



Horizon Project

# NMC Horizon Report Preview

## 2016 K-12 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. The full NMC Horizon Report > 2016 K-12 Edition, to be published in September 2016, is a collaboration between the NMC and CoSN, made possible by Share Fair Nation under a grant from the Morgridge Family Foundation.

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## Long-Term Trends: Driving K-12 Ed Tech adoption for five or more years

### Redesigning Learning Spaces

Some thought leaders believe that new forms of teaching and learning require new spaces for teaching and learning. More schools are helping to facilitate these emerging models of education, such as the flipped classroom, by rearranging learning environments to accommodate more active learning. Educational settings are increasingly designed to facilitate project-based interactions with attention to mobility, flexibility, and multiple device usage. Wireless bandwidth is being upgraded in schools to create “smart rooms” that support web conferencing and other methods of remote, collaborative communication. Large displays and screens are being installed to enable collaboration on digital projects and informal presentations. As K-12 continues to move away from traditional teacher-centered settings and to more hands-on scenarios, classrooms will start to resemble real-world work and social environments that facilitate organic interactions and cross-disciplinary problem solving.

### Rethinking How Schools Work

There is a focused movement to reinvent the traditional classroom paradigm and rearrange the entire formal education experience — a trend that is largely being driven by the influence of innovative learning approaches. Methods such as project- and challenge-based learning call for structures that enable students to move from one learning activity to another more organically, removing the limitations of seemingly disparate disciplines. The multidisciplinary nature of these contemporary approaches has popularized the creative application of technology and fostered innovative designs of institutional models that link each class and subject matter to one another. As learning becomes more fluid and student-centered, some education leaders believe that schedules should be more flexible to allow opportunities for authentic learning to take place and ample room for independent study. Changing how learning takes place in classrooms is also requiring shifts in the business models of institutions, which are increasingly becoming more agile and open to trying new approaches.

## Mid-Term Trends: Driving K-12 Ed Tech adoption over the next three to five years

### Increasing Use of Collaborative Learning Approaches

Collaborative learning, which refers to students or teachers working together in peer-to-peer or group activities, is based on the perspective that learning is a social construct. The approach involves activities that are generally focused around four principles: placing the learner at the center, emphasizing interaction and doing, working in groups, and developing solutions to real-world problems. Collaborative learning models are proving successful in improving student engagement and achievement, especially for disadvantaged students. Educators also benefit through peer groups as they engage in professional development and interdisciplinary teaching opportunities. An added dimension to this trend is an increasing focus on online global collaboration where contemporary digital tools are used to engage with others around the world to support curricular objectives and intercultural understanding.

### Shift to Deeper Learning Approaches

There is a growing emphasis in K-12 education on deeper learning approaches, defined by the William and Flora Hewlett Foundation as the mastery of content that engages students in critical thinking, problem-solving, collaboration, and self-directed learning. In order to remain motivated, students need to be able to make clear connections the real world, and how the new knowledge and skills will impact them. Project-based learning, challenge-based learning, inquiry-based learning, and similar methods foster more active learning experiences, both inside and outside the classroom. As the enabling role of technologies learning crystalizes, educators are leveraging these tools to connect the curriculum with real life applications. These approaches are decidedly more student-centered, allowing learners to take control of how they engage with a subject, even brainstorming solutions to pressing global problems and beginning to implement them in their communities.

## Short-Term Trends: Driving K-12 Ed Tech adoption over the next one to two years

### Rise of Coding as a Literacy

Integrating coding into classes is being perceived by many educators as a way to stimulate computational thinking: the skills required to learn coding combine deep computer science knowledge with creativity and problem-solving. Last year, Code.org projected that by the year 2020, there will be 1.4 million computing jobs but only 400,000 computer science students to fill them. As a result, an increasing number of school leaders are successfully making the case that coding needs to be integrated into curriculum at the K-12 level as a means of promoting complex thinking at a young age. Many schools across the world are already developing coding classes and programs in which students collaboratively design websites, develop educational games and apps, and design solutions to local challenges by modeling and prototyping new products. Additionally, the advent of user-friendly tools such as Scratch and LegoNXT is making it easier than ever for students to begin learning programming.

### Shift from Students as Consumers to Creators

A shift is taking place in the focus of pedagogical practice in schools all over the world as students in across a wide variety of disciplines are learning by making and creating rather than from the simple consumption of content. Creativity, as illustrated by the growth of user-generated videos, maker communities, and crowdfunded projects in the past couple years, is increasingly the means for active, hands-on learning.

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

### Creating Authentic Learning Opportunities

Authentic learning, especially that which brings real life experiences into the classroom, is still all too uncommon in schools. Authentic learning is seen as an important pedagogical strategy, with great potential to increase the engagement of students who are seeking some connection between the world as they know it exists outside of school, and their experiences in school that are meant to prepare them for that world. Use of learning strategies that incorporate real life experiences, technology, and tools that are already familiar to students, and interactions from community members are examples of approaches that can bring authentic learning into the classroom. Practices such as these may help retain students in school and prepare them for further education, careers, and citizenship in a way that traditional practices are too often failing to do.

### Rethinking the Roles of Teachers

Educators are increasingly expected to be adept at a variety of technology-based and other approaches for content delivery, learner support, and assessment; to collaborate with other teachers both inside and outside their schools; to routinely use digital strategies in their work with students; to act as guides and mentors in to promote student-centered learning; and to organize their own work and comply with administrative documentation and reporting requirements. Students add to these expectations through their own use of technology to socialize, organize, and informally learn on a daily basis. The integration of technology into everyday life is causing many educational thought leaders argue that schools should be providing ways for students to continue to engage in learning activities, formal and informal, beyond the traditional school day. As this trend gathers steam, many schools across the world are rethinking the primary responsibilities of educators. Related to these evolving expectations are changes in the ways educators engage in their own continuing professional development, much of which involves social media and online tools and resources.

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

### The Digital Divide

The digital divide refers to the unequal access to, use of, and impact of information and communication technologies among different strata of socioeconomic status and its impact on learning. As digital literacy has become increasingly relevant for students success, these inequalities affect educational outcomes. Distribution of equipment and broadband connections in the classroom can support student learning, but these measures alone may not suffice to correct the inequity. Increasing access to information and communication technologies in the classroom is most impactful when accompanied by training and curriculum design support for teachers. School districts must also take steps to address students' lack of connectivity at home.

### Scaling Teaching Innovations

Our organizations are not adept at moving teaching innovations into mainstream practice. Innovation springs from the freedom to connect ideas in new ways. Our schools and universities generally allow us to connect ideas only in prescribed ways — sometimes these lead to new insights, but more likely they lead to rote learning. Current organizational promotion structures rarely reward innovation and improvements in teaching and learning. A pervasive aversion to change limits the diffusion of new ideas, and too often discourages experimentation.

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

## The Achievement Gap

The achievement gap refers to an observed disparity in academic performance between student groups, especially as defined by socioeconomic status, race/ethnicity, or gender. This challenge is being exacerbated by environmental factors, such as peer pressure, student tracking, negative stereotyping, and test bias. Schools use various success standards to define learning expectations, including grades, standardized test scores, and completion rates, leading to comparison of student performance at the individual and group level. Technology is beginning to play a more integral role in identifying lower performing individual students and student groups, helping educators and leaders understand contributing factors, and enabling and scaling targeted intervention methods and engagement strategies that help close the gap.

## Personalizing Learning

Personalized learning refers to the range of educational programs, learning experiences, instructional approaches, and academic-support strategies intended to address the specific learning needs, interests, aspirations, or cultural backgrounds of individual students. While there is a demand for personalized learning, it is not adequately supported by current technology or practices — especially at scale. The increasing focus on customizing instruction to meet students' unique needs is driving the development of new technologies that provide more learner choice and allow for differentiated instruction. Advances such as online learning environments and adaptive learning technologies make it possible to support a learner's individual learning path. A major barrier to personalized learning, however, is that scientific, data-driven approaches to effectively facilitate personalization have only recently begun to emerge; adaptive learning, for example, is still evolving and gaining traction within K-12 education. Compounding the challenge is the notion that technology alone is not the whole solution — personalized learning efforts must incorporate effective pedagogy and include faculty in the development process.



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

### **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. 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. 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 foundation of the maker movement was built on 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. 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. Proponents of makerspaces for education highlight the benefit of engaging learners in creative, higher-order problem solving through hands-on design, construction, and iteration.

### **Online Learning**

Online learning refers to both formal and informal educational opportunities that take place through the web. This topic experienced a surge of interest with the rise of massive open online courses in 2012, and has since been garnering greater acceptance as a mode of learning that can complement face-to-face instruction in blended learning approaches — or stand on its own. As leaders have gained a better understanding of this field, they have been conducting numerous related online learning experiments; educators are becoming more comfortable testing various levels of integration in their existing courses, and many believe that online learning can be an effective catalyst for thoughtful discussion on all pedagogical practice. Indeed, online learning is undergoing a sea change, with every dimension of the process open for reconceptualization.

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

### **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 multi-disciplinary 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 non-verbal skills.

### **Virtual Reality**

Virtual reality (VR) refers to computer-generated environments that simulate the physical presence of people and/or objects and realistic sensory experiences. At a basic level, this technology takes the form of 3D images that users interact with and manipulate via mouse and keyboard. More sophisticated applications of virtual reality allow users to more authentically feel the objects in these displays through gesture-based and haptic devices, which provide tactile information through force feedback. While enabling people to explore new environments has compelling implications for learning, to date, virtual reality has been most prominently used for military training. Thanks to advances in graphics hardware, CAD software, and 3D displays, virtual reality is becoming more mainstream, especially in the realm of video games. Oculus VR, a company focused on designing virtual reality products, is developing the heavily-anticipated Oculus Rift, a head-mounted display for gameplay to make the game environments and actions more lifelike. As both games and natural user interfaces are finding applications in classrooms, the addition of virtual reality can potentially make learning simulations more authentic for students.

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

### **Artificial Intelligence**

In the field of artificial intelligence (AI), computer science is being leveraged to create intelligent machines that more closely resemble humans in their functions. Having access to abundant knowledge, including categories, properties, and relationships between various information sets is the basis of the knowledge engineering that allows computers to simulate human perception, learning, and decision making. Neural networks are one area of AI research currently proving to be valuable for more natural user interfaces through voice recognition and natural language processing, allowing humans to interact with machines similarly to how they interact with each other. Artificial intelligence has the potential to enhance online learning, adaptive learning software, and simulations in ways that more intuitively respond to and engage with students.

### **Wearable Technology**

Wearable technology refers to computer-based devices that can be worn by users, taking the form of an accessory such as jewelry, eyewear, 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 interactions, or, in the case of Oculus Rift and similar gear, it can enable virtual reality. There are even new classes of devices that are seamlessly integrated with a user's everyday life and movements. Over the couple years, Google Glass has been one of the most heavily discussed wearables, enabling users to see information about their surroundings displayed in front of them. Smartwatches from Apple, Samsung, Sony, and Pebble are already allowing users to check emails and perform other productive tasks through a tiny interface. Thanks to the quantified self movement, 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.