III. Important Developments in Educational Technology for Higher Education

Time-to-Adoption Horizon: One Year or Less
- Bring Your Own Device (BYOD) ................................................................. 4
- Flipped Classroom ..................................................................................... 4

Time-to-Adoption Horizon: Two to Three Years
- Makerspaces ............................................................................................ 5
- Wearable Technology .................................................................................. 5

Time-to-Adoption Horizon: Four to Five Years
- Adaptive Learning Technologies ............................................................... 5
- The Internet of Things ............................................................................. 5
I. Key Trends Accelerating Ed Tech Adoption in Higher Education

Fast Trend: Driving Ed Tech adoption in Higher Ed for the next one to two years

Evolution of Online Learning

Over the past several years, there has been a shift in the perception of online learning to the point where it is seen as a viable alternative to some forms of face-to-face learning. The value that online learning offers is now well understood, with flexibility, ease of access, and the integration of sophisticated multimedia and technologies chief among the list of appeals. Recent developments in business models are upping the ante of innovation in these digital environments, which are now widely considered to be ripe for new ideas, services, and products. While growing steadily, this trend is still a number of years away from its maximum impact. Progress in learning analytics, adaptive learning, and a combination of cutting-edge asynchronous and synchronous tools will continue to advance the state of online learning and keep it compelling, though many of these areas are still the subjects of experiments and research by online learning providers and tertiary institutions.

Fast Trend: Driving Ed Tech adoption in Higher Ed for the next one to two years

Rethinking Learning Spaces

New forms of teaching and learning require new spaces for teaching and learning. More universities are accommodating these emerging models of education, such as the flipped classroom, by rearranging the learning environment to emphasize the active learning paradigm. Educational settings are increasingly designed to facilitate project-based interaction with attention to mobility, flexibility, and usage of multiple devices. Wireless bandwidth is being upgraded in institutions to create “smart rooms” that support web conferencing and other methods of remote, collaborative communication. Large displays screens are being installed to enable collaboration on digital projects and informal presentation. As higher education continues to move away from traditional lecture-based programming and to more hands-on scenarios, university classrooms will start to resemble real world work and social environments that facilitate organic interactions and cross-disciplinary problem solving.

Mid-Range Trend: Driving Ed Tech adoption in Higher Ed for the next three to five years

Increasing Focus on Open Educational Resources

Openness — concepts like open content, open data, and open resources, along with notions of transparency and easy access to data and information — is becoming a value across education. As traditional sources of authority are augmented by downloadable content, however, there is need for more curation and other forms of validation that can communicate the credibility of a resource. Complicating the landscape in some ways, “open” has become a term often applied in very different contexts. Sometimes mistaken to simply mean “free,” open education advocates are working towards a common vision that defines “open” more broadly — not just free in economic terms, but educational materials that are freely copiable, freely remixable, and free of barriers to access, sharing, and educational use.

Mid-Range Trend: Driving Ed Tech adoption in Higher Ed for the next three to five years

Rise of Data-Driven Learning and Assessment

There is a growing interest in using new sources of data for personalizing the learning experience and for performance measurement. As learners participate in online activities, they leave an increasingly clear trail of analytics data that can be mined for insights. Learning analytics experiments and demonstration projects are currently examining ways to use that data to modify learning strategies and processes. Dashboards filter this information so that student progress can be monitored in real
time. As the field of learning analytics matures, the hope is that this information will enable continual improvement of learning outcomes.

**Long-Range Trend: Driving Ed Tech adoption in Higher Ed for five or more years**

**Agile Approaches to Change**

There is a growing consensus among many higher education thought leaders that institutional leadership and curricula could benefit from agile startup models. Educators are working to develop new approaches and programs based on these models that stimulate top-down change and can be implemented across a broad range of institutional settings. The Lean Startup movement uses technology as a catalyst for promoting a culture of innovation in a more widespread, cost-effective manner. Pilots and other experimental programs are being developed for teaching and improving organizational structure to more effectively nurture entrepreneurship among both students and faculty.

**Long-Range Trend: Driving Ed Tech adoption in Higher Ed for five or more years**

**Growing Importance of Open Communities and University Consortia**

Collective action among universities will be increasingly important for the future of higher education. Traditional practice has allowed publishers and other vendors to isolate individual universities into their ecosystems, or dilute the brand and control the educational experience. Innovative projects such as Unizin are gaining traction in the higher education landscape because they unite institutions through a large-scale digital research community that is aligned with open technology standards. BCNET is another example of a very active post-secondary shared service consortium, which provides a long list of technologies on behalf of all of its 26 post-secondary institutional members in British Columbia, Canada. Many educators and administrators in higher education see collective action as imperative to share and reduce the high costs of technology-enabled learning in order to promote sustainability as well as best practices for the future of the community.

II. Significant Challenges Impeding Ed Tech Adoption in Higher Education

**Solvable Challenge: Those which we both understand and know how to solve**

**Adequately Defining and Supporting Digital Literacy**

The traditional view of literacy as the ability to read and write has expanded to encompass digital, information, and cultural, visual, and financial literacy. These new categories of competence are affecting how education institutions address literacy issues in their curriculum objectives and teacher development programs. Lack of consensus on what are considered literacies in the 21st century is impeding many schools and universities from formulating policies to address the issue. Discussions among educators have touched on the idea of literacy as equating to competence with digital tools, or as an indicator of having the ability to critically think in a given area. Many educators and learning facilitators believe this disagreement on terms is keeping institutions from promoting the use of educational technology head-on. Digital literacy, for example, is an often-debated topic, because it encompasses a number of skills that differ between teachers and learners. Failure to redefine literacy in modern terms makes it very difficult to formulate policies that address low digital fluency of learning facilitators and allow K-12, higher education, community colleges, museums, libraries, and workplaces to take full advantage of the digital tools and learning resources.

**Solvable Challenge: Those which we both understand and know how to solve**

**Blending Formal and Informal Learning**

© 2014, NMC

Work-in-Progress
Traditional approaches with roots in the 18th century and earlier are still very common in many institutions, and often stifle learning as much as they foster it. As the Internet has brought the ability to learn something about almost anything to the palm of one’s hand, there is an increasing interest in the kinds of self-directed, curiosity-based learning that has long been common in museums and science centers. These and other more serendipitous forms of learning fall under the banner of informal learning, and serve to enhance student engagement by encouraging them to follow their own learning pathways and interests. Many experts believe that a blending of formal and informal methods of teaching and learning can create an environment that fosters experimentation, curiosity, and above all, creativity.

**Difficult Challenge: Those we understand but for which solutions are elusive**

**Complex Thinking and Communication**

We live in a world where in order to be successful, one needs to be capable not only of complex, expert thinking, but also adept at communicating complex information in accessible, understandable ways. Today's young people live in a world that is interconnected in myriad ways, and they begin to engage with social media and networks at a very early age. Institutions have the responsibility of informing learners of how to understand relationships and make decisions in that interconnected world. The semantic web, big data, modeling technologies, and other innovations are creating the experimental conditions that have the potential to train learners in complex and systems thinking to create meaningful learning experiences.

**Difficult Challenge: Those we understand but for which solutions are elusive**

**Integrating Personalized Learning**

The demand for personalized learning is not adequately supported by current technology or practices. The increasing demand for education that is customized to each student's unique needs is driving the development of new technologies that provide more learner choice and control and allow for differentiated instruction. It has become clear that one-size-fits-all teaching methods are neither effective nor acceptable for today's diverse students. Technology can and should support individual choices about access to materials and expertise, amount and type of educational content, and methods of teaching. The biggest barrier to personalized learning, however, is that scientific, data-driven approaches to effectively facilitate personalization have only recently begun to emerge; learning analytics, for example, is still evolving and gaining traction within higher education.

**Wicked Challenge: Those that are complex to even define, much less address**

**Competition from New Models of Education**

New models of education are bringing unprecedented competition to the traditional models of education. Across the board, institutions are looking for ways to provide a high quality of service and more learning opportunities. Massive open online courses (MOOCs) are at the forefront of these discussions, enabling students to supplement their education and experiences at brick-and-mortar institutions with increasingly rich, and often free, online offerings. At the same time, issues have arisen related to the low completion rates of some MOOCs. As these new platforms emerge, there is a growing need to frankly evaluate the models and determine how to best support collaboration, interaction, and assessment at scale. Simply capitalizing on new technology is not enough; the new models must use these tools and services to engage students on a deeper level.

**Wicked Challenge: Those that are complex to even define, much less address**

**Relative Lack of Rewards for Teaching**

Teaching is often rated lower than research in academia. In the global education marketplace, a university's status is largely determined on the quantity and quality of its research. According to the
Times Higher Education’s World University Rankings methodology, research and citations account for 60% of a university’s score, while teaching is only half that. There is an overarching sense in the academic world that research credentials are a more valuable asset than talent and skill as an instructor. Because of this way of thinking, efforts to implement effective pedagogies are lacking. Adjunct professors and students feel the brunt of this challenge, as teaching-only contracts are underrated and underpaid, and learners must accept the outdated teaching styles of the university’s primary researchers. To balance competing priorities, larger universities are experimenting with alternating heavy and light teaching loads throughout the school year, and hiring more adjunct professors.

III. Important Developments in Educational Technology for Higher Ed

Technology to Watch: Time-to-Adoption: One Year or Less

Bring Your Own Device (BYOD)

BYOD, also referred to as BYOT (Bring Your Own Technology), refers to the practice of people bringing their own laptops, tablets, smartphones, or other mobile devices with them to the learning or work environment. Intel coined the term in 2009, when the company observed that an increasing number of its employees were using their own devices and connecting them to the corporate network. Since implementing BYOD policies, the company has reported up to 5 million hours of annual productivity gains, a statistic that is compelling many other companies to consider BYOD. In schools, the BYOD movement addresses the same reality; many students are entering the classroom with their own devices, which they use to connect to the school’s network. While BYOD policies have been shown to reduce overall technology spending, they are gaining traction more so because they reflect the contemporary lifestyle and way of working. A 2013 Cisco Partner Network Study found that BYOD practices are becoming more common across industries, particularly in education; over 95% of educators surveyed responded that they use their own device for work purposes. Although administrators and educators have cited IT security concerns, technology gap issues, and platform neutrality as challenges to the uptake of this technology, a growing number of models in practice are paving the way for BYOD to enter the mainstream.

Technology to Watch: Time-to-Adoption: One Year or Less

Flipped Classroom

The flipped classroom refers to a model of learning that rearranges how time is spent both in and out of class to shift the ownership of learning from the educators to the students. In the flipped classroom model, valuable class time is devoted to more active, project-based learning where students work together to solve local or global challenges — or other real-world applications — to gain a deeper understanding of the subject. Rather than the instructor using class time to dispense information, that work is done by each student after class, and could take the form of watching video lectures, listening to podcasts, perusing enhanced e-book content, or collaborating with peers in online communities. Students access the online tools and resources any time they need them. Faculty can then devote more time to interacting with each individual. After class, students manage the content they use, the pace and style of learning, and the ways in which they demonstrate their knowledge; the instructor adapts instructional and collaborative approaches to suit their learning needs and personal learning journeys. The goal is for students to learn more authentically by doing. The flipped classroom model is part of a larger pedagogical movement that overlaps with blended learning, inquiry-based learning, and other instructional approaches and tools that are meant to be flexible, active, and more engaging for students.
Makerspaces

The turn of the 21st century has signaled a shift in what types of skillsets have real, applicable value in a rapidly advancing world. 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. The question of how to renovate or repurpose classrooms to address the needs of the future is being answered through the concept of makerspaces, or workshops that offer tools and the learning experiences needed to help people carry out their ideas. Makerspaces are intended to appeal to people of all ages, and are founded on openness to experiment, iterate, and create. The driving force behind makerspaces is rooted in the Maker movement, a following comprised of artists, tech enthusiasts, engineers, builders, tinkerers, and anyone else with a passion for making things. The formation of the movement stems from the success of the Maker Faire, a gathering that launched in 2006 and has since propagated itself into numerous community-driven events all over the world.

Wearable Technology

Wearable technology refers to devices that can be worn by users, taking the form of an accessory such as jewelry, sunglasses, a backpack, or even actual items of clothing such as shoes or a jacket. The benefit of wearable technology is that it can conveniently integrate tools that track sleep, movement, location, and social media. There are even new classes of devices that are seamlessly integrated with a user’s everyday life and movements. Google’s “Project Glass” was one of the earliest examples, and enabled a user to see information about their surroundings displayed in front of them. Smart watches are becoming commonplace, allowing users to check emails and perform other productive tasks through a tiny interface. A rapidly growing category of wearable technology takes advantage of the burgeoning interest in the “quantified self.” The Jawbone UP and Fitbit bracelets are two examples that track how people eat, sleep, and move. Empowered by these insights, many individuals now rely on these technologies to improve their lifestyle and health. Today’s wearables not only track where a person goes, what they do, and how much time they spend doing it, but now what their aspirations are and when those can be accomplished.

Adaptive Learning Technologies

Adaptive learning technologies refer to software and services that adapt to individual students’ needs as they learn. These tools are now capable of learning the way people learn; enabled by machine learning technologies, they can adapt to an individual student’s progress and adjust content in real-time or provide customized exercises when they need it. Educators in higher education envision these adaptive platforms as new, patient tutors that can provide personalized instruction on a large scale. There are two levels to adaptive learning technologies — the first platform reacts to individual user data, and adapts instructional material accordingly, while the second takes into account aggregated data across a large sample of users for insights into design and adaptation of curricula.

The Internet of Things

The Internet of Things (IoT) is a network of connected objects that link the physical world with the world of information through the web. The advent of TCP/IP v6, launched in 2006, expanded the capabilities of the Internet, and enabled objects, sensors, and devices to be addressable and thus findable across the Internet. This augmented address space is particularly useful for tracking objects that monitor sensitive equipment or materials, point-of-sale purchases, passport tracking, inventory...
management, identification, and similar applications. Embedded chips, sensors, or tiny processors attached to an object allow helpful information about the object, such as cost, age, temperature, color, pressure, or humidity to be transmitted over the Internet. This simple connection allows remote management, status monitoring, tracking, and alerts if the objects they are attached to are in danger of being damaged or spoiled. Many web tools allow objects to be annotated with descriptions, photographs, connections to other objects, and other contextual information; the Internet of Things makes access to these data as easy as it is to use the web.