education may be lost by specializing, writing, “Shifting the emphasis to ‘customized outcomes’ will lead to narrow-minded and less flexible students.” Some disciplines—such as the creative arts—may prove problematic, if not impossible, to adapt to the Web. **Mark Callahan**, artistic director for Ideas for Creative Exploration at the University of Georgia, shared his view that, “As a fine arts studio instructor, I find it hard to imagine that there will ever be a ‘mass adoption’ of teleconferencing and distance learning in higher education in my field, which depends so much on nuanced social interaction (peer review) and mentorship. A market for such offerings will continue to grow, but will never gain the legitimacy or networking benefits of face-to-face education.”

Other fields are expected to possess qualities that demand standardized requirements. "In my profession,” said **Marcia Richards Suelzer**, a senior writer and analyst at Wolters Kluwer, “it's doubtful there will ever be ‘customized’ graduation outcomes because of the licensure requirements, but clearly the Internet makes it possible to design custom learning experiences.”

Scalability emerged as another concern related to customization, as the start-up costs for traditional universities can be daunting. An anonymous respondent shared, “It would be very difficult for a large university with 35,000 students to implement ‘requirements for graduation will be significantly shifted to customized outcomes.’ This tends to be relevant for the top 10% of college-bound students. The other 90% are perfectly willing to follow the requirements as they are today.”

Others disagreed—envisioning a user-driven landscape of “designer degrees,” in which students are encouraged to construct their own programs of study. An anonymous respondent wrote, “Universities are realizing that if they don't innovate, they can't compete. With costs of education rising in an already weak economy, these customized courses are becoming all the more important, and colleges have already begun to respond. While traditional assessments of learning and the tradition of in-class lectures will never full fade away, I do think we will see a continued movement to more individualized and customized course loads designed for each student’s learning goals.”

Alan Bachers, director of the Neurofeedback Foundation, pointed out, “The era of super-specialized education is upon us. All learning will soon be online. Guided learning by talented professionals will be part of this revolution. Universities will have to repackage themselves when all knowledge is available free or by subscription. Skill practicing or gaining mastery by repetition will be the new ‘school,’ whether tying thousands of operating room sutures, flicking in a hockey goal, or the 10,000 repetitions required for mastery in some disciplines.”

Karen Hilyard, an assistant professor of health communication at the University of Georgia College of Public Health, agreed. “This is where the Internet can really excel: the provision of targeted, self-paced instruction and interaction,” she explained. “In an era of rising energy and fuel costs, it makes great sense to shift certain activities online; the exciting thing is that

efficiency here does not demand a cookie-cutter approach, but rather makes individualized education more possible."

A selection of related remarks by anonymous respondents:

> "I suspect that 'classes' will play smaller and smaller roles, with greater automation and guidance, supported by peer, or near-peer interactions at a more personal level. I am not confident we will see 'customized' outcomes, since I doubt that the market for education-based competence will develop in ways that support linking greater diversity in capability to their potential applications by employers (we just don't know enough about what specific skills are needed for future jobs)."

> "Standardized forms of assessment will remain in place. Individually oriented learning implies having a system that supports it as a practice and provides teachers with the resources they need to carry it out. We don't have the ability to offer individual customized learning to each student, regardless of the platform. As our country invests less and less in education and standards decrease, this is unlikely to change."

> "Will 'customized outcomes' become the norm? I'm still not certain how that might come to pass for most students. With movements like the Open Educational Resources University, we'll see more assessment of prior learning and more mixing and matching of courses, etc., but I'm not sure how that will scale to thousands of students. It's a problem that still needs solving."

> "A shift to customized outcomes runs counter to the entire idea of a liberal arts education, and faculty will not stand for that."

Some predict significant redefinition within higher education in a future packed with choices for knowledge acquisition

While most respondents to the survey depicted a future marked by incremental progress, some experts forwarded bold assessments for the state of higher education in 2020.

Bryan Alexander, senior fellow for the National Institute for Technology in Liberal Education (NITLE), envisioned that, "By 2020 we will see: 1) A split between teaching and research faculty. Teaching faculty will largely be part-time, ill-paid, and expected to do no research. Research professors will teach little (perhaps the occasional grad student) and focus on grant-funded research. 2) Distance learning will be normative. A majority of students have taken at least one online class by age 16. The default for learning is online at this point. 3) Number of college campuses will dwindle. Those that survive will emphasize: face-to-face experiences; campus grounds (beauty, history, charm); charismatic teachers; a sense of tradition (meaning mid-20th century, but aiming for an older time)."

An anonymous respondent predicted a new star system for elite faculty, writing, "This phenomenon has the potential to make higher education more of a winner-takes-all profession. The most effective faculty (or the faculty who are most willing and able to effectively market themselves) will become 'superstars,' in demand for various sorts of lectures and workshops, both live and recorded, at their own institutions and at other institutions. This superstar status will be rewarded with ever-greater compensation. On the other end of the spectrum, the least

effective faculty (or those least effective at marketing themselves) will find significantly less demand for their teaching services."

Patrick Tucker, deputy editor of The Futurist magazine and director of communications for the World Future Society, predicted a powerful instructional role for future faculty: "Future information technology advances will influence education and higher education in the following ways: 'Vocational training' will lose its rotten stigma in the United States, and more kids will do core course work online and via teleconference and devote their in-person time to their apprenticeship. This will work better for everyone. Thanks, Internet! Lesson plans will have an IT component and an in-person component, and this will raise education outcomes significantly. Both of these components will be customized to individual students. Sons and daughters of privilege will continue to attend in-person classes at the nation's top schools and will realize the attendant social rewards in doing so. The value of in-person schooling will decrease for everyone else, and most institutions will diversify their offerings and their business models. The future for teachers is still bright. Student performance rises when teachers can give more time to individual students. The medium for giving that attention is shifting away from schoolhouses toward online environments coupled with real-world working situations, but teacher insight and attention is still the critical factor to reaching better education outcomes."

Student services that support the educational mission will also largely concurrently evolve, some experts say. **Cathy Cavanaugh**, an associate professor of educational technology at the University of Florida, Gainesville, predicted, "Higher education will be much more personalized, with fewer educational experiences and credentials packaged in courses and degrees, and take place in a wide range of physical and virtual learning environments, signaling a return to forms of learning in performance contexts in apprenticeship models. Universities will join with workplaces and other organizations to assess learner entry levels and broker the experiences they need to reach a desired level of expertise. Universities will be assessment, counseling, library, and quality management centers that connect learners with digital and human instructors, many of whom work as consultants/contractors (almost troubadours)."

Flexible education was featured in one anonymous respondent's prediction: "Individuals will be able to 'pick-and-choose' their educational paths from global sources. Unless there is a technological breakthrough that allows HD video via reading glasses-sized displays, there will be segmented consumption—large-screen video at home and office for pleasure and learning and small-screen video for info updates. People will learn from video and audio, with less emphasis upon the written word. There will be a tendency to easily forget the past, even the recent past, and therefore repeat the mistakes previously made. Because the individual will be able to choose his or her educational path more fluidly, 'credentialing' will become a major industry in education. It won't necessarily be what you know and have experienced, but does your present knowledge have value, and have you proven capable of learning 'on the fly'?"

David Weinberger, senior researcher, Harvard University's Berkman Center for Internet & Society and Harvard Library Innovation Lab, noted, "The most rapid learners on the planet these days are software engineers. They've built an environment that facilitates incredibly fast learning. It's characterized by the emergence of pragmatic truths via social filters, a culture of collaboration, and a sense that learning is a public act. I'm guessing that other fields will move in that direction."

Other survey participants portend that drastic changes will metamorphose the conception of the four-year institution by the decade's end. **Hakikur Rahman**, chairman of the SchoolNet Foundation of Bangladesh, said in 2020, "Learners will be able to learn when they want, what they want, and how they want. Educators will equip themselves to be able to compete in the world of a supply-and-demand chain of knowledge. Learning will not be limited by age or sex; it will not be discriminated by regions or religions; it will not be narrowed down due to culture or history. Learning will be like a homogenous fluid to elevate the knowledge content of each and every living human being on the planet."

About the Pew Research Center's Internet & American Life Project

The Pew Research Center's Internet & American Life Project is one of seven projects that make up the Pew Research Center, a nonpartisan, nonprofit "fact tank" that provides information on the issues, attitudes and trends shaping America and the world. The Project produces reports exploring the impact of the Internet on families, communities, work and home, daily life, education, health care, and civic and political life. The Project aims to be an authoritative source on the evolution of the Internet through surveys that examine how Americans use the Internet and how their activities affect their lives.

The Pew Internet Project takes no positions on policy issues related to the Internet or other communications technologies. It does not endorse technologies, industry sectors, companies, nonprofit organizations, or individuals.

URL: http://www.pewInternet.org

About the Imagining the Internet Center at Elon University

The Imagining the Internet Center's mission is to explore and provide insights into emerging network innovations, global development, dynamics, diffusion and governance. Its research holds a mirror to humanity's use of communications technologies, informs policy development, exposes potential futures and provides a historic record. It works to illuminate issues in order to serve the greater good, making its work public, free and open. The center is a network of Elon University faculty, students, staff, alumni, advisers, and friends working to identify, explore, and engage with the challenges and opportunities of evolving communications forms and issues. They investigate the tangible and potential pros and cons of new-media channels through active research. Among the spectrum of issues addressed are power, politics, privacy, property, augmented and virtual reality, control, and the rapid changes spurred by accelerating technology.

The Imagining the Internet Center sponsors work that brings people together to share their visions for the future of communications and the future of the world.

URL: http://www.imaginingtheInternet.org

Methodology

The survey results are based on a non-random, opt-in, online sample of 1,021 Internet experts and other Internet users, recruited via email invitation, Twitter or Facebook from the Pew Research Center's Internet & American Life Project and the Imagining the Internet Center at Elon University. Since the data are based on a non-random sample, a margin of error cannot be computed, and the results are not projectable to any population other than the experts in this sample.