Delivering 21st Century Skills

“If we want things to stay as they are, things will have to change.”
— Giuseppe Tomasi di Lampedusa, The Leopard

Introduction

The role of higher education has always been to prepare learners to thrive in life and in a career in the world of today and into the future. Equally, higher education provided a direct benefit to society and the main engine for social and economic mobility. However, to continue to deliver on this core mission over the centuries, the university has transformed over time in response to economic, social and technological changes – redefining itself as it moved through the industrial age and then embraced the practical professions (e.g. accounting, health) and then a more global and diverse society. Today, to maintain that mission, higher education must transform again to meet the economic and social needs of a digital world. This paper sketches out a road map for higher education that outlines those broader socio-economic changes, extrapolates the implications of those changes for both learning and the structure of the university enterprise, then concludes with examples of how universities are innovating to meet these challenges.

The Challenge: Thriving in a volatile and unknowable digital future

The pressures for university change are increasing in size, speed and intensity and they intersect and overlap in unpredictable and highly complex ways. These pressures include accelerating technological advances, population changes across many dimensions, and a lack of a skilled workforce.

- Technology
  - Robotics, AI, Virtual reality. Studies by McKinsey, Oxford and other predict the rise of robots and other forms of artificial intelligence will lead to loss of up to 50% of current jobs over the next 20 years. Even if these numbers are an overestimate, the implication is clear – not just individual jobs but whole job types will be eliminated. Moreover, they will diverse impacts on different regions in the country and the globe. For example, nationally, the ratio of robots to people is higher in the mid-west and part of the south.¹
  - Cloud computing is enabling the diffusion of on-line courses (which are improving in quality and decreasing in price), which allows those courses to reach deep into underserved markets, and will, in time provide a direct challenge to high tuition costs of the existing university enterprise.²

¹ https://economics.mit.edu/files/15254
• **Rapid Obsolescence.** The rapidity of change of technology also matters for how universities invest and can hamper their change process. For example, University technology planning cycles tend to be longer than the cycle of innovation, making technology plans obsolete before they are even implemented.

- **Populations**
  - **Race and ethnicity and equity.** New college classes are becoming more diverse. And yet, sixty percent of learners who enroll in a four-year complete and only thirty percent who enroll in a two-year complete. The numbers are worse among students of color. Strategies to improve completion must center on equity of access and outcomes. In some places, that shift is happening rapidly. Research indicates the majority of increase of high school graduates will be non-White and primarily Hispanic. These shifts have important implications for student success. Over ninety-percent of high school graduates will enroll in a higher education institution. And yet, sixty percent of learners who enroll in a four-year complete and only thirty percent who enroll in a two-year complete. The numbers are worse among students of color. Strategies to improve completion must center on equity of access and outcomes.

- **Rise of non-traditional learners.** As traditional college-aged populations have flattened in regions in the US, specifically in the Northeast and Midwest, there is an influx of non-traditional learners (i.e., stop-outs, dropouts, etc.) entering higher education institutions. In fact, 70 percent or 14 million students work while in college, 43% of which are low-income and a third of which are over 30. Adult and transitioning populations can have very different needs around education (e.g. convenience and access, family support, pricing structures).

- **Digital natives and Gen Z,** long accustomed to working across devices and platforms to build or supplement their own learning agenda may challenge universities standard approaches to teaching and learning. According to research by Pearson that while GenZ hold a college education in higher regard than millennials, how they learn and how they engage digitally is quite different with important implications for how they learn. In sum, their preferred social media is YouTube (as compared to Facebook for millennials), spend more time with visual and game content on line, resulting in a preference for YouTube, in-person group activities and learning apps or interactive games rather than books (preferred by millennials) as their preferred approach to learning. In fact, 55 percent of GenZ report that they believe YouTube

---


4 [https://www.amacad.org/content/Research/researchproject.aspx?i=21999](https://www.amacad.org/content/Research/researchproject.aspx?i=21999)

contributes to their education. The good news, they place high value on teachers and learning with other students.

- **Lack of skilled workforce.** One of the most complex challenges facing higher education is unpacking the multitude of issues wrapped up in the phrase lack of skilled workers, which includes: 1) lack of technical workers, which may or may not need a four year degree; 2) lack of sufficient STEM graduates; 3) lack of certain skill types in college graduates (e.g. team working, time management, problem solving, communication); 4) lack of sufficient workers within an identifiable work category (e.g. cybersecurity, nursing) and 5) upgrading and reskilling existing workers to a higher or different level. For example, only eleven percent of employers believe colleges do an effective job preparing learners. Translating that insight into strategies and tactics is not as simple as identifying those skills, to requires the regular need to assess and reassess skill needs.

### 21st Century Competences for all Learners

The confluence of all these pressures have profound implications for what learners need to know to survive and thrive today and in the future. The National Association of Colleges and Employers (NACE) identified seven core competences that all learners require and these remain important and relevant for answering this question. Those competences are:

- critical thinking/problem solving;
- oral/written communications;
- teamwork/collaboration;
- information technology application;
- leadership;
- professionalism/work ethic; and
- career management.

NACE’s framework aligns student outcomes to employer needs, which is necessary to succeed in the workforce. Given all of the wider changes in motion, are the enough? The Partnership for 21st Century Learning (P21) offers a different lens for exploring 21st century skills. Developed by practitioners to better skills integrate into the teaching of core disciplines, this framework recognizes that education is about the mastery of skills needed for work, life, and citizenship. These skills are interconnected in the process of 21st century teaching and learning:

- Life and Career Skills

---

• Flexibility and Adaptability
• Initiative and Self-Direction
• Social and Cross-Cultural skills
• Productivity and Accountability
• Leadership and Responsibility

• Information, Media, and Technological Skills
  • Information Literacy
  • Media Literacy
  • Information, Communications, and Technology Literacy

• Learning and Innovations Skills
  • Creativity and Innovation
  • Critical thinking and Problem Solving
  • Communication and Collaboration

While these are an excellent place to start, the 21st century and the rise of artificial intelligence is expanding this list. To meet the needs of our changing needs will require universities to transform how they do business. Joseph Aoun’s recent book, *Robot Proof: Higher Education in the Age of Artificial Intelligence* lays out an additional set of literacies and cognitive capacities that are necessary to survive and thrive in era of smart machines and the increasing automation of ever more jobs. He argues the goal is to continue to develop the skills that are uniquely human, and to do that, means the NACE skills, the P21 set and beyond. Human skills include communication, critical thinking, leadership and teamwork but also core human elements of curiosity, empathy, creativity, cultural agility and entrepreneurialism. Here is what he recommends adding to the curriculum, design and sequencing of higher education.

New Literacies
• Data literacy to navigate in a world defined by continuous connectivity and information flows, and to make sense of data coming from both people and machines;
• Technology literacy to understand the basics of how machines, now ubiquitous, work with an ability to automate processes as needed; and
• Human literacy, which focuses on humanities, communication and the growing importance of design.

Cognitive Competences
• Systems thinking or thinking holistically and making sense and connections among disparate pieces and ideas;
• Entrepreneurship which applies creative thinking to economic endeavors; and to develop workarounds and solutions, in extreme environments which are becoming more common;
Delivering 21st Century Skills

- Cultural agility, to help students work with those from other places and with widely different perspectives to contextualize information to understand people and things; and
- Critical thinking and problem solving.

Labor market data underscores the importance of these skills. According to the recent Strada report, “(h)uman skills like leadership, communication and problem-solving are the most in demand skills in the labor market.” Moreover, the report cites that more liberal arts graduates than computer science and engineering graduates have been entering the technology market, although the report is quick to follow-up that liberal arts may be necessary but insufficient to meet the needs of learners and employers. In fact, like Aoun, the authors agree that to deliver what’s truly needed, requires real university transformation to serve a broader cohort of learners across a lifetime.

Notably, the skills and competences discussed thus far have neither focused on an individual discipline (e.g. math) nor have centered on a particular industry. This does not mean that industry specific skills don’t matter but 21st Century skills refer to what all learners need to know irrespective of focus, discipline or career path, which will change significantly over a lifetime and across many jobs, careers and gigs.

In fact, there is clear overlap with industry core competences. For example, the National Center for Biotechnology Information identifies the following competences needed for Healthcare workers: 1) providing patient centered care; 2) working in multi-disciplinary teams; 3) employ evidence-based practices; 4) apply quality improvement; and 5) use informatics and data. While this has a health bent, the congruence between these and the overarching competences required for all learners is apparent. Being able to integrate precise industry needs (which will be changing rapidly over time) means building deep partnership with employers and other partners to keep the curricula agile and in step with changing social and economic conditions and the skills and competences needed to navigate them.

What does the advent of 21st century skills mean for universities.

Delivering education to meet the needs of the coming AI revolution, a broader cohort of learners with diverse education needs, and compete with emerging new business models suggests the following directions: curriculum redesign; building new types of relationships with the state, employers and the community, and rethinking finance and models and pricing structures.

Curriculum and instruction redesign

Delivering 21st century skills will likely require a more agile curriculum with more coherent on and off ramps for a broader, more diverse cohort of learners, and include some or all of the following components.
• Integrating career and academic advising throughout the student journey to help shape pathways and guide learners to better align a course of study with career aspiration and navigation. This will require more and better use of real-time labor market data to ensure skills and competences and learning align with what’s needed.

• A more multidisciplinary approach to education which includes cross-training across disciplines (e.g. ensuring an English majors also have business, finance and technical skills and STEM and professional majors have the human skills needed) and the creation of, and the ability to leverage, experiential learning and real-world problem-solving opportunities to help learners better make connections between what’s learned in the classroom and what they see in the workplace (integrative thinking).

• Building seamless, integrated and customizable education and training pathways that are available to learner to manage a lifetime of career and life transitions. The foundation of this approach includes a series stackable badges, credentials, and certificates connected to credit that certify workforce competences and provide new on and off ramps for students and competency-based assessments and frameworks that enable those seamless transitions in and out of the workforce.

While the identification of core 21st century competences and the recognition that implementing these means a re-envisioning of the work of the university are critical, another key insight from Aoun’s book is the need to ground this transformation in learning science. And the implications of that are equally profound, underscoring the need for curriculum redesign that is not just academic and organizational also behavioral, designed in a way to maintain motivation, curiosity, and a love for learning.

Re-envisioning new types of partnerships with employers, the state and the community.

As the university adapts to these new conditions, how it works with its partners and stakeholders will require similar rethinking and reorganizing. From more regularized employer input on skill needs, to solving community problems by engaging learners, to creating meaningful learn and earn opportunities, and working with the state to open up more opportunities to more students, delivering 21st century skills means new ways of working on campus and collaboratively in the wider environment.

Rethinking finance models and pricing structures

With state support declining, tuition rising and incomes relatively stagnant, how universities deliver skills is also an economic question. To make the change discussed requires investment but they will also enable a broader cohort of learners to access the university across different formats (e.g. on-line, badges) across different time frames (stackable credentials) and new approaches to build degrees (e.g. competences). New models are emerging (detailed below) that are showing us how to think about these changes.
An Emerging New Way of Doing Business: Innovations from the Field.

Before exploring the changes in motion in the world of practice, it’s worth taking a moment to warn of potential dangers and wrong roads. As we noted above, the pressures on universities to deliver a better workforce for today, when universities must stick to their core mission of molding learners for today and tomorrow. Thus, given the range of changes occurring simultaneously, we run the risk of partial or mis-focused solutions. In what follows, we point out a few (not all) dangers as universities work their way down this path.

Danger 1: An emerging STEM vs Liberal Arts dichotomy
The acceleration of technology combined with a need for skilled workers has led to an undervaluing of liberal arts and humanities and an elevation of STEM and more professional tracks (e.g. accounting) which have a direct and immediate connection to the labor market and reasonable starting salaries. As we have seen, the need is for both because it is the skills developed in the humanities (e.g. creativity and critical thinking) which are the most robot proof. The real irony is that technical skills, which can be reduced to a formalized logic model, can then be automated. In the digital age, we need all learners to handle both STEM and liberal arts.

Danger 2: Short term training (including badges, credits and credentials) disconnected from pathways
The volatility of the economy means that any short-term solution (e.g. six week training course) that leads to a job and accredits a single only delivers a short term fix. The new digital age requires continuous access to training and education, and the emerging generation is using just in time small bites of education to solve a problem or up their game. Finding ways to recognize, accredit, and tie pieces to more complete pathways is truly what’s needed.

Danger 3: Silver bullet solutions isolated from mainstream transformation
Apprenticeships seem to dominate the language around training and education. While they are a good idea, one size does not fit all. The stronger approach with wider reach is to re-envision curriculum around experiential learning of which apprenticeships are one important option. We should be focusing on experiential options and work and learn – not a single model.

Although not all dangers are addressed, the few examples provided help demonstrate the duality universities experience in the face of meeting workforce employer demands with state attainment goals. Leading university practices that represent on-the-ground tactical strategies can help ease anxieties around the potential dangers.

State Level Innovations
State leaders are leveraging colleges and universities to advance economic and workforce outcomes, including nontraditional education, grants, and strategic employer and community partnerships.

- **Tennessee** developed and implemented Reconnect, a program that allows adults 25 and older enter postsecondary education to reskill and upskill.
- **Kentucky** distributed funding to expand career and technical education based on a $100 million bond initiative to build trained, modernized workforce to meet employer needs and demands.
- **Arkansas** approved a free community college targeted at sector with specific workforce needs.
- **Pennsylvania** has begun re-aligning academic programs and providing academic flexibility to meet specific regional needs.

**University Innovations by category**

**Pathways and on-ramps for a broader set of learners**

*Florida International University’s (FIU) CyberSecurity Fundamentals,* open to students and the community, targets technology and information security jobs. FIU is also launching Urban Potentials Labs, a center in FIU’s Office of Engagement which partners with industry to provide opportunities to community members in high demand fields and is currently about to launch an apprenticeship program in Healthcare.

*University of Memphis (UM)* partnered with FEDEX to provide their workers, 50% of which do not have credentials post high school, a pathway starting with high school equivalency leading ultimately to a college degree.

*University of Wisconsin-Milwaukee,* developing a modularized online education system for employee upskilling in digital manufacturing and the Industrial Internet of Things through the Design Solutions Center for Workplace and Education Innovations. University of Wisconsin-Milwaukee is also working with Marquette University and Northwestern Mutual are building a Data Science Institute (DSI) to advance the southeastern Wisconsin region as a hub for technology, research, business and talent development that accelerates STEM education at all levels.

*University of Melbourne* created a blockchain-based credential owned by the recipient, allowing students to own the record of their academic achievements especially when pieces are taken across multiple institutions over many years.

**Curriculum Redesign**

*Portland State University (PSU)* is crafting a competency-based learning program in GIS with built-in hands-on practical experience, that will be designed as a long-term structured collaboration among GIS employers, community partners and PSU.
University of North Texas (UNT) built the New College at Frisco on the 5-million-dollar mile north of Dallas, which is a partnership-based educational approach to support the adult learners and employers in this region. UNT main campus also has Career Connect, a campus-community connection vehicle that:

- Works with employers in Dallas
- Focus on experiences that builds work-relevant competencies
- Builds on service learning, capstone and student employment.
- Build and articulate skills and competencies via an electronic portfolio

Virginia Commonwealth University’s Make it Real campaign is putting experiential opportunities at the center of its transformation and the Da Vinci Center is prioritizing multi-disciplinary, entrepreneurial and experiential approaches.

University of Cincinnati, home of the co-op, provides a minimum of one experiential learning opportunity for every student, and some disciplines have many more.

University of North Carolina, Charlotte, creates new systems that help translate competencies gained from on-campus engagement.

Indiana University-Purdue University Indianapolis (IUPUI) recently launched the Institute for Engaged Learning whose goal is to ensure equitable access to a minimum of four high-impact practices for all of its students prior to graduation.

**Badges. Microcredentials and certifications**

SUNY, University at Albany is developing a micro-credential program for their technology industry, recognized by U.S. News as the third fastest growing in the nation.

**21st Century employer partnerships**

San Jose State University partners with Jabil Industry and the Santa Clara County Social Services Agencies to meet continuous demand for technology and social service workers.

University of North Carolina, Charlotte partners Bank of America for a 17-month work-based, technology-focused experience with competitive pay, executive mentorship, scholarships and a 95% placement rate. UNC, Charlotte’s career center created a new system that helps translate competencies gained from engaging on campus. Specifically, it is creating an online system like Amazon where you can see activities and class assignments, and what competencies are received.

Indiana University-Purdue University Indianapolis (IUPUI) has partnered with industry sector promoter TechPoint to extend a successful summer internship program such that students would continue to work with employers following the internship for up to two semesters thus addressing concerns that employers have around the short nature of internships.
**Strategic Community Partnerships**

*University of Wisconsin, Milwaukee*, career center works with all seven counties surrounding the city of Milwaukee.

*University of Texas, San Antonio*, downtown campus partners with government-university-industry to build School of Data Science and National Security Collaboration Center.

**Rethinking the University Enterprise through a 21st Century Skills Lens**

*Southern New Hampshire University*’s strategic plan is grounded in a vision of the world in 2030 and how it must support learners to meet that vision. [https://snhu-externalaffairs.app.box.com/s/7k526w442reszti50fdtceyrre2f1il8](https://snhu-externalaffairs.app.box.com/s/7k526w442reszti50fdtceyrre2f1il8)

**Rethinking Financial Models**

*Northeastern University* developed a Lifetime Learning Membership Network. Through a subscription model, it provides learners with post-graduate degree opportunities and pathways to nearly 200 master’s and doctoral degrees, bootcamps, and certificate programs across the globe.

*National University of Singapore* launched programs for current students and alumni with local universities in eight priority and emerging areas to help equip working adults with the skills required for new hi-tech industries.