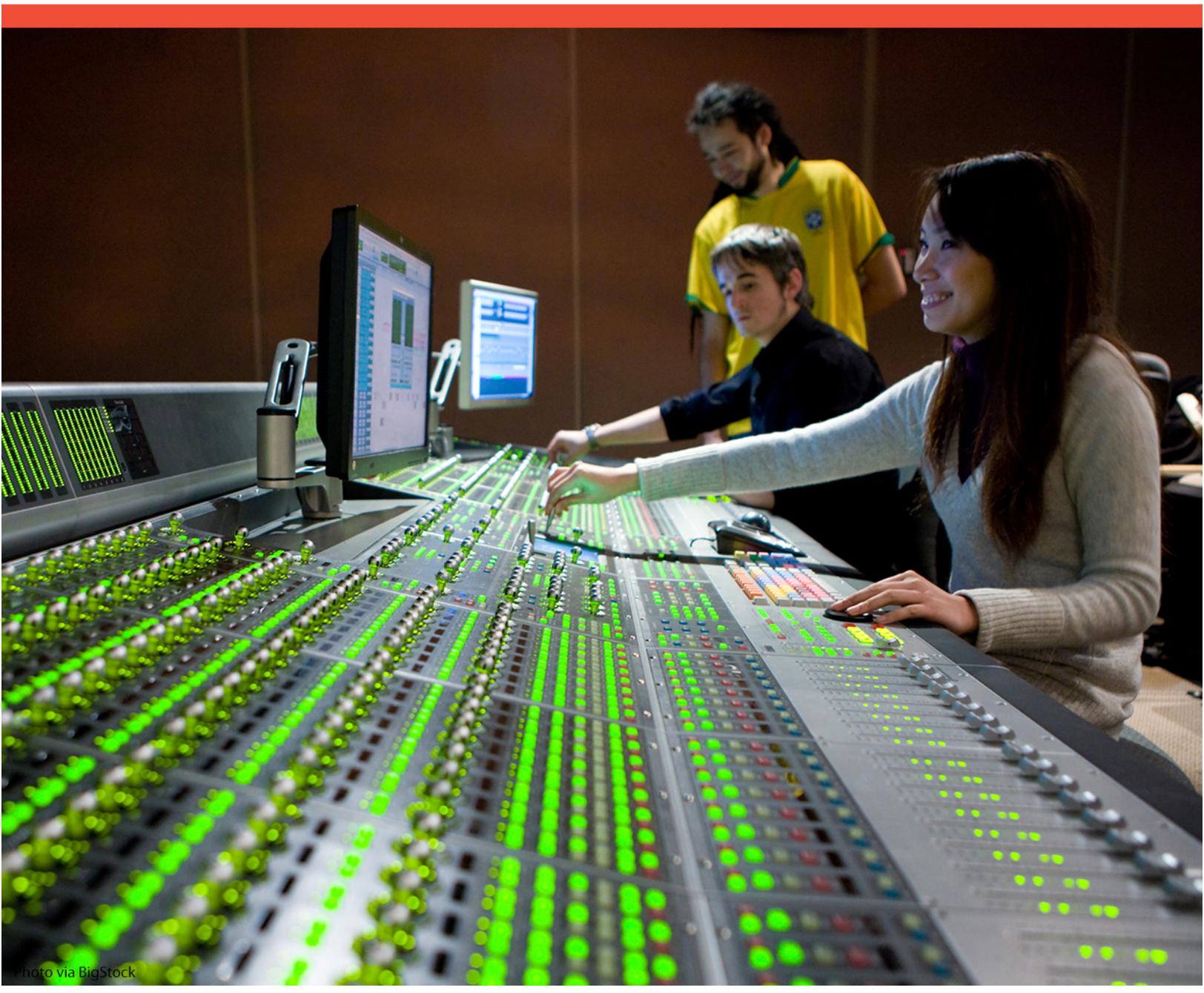




Horizon Project

# NMC Horizon Report Preview

## 2018 Higher Education Edition



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The NMC Horizon Report Preview provides summaries of each of the upcoming edition's trends, challenges, and important developments in educational technology, which were ranked most highly by the expert panel. For more than a decade, EDUCAUSE has partnered with the New Media Consortium (NMC) to publish the annual Horizon Report - Higher Education Edition. Earlier this year, EDUCAUSE acquired the rights to the NMC Horizon project. In the interest of both honoring and working actively with the NMC's Horizon legacy, EDUCAUSE is publishing this preview and will publish the complete 2018 Horizon Report in the summer.

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## Long-Term Trends: Driving Ed Tech adoption in higher education for five or more years

### Advancing Cultures of Innovation

As campuses have evolved into hotbeds for entrepreneurship and discovery, higher education has become widely regarded as a vehicle for driving innovation. The focus of this trend has shifted from understanding the value of fostering the exploration of new ideas to finding ways to replicate it across a span of diverse and unique learning institutions. Research has been conducted over the past year to better understand how institutions can nurture the types of culture that promote experimentation. A significant element for progressing this movement is the call for higher education to alter its status quo to accept failure as an important part of the learning process. The act of integrating entrepreneurship into higher education further acknowledges that every big idea has to start somewhere, and students and faculty can be equipped with the tools needed to spark real progress. In order to keep pace, institutions must critically assess their curricula and implement changes to their evaluation methods to remove barriers that limit the development of new ideas.

### Cross-Institution & Cross-Sector Collaboration

Collective action among colleges and universities is growing in importance for the future of higher education. Increasingly, institutions are joining forces to combine their intellectual capital or to align themselves strategically with innovative efforts in the field. Today's global environment is allowing institutions to unite across international borders and work toward common goals concerning technology, research, or shared values. By forging partnerships, institutions facing financial constraints in specific areas can pool their resources so that learners can access a larger variety of digital course materials, data, and technologies that may otherwise be unavailable locally. Cross-sector collaborations and partnerships are also becoming more common, with businesses looking to institutions for research and development (R&D) to solve pressing challenges and institutions working with businesses to prepare students for the digitally focused workforce, aligning programs and degree pathways with industry needs.

## Mid-Term Trends: Driving Ed Tech adoption in higher education for the next three to five years

### Proliferation of Open Educational Resources

The Hewlett Foundation defined open educational resources (OER) as “teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property license that permits their free use and re-purposing by others.” Momentum behind OER got a major boost when MIT founded the OpenCourseWare initiative in 2001, making MIT instructional materials for over 2,200 of its courses available online, free of charge. Soon after, prestigious universities including Carnegie Mellon University and Harvard University pushed forward their own open learning initiatives. Understanding that the term “open” is a multifaceted concept is essential to following this trend in higher education. Openness is often mistaken to simply mean “free of charge,” and advocates have worked toward a common vision that defines it more broadly — free not just in economic terms but also in terms of ownership and usage rights. Open-licensing software can be thought of as the catalyst for OER; open-source code is designed to be a blueprint that allows users to modify any design to custom fit their needs.

### Rise of New Forms of Interdisciplinary Studies

According to the Melbourne Sustainable Society Institute, multidisciplinary research refers to concurrent exploration and activities in seemingly disparate fields. Digital humanities and computational social-science research approaches are opening up pioneering areas of multidisciplinary research at libraries and innovative forms of scholarship and publication. Researchers, along with academic technologists and developers, are breaking new ground with data structures, visualization, geospatial applications, and innovative uses of open-source tools. At the same time, they are pioneering new forms of scholarly publication that combine traditional static print-style scholarship with dynamic and interactive tools, enabling real-time manipulation of research data. Applying quantitative methods to traditionally qualitative disciplines has led to new research categories such as Distant Reading and Macroanalysis — the study of large corpuses of texts as opposed to the close reading of a few. These emerging areas could lead to exciting new developments in education, but effective organizational structures will need to be in place to support this collaboration.

## Short-Term Trends: Driving Ed Tech adoption in higher education for the next one to two years

### Growing Focus on Measuring Learning

This trend describes an interest in assessment and the wide variety of methods and tools that educators use to evaluate, measure, and document academic readiness, learning progress, skill acquisition, and other educational needs of students. As societal and economic factors redefine what skills are necessary in today's workforce, colleges and universities must rethink how to define, measure, and demonstrate subject mastery and soft skills such as creativity and collaboration. The proliferation of data-mining software and developments in online education, mobile learning, and learning management systems are coalescing toward learning environments that leverage analytics and visualization software to portray learning data in a multidimensional and portable manner. In online and blended courses, data can reveal how student actions contribute to their progress and specific learning gains.

### Redesigning Learning Spaces

As universities engage with strategies that incorporate digital elements and accommodate more active learning in the physical classroom, they are rearranging physical environments to promote these pedagogical shifts. Educational settings are increasingly designed to support project-based interactions with attention to greater mobility, flexibility, and usage of multiple devices. To improve remote communication, institutions are upgrading wireless bandwidth and installing large displays that allow for more natural collaboration on digital projects. Further, universities are exploring how mixed reality technologies can blend 3D holographic content into physical spaces for simulations like experiencing Mars by controlling rover vehicles or can enable multifaceted interaction with objects, such as the human body in anatomy labs, with detailed visuals. As higher education continues to move away from traditional, lecture-based lessons toward more hands-on activities, classrooms are starting to resemble real-world work and social environments that foster organic interactions and cross-disciplinary problem-solving.

## Solvable Challenges: Those that we understand and know how to solve

### Authentic Learning Experiences

Authentic learning experiences, those that bring students in touch with real-world problems and work situations, are still not pervasive in universities. The term *authentic learning* is seen as an umbrella for several important pedagogical strategies that have great potential to immerse learners in environments where they can gain lifelong learning skills; these approaches include vocational training, apprenticeships, and certain scientific inquiries. Advocates of authentic learning underscore the importance of metacognitive reflection and self-awareness as cornerstones. An increasing number of institutions have begun bridging the gap between academic knowledge and concrete applications by establishing relationships with the broader community; through active partnerships with local organizations, learners can experience the future that awaits them outside the campus.

### Improving Digital Literacy

The productive and innovative use of technology encompasses 21st-century practices that are vital for success in the workplace and beyond. Digital literacy transcends gaining isolated technological skills to generating a deeper understanding of the digital environment, enabling intuitive adaptation to new contexts and co-creation of content. Institutions are charged with developing students' digital citizenship, ensuring mastery of responsible and appropriate technology use, including online communication etiquette and digital rights and responsibilities in blended and online learning settings and beyond. This new category of competence is affecting curriculum design, professional development, and student-facing services and resources. Due to the multitude of elements of digital literacy, higher education leaders are challenged to obtain institution-wide buy-in and to support all stakeholders in developing these competencies. Frameworks are helping institutions assess current staff capabilities, identify growth areas, and develop strategies to implement digital literacy practices.

## Difficult Challenges: Those that we understand but for which solutions are elusive

### Adapting Organizational Designs to the Future of Work

Increasing attention is being paid to the organizational structure of colleges and universities to better align them with the agile and 21st-century practices of the future workplace. Technology, shifting information demands, and the evolving roles of faculty are forcing institutions to rethink the traditional functional hierarchy. Institutions must adopt more flexible, team-based matrix-like structures to remain innovative and responsive to campus and patron needs. At Ithaca S+R, researchers are beginning a new study to examine the effect of academic organizational structure on decision-making. The findings from this project have implications for institutions' structures and policies. In order to adapt, higher education institutions are examining motivating factors for flexible designs but often face steep learning curves and resistance among staff.

### Advancing Digital Equity

Digital equity refers to unequal access to technology, particularly broadband internet. UNESCO reports that while 3.2 billion people across the globe are using the internet, only 41% of those that live in developing countries are online. Further, 200 million fewer women than men are accessing the internet around the world. The United Nations has identified internet access as essential to meeting its sustainable development goals of alleviating poverty and hunger and improving health and education worldwide by 2030. This rampant social justice issue is not just impacting developing nations: More than 30 million Americans lack access to high-speed internet. Efforts to improve these figures are necessary to promote full participation, communication, and learning within society. Technology plays an important role in advancing the availability of higher education for underrepresented student populations and ensuring accessibility of web materials for disabled students. Online learning is enabled by high-speed internet access, while use of open educational resources can provide cost savings to students.

## Wicked Challenges: Those that are complex to even define, much less address

### Economic and Political Pressures

Flat or declining college enrollments, increasing subscription fees and publishing output, and decreasing government support contribute to a web of complexities for higher education institutions. As a result, they are increasingly prioritizing technologies and digital resources that reduce the expenses associated with delivering educational services. For example, the development and adoption of open educational resources are viewed as potential solutions for reducing costs. Complicating this challenge is the notion that technology adoption can trigger a variety of costs. Further, new administrations and governmental policy actions are raising concerns, particularly as higher education institutions are organized around core intellectual freedom principles that are being challenged.

### Rethinking the Roles of Educators

Educators are increasingly expected to employ a variety of technology-based tools, such as digital learning resources and courseware, and engage in online discussions and collaborative authoring. Further, they are tasked with leveraging active learning methodologies such as project- and problem-based learning. This shift to student-centered learning requires instructors to act as guides and facilitators. Adding to this challenge is the evolution of learning through the rise of competency-based education, which further customizes the academic experience to students' needs. As these technology-enabled approaches gather steam, many institutions across the world are rethinking the primary responsibilities of educators. Related to these growing expectations are the implications of societal changes and evolving faculty models where an increasing percentage of classes are being taught by non-tenure-track instructors.

## Time-to-Adoption Horizon: One Year or Less

### Analytics Technologies

Today, almost any interaction made over the internet or through the consumption of goods and services is being tracked, stored, and used in targeted ways. This has led to the notion of big data — massive amounts of data that reflect the behavior and actions of various populations. Data scientists and data-collection platforms are now able to computationally organize petabytes and exabytes of data so that it is easy to analyze and identify patterns that might otherwise go undetected. With the complexity surrounding such large, diverse sets of data, displaying the information is crucial to its success. Information visualization uses infographics, the graphical representation of technical data designed to be quickly and easily understood. In education, data mining is already under way to target at-risk students, personalize learning, and create flexible pathways to success. As educational institutions become more adept at working with and interpreting big data, they can make more informed decisions that reflect real learner needs. However, at the same time there is a need for better tools and for deeper exploration into how collecting and analyzing data can enable more informed decisions and predictions. If we want students, educators, and leaders to better use available data, they need tools and training to do it. Students must have good methods for evaluating and managing information. Understanding how to use new data tools and enabling analytic skills, including data literacy, computational thinking, and coding, are essential for both faculty and students to advance the understanding and use of big data.

### Makerspaces

The turn of the 21st century has signaled a shift in what types of skill sets have real, applicable value in a rapidly advancing world. The question of how to renovate or repurpose classrooms to address the needs of the future is being answered through the concept of makerspaces, workshops that offer tools and the learning experiences needed to help people carry out their ideas. The driving force behind makerspaces is rooted in the maker movement, a following that comprises artists, tech enthusiasts, engineers, builders, tinkerers, and anyone else with a passion for making things. Makerspaces are intended to appeal to people of all ages and are founded on openness to experiment, iterate, and create. In this landscape, creativity, design, and engineering are making their way to the forefront of educational considerations, as tools such as 3D printers, robotics, and 3D-modeling web-based applications become accessible to more people. A recent addition to makerspaces has been the introduction of virtual reality (VR), which eliminates limitations to physical space by harnessing 3D imagery to simulate a 360-degree view of an environment; those on the cutting edge are anticipating the design of digital makerspaces equipped with VR. Proponents of makerspaces for education highlight the benefit of engaging learners in creative, higher-order problem-solving through hands-on design, construction, and iteration.

## Time-to-Adoption Horizon: Two to Three Years

### Adaptive Learning Technologies

Encompassed by the personalized learning movement and closely linked to learning analytics, adaptive learning refers to technologies that monitor student progress and use data to modify instruction at any time. Adaptive learning technologies, according to EDUCAUSE, “dynamically adjust to the level or type of course content based on an individual’s abilities or skill attainment, in ways that accelerate a learner’s performance with both automated and instructor interventions.” Enabled by machine learning, these technologies can adapt to a student in real time, providing both instructors and students with actionable data. The goal is to accurately and logically move students through a learning path, empowering active learning, targeting at-risk student populations, and assessing factors affecting completion and student success. Advocates for adaptive learning believe that it can be a solution for the “iron triangle” of educational challenges: cost, access, and quality.

### Artificial Intelligence

In the field of artificial intelligence (AI), advances in computer science are being leveraged to create intelligent machines that more closely resemble humans in their functions. The knowledge engineering that allows computers to simulate human perception, learning, and decision-making is based on access to categories, properties, and relationships between various information sets. Machine learning is a subset of AI, providing computers the ability to learn without being explicitly programmed. As another significant area of research, neural networks model the biological function of human brains to interpret and react to specific inputs such as words and tone of voice. Neural networks are proving valuable for more sophisticated natural user interfaces through voice recognition and natural language processing, allowing humans to interact with machines similarly to how they interact with each other. As the underlying technologies continue to develop, AI has the potential to enhance online learning, adaptive learning software, and research processes in ways that more intuitively respond to and engage with students.

## Time-to-Adoption Horizon: Four to Five Years

### Mixed Reality

At the intersection of virtual and physical realities is an emerging environment known as mixed reality (MR), where digital and physical objects coexist. This hybrid space integrates virtual technologies into the real world so that viewers cannot distinguish where one world begins and the other ends. The virtual aspect of MR comes from the use of devices equipped with 3D viewing technology that seamlessly layers digital objects onto the real world. Another major component of MR is the integration of augmented reality (AR), which is the layering of information over 3D space. A key characteristic of AR is its ability to respond to user input, which confers significant potential for learning and assessment; learners can construct new understanding based on interactions with virtual objects that bring underlying data to life. Holographic devices are also being used to create MR environments, as their video displays project 3D images into a physical space. While lagging behind other virtual worlds, MR is gradually making its way into the consumer market. In 2014, Michael Jackson was re-embodied in holographic form and debuted at the Billboard Music Awards, where his holograph performed on stage with live, choreographed dancers.

### Robotics

Robotics refers to the design and application of robots, which are automated machines that accomplish a range of tasks. The first robots were integrated into factory assembly lines in order to streamline and increase the productivity of manufacturing, most notably for cars. Today, the integration of robots into mining, the military, and transportation has helped improved operations for industries by taking over tasks that are unsafe or tedious for humans. It is expected that the global robot population will double to four million by 2020, a shift that is expected to shape business models and economies all over the world. There is a substantial debate on how workers will continue to be affected by the global economy's growing dependence on robots, especially now that robots are more autonomous, safer, and cheaper than ever. While robotics is at least four years away from being in mainstream use in education, its potential uses are starting to gain traction. Robotics programs are focusing on outreach efforts that promote robotics and programming as multidisciplinary STEM learning that can make students better problem solvers for the 21st century. It is also clear that some students with spectrum disorders are more comfortable working with robots to develop better social, verbal, and nonverbal skills.