PRESIDENTIAL INNOVATION LAB
{WHITE PAPER SERIES}

Presidential Innovation Lab Participants

Joseph E. Aoun, President
Northeastern University (MA)

Chris Bustamante, President
Rio Salado College (AZ)

Scott S. Cowen, President Emeritus
Tulane University (LA)

Michael M. Crow, President
Arizona State University

John F. Ebersole, President
Excelsior College

Renu Khator, President
University of Houston and
Chancellor, University of Houston System

Paul J. LeBlanc, President
Southern New Hampshire University

Robert W. Mendenhall, President
Western Governors University

Vincent Price, Provost
The University of Pennsylvania

Mohammad H. Qayoumi, President
San José State University (CA)

L. Rafael Reif, President
Massachusetts Institute of Technology

Kevin P. Reilly, President Emeritus
University of Wisconsin System

A. Clayton Spencer, President
Bates College (ME)

Linda M. Thor, Chancellor
Foothill–De Anza Community
College District (CA)

This series of Presidential Innovation Papers is edited by Cathy A. Sandeen, the American Council on Education's vice president for education attainment and innovation.

As part of a grant from the Bill & Melinda Gates Foundation, the American Council on Education convened a group called the Presidential Innovation Laboratory (PIL).

The purpose of this effort was to examine and explore new models inspired by the disruptive potential of new educational innovations—technological, pedagogical, organizational, and structural—especially those that could increase the number of Americans able to earn a post-secondary degree, certificate, or credential.

Fourteen chief executive officers from a diverse group of colleges and universities participated in the PIL, which provided an opportunity for higher education leaders to engage in proactive thinking about the evolving dynamics of higher education and guide a national dialogue that will help colleges and universities serve students—and close persistent student attainment gaps—in the years ahead. Two-day convenings took place—one in July 2013, and one in October 2013—facilitated by the Institute for the Future, an independent, nonprofit research organization located in Palo Alto, California.

The goal was not to issue a series of recommendations, which is not really possible, the group agreed, given the vast diversity of higher education institutions in the United States. Instead, the goal was to engage in a robust and wide-ranging conversation about the various drivers of change and potential reactions to those drivers.

This series is a reflection of some of the important conversations of the group, with a focus on four somewhat overlapping areas: major drivers and signals of change in postsecondary education; business model innovation; the changing faculty role; and the students of the future. We are pleased to be able to share some of this thinking with a wider audience.

This paper, *The Students of the Future,* explores the various demographic, economic, technological, and pedagogical drivers that are shaping change for students of the future—requiring college and university leaders to reflect and plan. Several PIL participants were interviewed for this paper. The editor acknowledges and thanks Kathryn Masterson for her contributions toward this paper.

WHO ARE THE COLLEGE STUDENTS OF THE FUTURE?

Major changes in demographics, technology, social media, and students' learning styles—as well as their expectations for the learning experience—mean the students who will be coming to colleges and universities in the next five to 10 years are very different than those in the past. As higher education looks ahead to the future, colleges and universities will need to be mindful of where changes, gaps, disconnects, and opportunities exist.

The digital revolution has left little untouched, and the college students of the future will have grown up right along with it. Currently, 97 percent of young adults ages 18 to 29 use the Internet, according to the Pew Research Center's Internet & American Life Project survey. Ninety percent of young adults use social networking sites.

Young people today are networked, connected, and used to having information at their fingertips; they have libraries of knowledge accessible with just a tap of a screen. Even low-income students—and demographic projections show that young people who will be higher education's next generation of students will be less wealthy than their predecessors—have access to smart phones that connect them to the world.

"There's a huge shift from broadcasting to participation," says Constance M. Yowell, who oversees a program on digital media and learning as director of education for the MacArthur Foundation. Participation is the heart of social media and peer-to-peer learning, she says, and "antithetical to what they experience in a college classroom."

Forecasting who the college student of 2020 or 2025 will be is an imperfect science. But based on what researchers, educators, and journalists are seeing and experiencing today, as well as population and demographic projections, a picture begins to emerge.

Young people don't want to be passive learners: They are content producers, not just consumers. They communicate in different ways than older generations, in shorter bursts, and they are used to being a part of large networks that allow them instant feedback on their thoughts and ideas. At the same time, they may be coming to the college or university unprepared in some areas and prone to distracted thinking brought on by constant use of smart phones and/or other technology. They may not yet have the skills to think deeply about a subject and draw connections in the way that colleges and universities—and ultimately employers—expect.

Experts in digital learning see a disconnect between today's young people and how colleges and universities currently organize and teach. A disconnect also exists between the needs of the next generation of students—many of whom will be used to learning in hybrid, online formats and in informal ways—and the traditional ways that institutions teach, assess students' learning, and award credentials.

Mohammad Qayoumi, president of San José State University (CA), which sits in the heart of Silicon Valley and is known for its experimentation with methods and technology, says higher education must "embrace the change the digital revolution is bringing." Any institution that thinks it is immune from that change may find itself obsolete, he says.

DEMOGRAPHIC SHIFT

The portrait of the "typical" college student, if one exists at all, is changing. The next generations of students entering higher education will look different than those in the past.

The Western Interstate Commission for Higher Education's 2012 report *Knocking at the College Door: Projections of High School Graduates* identified two major trends—a modest decline in the number of high school graduates, and a pool of future college students that is becoming more racially and ethnically diverse.

In the 10 years from 2009 to 2019–20, the proportion of non-white graduates of public high schools is expected to increase to 45 percent of U.S. high school graduates, an increase of more than 7 percent. The change varies state to state, but most states will see an increase in the number of Hispanic and Asian graduates. By 2019, states including Florida, Georgia, Maryland, Nevada, and Arizona are expected to have graduating classes that reach majority-minority status (California, Hawaii, New Mexico, Texas, and the District of Columbia already have that makeup).

Sara Lipka's article in *The Chronicle of Higher Education*, "Demographic Data Let Colleges Peer Into the Future" (2014), outlines major demographic trends that will affect higher education: fewer traditional-aged students, a greater proportion of non-white students, a greater proportion of students from lower-income families, and a greater proportion of first-generation students.

Public school enrollment is projected to increase, and private school enrollment is projected to decrease, according to the U.S. Department of Education's *Projection of Education Statistics to 2022* (2014). For colleges and universities, as well as the K–12 system, these demographic shifts will likely put pressure on educators to deal with education and attainment gaps.

Students may become even more price sensitive when choosing a college or university. An analysis of U.S. Census data by *The Chronicle of Higher Education* showed that, in places where the number of children ages four to 18 was growing, families were less wealthy than in the areas where the number of young people was going down.

Providing a different perspective, a report by The Parthenon Group, *The Differentiated University: Recognizing the Diverse Needs of Today's Students* (2014), segmented students by their needs and motivations. These segments include "aspiring academics," traditional students with high academic motivation and preparation (24 percent); "career accelerators," older students who want to advance their careers (21 percent); "industry switchers," students who need to change careers due to adverse economic conditions (18 percent); "career starters," traditional-aged students who are highly focused on job-related skills acquisition (18 percent); "coming-of-agers," traditional-aged students who are unsure of their future path (11 percent); and "academic wanderers," who know they need a degree, but do not have a clear direction (8 percent). Each segment has different risk profiles in terms of persistence and completion.

From almost every viewpoint, the students of the future are less and less likely to conform to our image of "college students"—traditional-aged, full-time students living on campus. Students will have a wide range of backgrounds, skills, abilities, needs, and motivations that will have an impact on recruitment, enrollment management, advising, academic programs, facilities—virtually every aspect of the institution.

UBIQUITY OF TECHNOLOGY: THE SMART PHONE GENERATION

No matter what students look like, or their family incomes, one common shift for the college students of the future is that they all are likely to be bringing their own tech devices to the classroom.

The explosion in smart phone use has been as a major force for change in how young people are living and learning, researchers and observers say. Even in poor countries, says San José State's Qayoumi, who was born in Afghanistan, young people with few other resources have access to mobile devices. Society has moved from scarcity of knowledge to knowledge being available 24 hours a day, Qayoumi says, and people have more ways to access that knowledge. That represents a significant change for educational institutions, which no longer control how information will be disseminated.

A look at smart phone adoption over the past few years shows how rapidly the technology is spreading and how common it is. In America, according to the Pew Research Center's Internet & American Life Project, 58 percent of all adults owned a smart phone in January 2014. For young adults ages 18 to 29, that number was much higher—83 percent. While a higher percentage of high-income adults own cellphones, almost half of adults with a household income of less than $30,000 report owning a smart phone. Tablet computers have grown at an even faster rate. In May 2011, 8 percent reported owning one, according to the Pew study. By January 2014, that number was 42 percent.

As prices for technology continue to drop, one can expect that the number will be even higher as the next generation and the ones thereafter enter college. Moving between technological platforms will be natural for them—it already is, Qayoumi says. "We are going through a technological transformation," says Marina Gorbis, executive director of the Institute for the Future. Constantly being connected to the network and resources is an expectation of daily life. "It's not about going to school and opening your computer," she said. "The technology is an extension of people's brains and bodies." So what does that mean for higher education?

Faculty should consider working with students' technology rather resisting or forbidding it. Even something as simple as asking students to look up something during class could be a way to use mobile devices to the benefit of the classroom, says David Theo Goldberg, director of the University of California Humanities Research Institute, which has developed a research hub in digital media and learning.

Students will be coming to higher education with a very different idea of what knowledge acquisition looks like, Goldberg says. Many of them know how to find the information themselves. They don't want a master expert holding forth in the front of the class—they want a facilitator who will encourage connected learning with their peers, where they can engage each other, each bringing different strengths to the experience.

Connecting students to each other is key, and a change from how subjects were taught in the past, Goldberg says. Before, peer-to-peer interaction tended to happen at the college or university during recreation hours, while learning was an individual pursuit. Now, "it's almost as though learning is a part of recreation," he says.

DIFFERENT WAYS OF COMMUNICATING

Twitter is an example of a tool that can be both recreation and learning device when used to its full advantage. Kylie Peppler, an assistant professor of learning sciences at Indiana University, Bloomington, who runs the Creativity Labs there, found that using Twitter to communicate during a course period opened up new connections and learning opportunities between the students and for her as well.

Today's young people are used to communicating in quick bursts—short text messages that arrive at their destination within seconds. While they're constantly connected by their mobile devices, young people don't always check their email every day. This can frustrate professors who choose to communicate about course changes that way, and frustrate students, too, says Peppler. "They are not used to communicating the way we are used to communicating," she says.

Recently, Peppler experimented with communicating in the rapid way students do, using a live Twitter feed for her class. It became a way to do informal sharing; she and the students could quickly share a thought, question, or reading related to the subject material. She knows many faculty members aren't as comfortable with using Twitter as their students, and she suggests colleges and universities create safe spaces where faculty and students can try out new technology and ask questions of their peers without too much pressure.

The idea of a safe space to try out new technology should also extend to students, she says. While students are savvy with social media, Peppler has been surprised in her research and observations to find that many aren't nearly as skilled on the production side of technology: using programs, creating graphs, or even attaching a document to an email. A safe space to ask questions and work on closing the gap between the tech-savvy students and those who are less adept is another way to create an opportunity for peer-to-peer sharing and learning.

ACTIVE LEARNERS

Learning is social for today's young people, says Constance M. Yowell, director of education at the MacArthur Foundation. In the research the foundation is sponsoring, it is finding that students want to customize knowledge, combining parts in new ways. (To students, it's remixing. To older adults, that can be seen as plagiarism.)

"They expect to be makers and creators," Yowell says. And because of the access to smart phones with video, audio, and photographic capabilities, it is now easier for them to do so. Young people today do not want to receive information as a broadcast—the traditional model of higher education, in which the professor stands in front of a large lecture hall and speaks while students sit and take notes. Nowadays, if a professor lectures students in that way, they're going to get bored or frustrated and turn to their devices, she says.

It's a major disconnect between the way things are now in many college and university classes, she says. If faculty do not embrace the technological changes that are part of young people's lives, "it's only going to get more frustrating," Yowell says. "There's only going to be a larger and larger disconnect."

Young people now are a part of large distribution channels, Yowell says. They are used to receiving instant responses to their Tweets, status updates, posted photos, and other social media contributions. The idea that they would be doing work for an audience of one (the professor) and that they may have to wait long periods for any feedback or response to their work doesn't fit with that model.

She suggests finding ways to have students contribute work to a larger network. It is important not to stereotype this new style of learning and communication as a characteristic of a narcissistic generation whose members spend their time Tweeting about themselves and using social media to conduct their social lives, Yowell says. In the MacArthur Foundation's research, it has found that this generation cares deeply about the world and making it a better place. She recommends that colleges and universities figure out how to make content relevant to that desire to improve the world and the lives of people in it, allowing students to first identify the problems they want to solve and then marshal the resources to do so.

"I think the disciplines are a tough sell," Yowell says. She points to Stanford University (CA), which has many interdisciplinary centers dedicated to issues such as the environment or longevity, as an example of an institution that is tapped into the way people want to work today.

INFORMAL LEARNING

One way young people want to work and learn today is by teaching themselves to do or build things. The growing maker culture and do-it-yourself ethos, which encourages hands-on learning through tinkering and experimentation, captures that spirit.

Maker Faires[1] and hackathons[2] offer people ways to get together informally to create things and solve problems with a spirit of play. Even alone at home, people can make a video of themselves doing something and post it to YouTube for anyone to see. One does not need to be an expert to participate in these informal learning spaces, and there is even a subculture that celebrates failure. Maker culture has taken the world by storm, says Indiana University's Peppler, who recently hosted a symposium on maker culture and is running the university's Make-to-Learn initiative. "Everyone wants a 'makerspace' now."

Examples of makerspaces[3] include the Prototyping and Design lab (The PAD) at the University of Maryland, Baltimore County (UMBC) (the university also recently held a 24-hour hackathon on campus), and a teen makerspace with computers and 3-D printers at the main branch of the Chicago Public Library.

At UMBC, Amy Hurst, a professor of human-computer interaction, started The Pad with another professor. The lab, filled with 3-D printers, computer boards, and a variety of tools and materials, is attracting students across disciplines who share a sense of curiosity and independence, along with a desire to be creators, rather than an area of study. (Hurst, who participates in Maker Faires and hackathons, has a sign on her office door that says "Keep Calm and Make.")

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[1] A large public event that is "part science fair, part county fair, and part something entirely new, Maker Faire is an all-ages gathering of tech enthusiasts, crafters, educators, tinkerers, hobbyists, engineers, science clubs, authors, artists, students, and commercial exhibitors. All of these 'makers' come to Maker Faire to show what they have made and to share what they have learned." http://makerfaire.com/makerfairehistory.

[2] A hackathon is "an event, typically lasting several days, in which a large number of people meet to engage in collaborative computer programming." http://www.oxforddictionaries.com/us/definition/american_english/hackathon.

[3] "Makerspaces are community centers with tools. Makerspaces combine manufacturing equipment, community, and education for the purposes of enabling community members to design, prototype, and create manufactured works that wouldn't be possible to create with the resources available to individuals working alone." http://makerspace.com.

In Peppler's Learning New Media class at Indiana University, the most popular assignment she gave was toward the end of the course. Students were instructed to either make their own tutorial video or watch one and follow the instructions. One student, a father, watched a tutorial and learned how to conduct science experiments with his children. Another learned how to prune her fruit trees, something she'd always wanted to learn but never had. The assignment so grabbed her students that, despite it being the end of the semester, everyone completed the assignment ahead of time.

HYBRID/FLIPPED MODELS

The digital revolution—blogs, Twitter, and other social media sites—has created a different ecosystem for learning, says Mohammad Qayoumi. "They want to generate it; they want to question it," Qayoumi says.

Yet many institutions are still operating in a way that asks students living in the twenty-first-century digital world to come into a classroom and revert to a model of learning from hundreds of years ago. It's a disconnect, Qayoumi says, and colleges and universities would do well to consider how to shape courses for these new learners.

One way to do that is to reconsider how courses are taught and how information is disseminated to students. Qayoumi suggests colleges and universities abandon the lecture model (or use it sparingly) in favor of classes that encourage more participation and working on projects. Because so many students have access to smart phones that play video, the "flipped classroom" model is even more accessible to students. Students can watch a lecture wherever they are before coming to class, and then spend the class time debating the material or otherwise participating in the learning process and connecting with one another.

Even videos—and San José State was one of the first universities to experiment with using massive open online courses (MOOCs) for credit—need to include participation or activity breaks, Qayoumi says. Recent student behavioral data collected by many MOOC platforms show that students often stop watching a video after a few minutes. Online or hybrid courses with an online component should include regular breaks for students to answer questions or otherwise engage in active learning. "Nobody is interested in a 90-minute lecture," he says.

People's attention is at a premium, and with so much information and entertainment available, the bar is high, says Marina Gorbis, executive director of the Institute for the Future. What young people—all people—are hungry for is to be inspired and awed, Gorbis said. People still crave awesome experiences—and those can come from community experiences, exposure to great people, and even from a longer lecture, if it is a compelling topic and speaker (for example, TED talks, which millions of people have viewed online). Unless a college or university can deliver that kind of experience, it will be very hard to keep students engaged, she says.

She sees the area of higher education most vulnerable to this as the large lectures that populate the introductory classes in all but the smallest institutions. She knows it's a hard model to break, because many institutions' business models are built on large classes for first-year students. Colleges and universities should think of ways to perhaps break these classes up into groups or add elements of community and social learning to them.

NEW PATHS

An the extreme end of the spectrum, some forecasters predict a world where formal education and traditional credentialing—the purview of higher education institutions—will evolve into newer, less structured and formalized models. "With technology and informal learning spaces, learning is no longer tied to a specific place like a school," Gorbis says. "Instead, it is happening everywhere. Education is also shifting from something that happens during a set period of time—four or five years for a bachelor's degree, or the hours spent in a classroom—to more of a continuum."

At the same time, some workplaces, especially technology or design-oriented firms, are becoming more interested in the work that applicants can demonstrate in their portfolios than what degrees they hold, she says. These changes are opening up more possibilities for students to customize their education and divert from the traditional route to higher education. "More people are carving out different paths," Gorbis said. She expects the opportunities for students to take alternate paths to increase significantly in the next 10 years.

The Institute for the Future has identified a specific type of student that it calls an "extreme learner." Such students take their education into their own hands, driven more by a desire to learn and to be in a community of fellow seekers with similar interests than to achieve certain grades. Extreme learners use all of the resources at their disposal to learn, and they may even bypass higher education altogether. They are attracted to places like BioCurious, an open biology lab in the San Francisco Bay Area, and hacker spaces, where they can be in a community with fellow learners who want to experiment.

Extreme learners are mavericks now, Gorbis says, but in 10 years, people will be more familiar with their stories. She expects more people may then be willing to try that path themselves. "There will be people who have gone that route who will show up more and more," she said. In the next 10 years, there will be more education alternatives, and students won't need to be mavericks to take a different path to learning (or even to earn a credential).

This is already happening in some industry sectors. In the technology fields, programmers and other technology professionals are often hired without degrees. In his op-ed in *The New York Times*, "How to Get a Job at Google" (2014), Thomas Friedman reported that on some teams at Google, as many at 14 percent of team members have not earned degrees. Hiring on the basis of a portfolio showing completed work, rather than solely on degree attainment, has been a common practice in the design professions and entertainment industry for decades.

Beyond the desire to experiment and mix and match learning—a hallmark of young people growing up in the digital revolution—Gorbis sees hard questions about cost and return on investment driving this change. She sees young people taking different paths and looking for alternatives because of the high cost of higher education and the assumption that a degree ensures them a decent-paying job. "It's the cost and the relevance and what it gets you," Gorbis said.

She expects tomorrow's students, along with workplaces more interested in portfolios and work than a certain degree, to push for other forms of credentialing. The change will come more from the outside than the inside, she believes, though some higher education institutions are experimenting with apprenticeship degrees or other new forms of recognizing what someone has learned.

THE CHANGING BRAIN

Not everyone thinks colleges and universities need to change and reorganize around technology. Nicholas Carr, a journalist and author of *The Shallows: What the Internet Is Doing to Our Brains* (2010), believes that colleges and universities need to counteract the distracted thinking caused by our constant use of technology, especially mobile devices.

Computer use—particularly mobile devices, which we tend to access from the moment we wake up to the last moment before we go to sleep—has rewired our brains. Web surfing stimulates different parts of our brain, making it more difficult to engage in deep thinking and disengaging our ability to make deep mental connections.

Carr cautions against saying that only young people think like this now—the digital life has changed all of our brains. We're all distracted. It's just that for young people who have used this technology from a very young age, it may have a stronger effect. "It's stronger the younger you start to use this technology," Carr says.

There is much that is unknown about the effect of this constant tech use on our brains, especially the developing ones of small children. Toddlers today can manipulate iPads, but because the technology is so new, researchers don't know what the long-term effects of that exposure will be. It is very likely that research into cognitive science and technology use will continue to come out in the years between now and when those young children are ready for college.

One interesting area of study is that of memory, which is showing that when people think they can look something up any time, they are less apt to actually learn the information, Carr says. "If students assume they can Google anything at any time, then they become less likely to learn it." That can become a problem when students are asked not just to recall facts, but also to weave information together.

The good news is that it is possible to retrain the brain and rewire the connections to do deep thinking, as long as sufficient time is spent thinking in that way, Carr says. To do that, "you have to spend significant amounts of time not staring at screens."

That time away from screens devoted to deeper and more focused thinking may be something professors need to encourage, as the number of hours we spend online keeps going up (and students turn to their phones the moment they walk outside of class). Retraining our brains isn't easy, and it's uncomfortable, because our brains are used to scanning and skimming and the rewards of new things. We also feel a panic when we're first cut off that we're missing out. But given sufficient time, it can be done.

In a recent *Washington Post* article, Maryanne Wolf, a cognitive neuroscientist at Tufts University (MA) and an expert in the study of reading, said she had to retrain herself over two weeks to be able to concentrate enough to sit and read a novel. There are advantages to both kinds of reading (skimming and more deliberate reading), she said in the article, and because the world will not be retreating from technology, it is important to have a "bi-literate" brain. (Her next book will consider the effect of the digital world on our brains, she told the newspaper.)

Carr argues that colleges and universities should not take the path of least resistance and throw up their hands and completely restructure themselves based on how we use technology today. That approach seems self-defeating, he says. "I don't think you're helping the students," he says. The college or university should offer at least some refuge from technology and the culture of distraction it brings about. "To me, the most important challenge in education is

teaching people to pay attention," Carr says. The challenge is not easy, but getting students to think deeply and critically and make connections is essential.

Though we do not have a crystal ball that can help us see into the future, all colleges and universities will need to reflect deeply about potential changes in the students of the future and how we can serve them. Composition of students will continue to vary from institution to institution, and no one size fits all. Still, the impact of demographic and economic shifts, ubiquitous technology, and new ways of learning and credentialing will impact us all to some degree. The time to reflect and plan is now.

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