



2017 K–12 Edition

HORIZON REPORT

DIGITAL TOOLKIT

Dialogue & Discussion: Catalysts for Change



Transformation in Perspective

Trends and technologies that will drive educational change over the next several years:

- 55 experts shared their knowledge and insights
- Your insights, experience, and expertise contribute to your district's direction



Trends, Challenges & Important Developments

- Summary Information
- Guiding Questions





Long-Term Trends: Driving Edtech Adoption in K-12 Education for Five or more years

ADVANCING CULTURES OF INNOVATION

- Schools are often seen as vehicles for driving innovation and entrepreneurship.
- We need new ideas to find ways to replicate promising ideas across diverse and unique learning institutions.
- Recent research indicates schools can nurture cultures that promote experimentation.
- Can K-12 education accept failure as an important part of the learning process?
- Integrating entrepreneurship into K-12 education underscores that every big idea has to start somewhere.
- Can we equip students and educators with the tools needed to spark real progress?
- Should we critically assess curriculum and implement changes to evaluation methods to remove the barriers to new ideas?



Topic One: Key Trends Accelerating K-12 Tech Adoption

Long-Term Trends: Driving Edtech Adoption in K-12 Education for Five or more years

DEEPER LEARNING APPROACHES

- Deeper learning is the mastery of content that engages students in critical thinking, problem-solving, collaboration, and self-directed learning.
- To remain motivated, students need to understand how new knowledge and skills will impact the world around them.
- Shifting the dynamic from passive to active learning enables students to use new information and develop ideas themselves.
- Approaches include problem-based, project-based, challenge-based, and inquiry-based learning. Each encourages creative problem-solving and actively implementing solutions.
- Technology tools are evolving to help educators connect the curriculum with real-life applications.



Mid-Term Trends: Driving Edtech Adoption in K-12 Education for the next Three to Five Years

GROWING FOCUS ON MEASURING LEARNING

- There is growing interest in “assessing” assessment.
- As societal and economic factors redefine what skills are necessary in today’s workforce, schools must rethink how to define, measure, and demonstrate subject mastery.
- Are there ways to assess soft skills such as creativity and collaboration?
- Data mining software and developments in online education, mobile learning, and learning management systems are starting to support learning environments that leverage analytics and visualization software.
- We now have the power to “see” learning data in a multidimensional portable manner.
- In online and blended courses, data can reveal how student actions contribute to their progress and specific learning gains.



Mid-Term Trends: Driving Edtech Adoption in K-12 Education for the next Three to Five Years

REDESIGNING LEARNING SPACES

- Conventional teaching models are evolving. Emerging technologies are gaining solid footholds in classrooms worldwide.
- Formal learning environments are changing to support 21st century learning practices.
- Education has traditionally relied on teacher-centric, “lecture” approaches for transferring knowledge.
- Student-focused pedagogies are taking hold to better prepare learners for the future workforce.
- New approaches to classroom design support this shift.
- Innovative thinking in architecture and space planning are influencing the sustainable design and construction of new school infrastructures, and may impact classroom practices and student learning significantly.

Topic One: Key Trends Accelerating K-12 Tech Adoption



Short-Term Trends: Driving Edtech Adoption in K-12 Education for the next One to Two Years

CODING AS A LITERACY

- Coding refers to a set of rules that computers understand.
- Coding can stimulate computational thinking by combining deep computer science knowledge with creativity and problem-solving.
- Code.org projected that by 2020 there will be 1.4 million computing jobs, but only 400,000 computer sciences students to fill them.
- To better prepare learners, a growing number of school leaders and technologists are making the case for embedding coding into K-12 curricula.
- Schools worldwide are developing coding programs in which students collaboratively design websites, develop educational games and apps, and design solutions to challenges by modeling and prototyping new products.
- User-friendly tools make it easier than ever for students to learn basic coding skills.



Short-Term Trends: Driving Edtech Adoption in K-12 Education for the next One to Two Years

RISE OF STEAM LEARNING

- STEM (science, technology, engineering and math) curriculum and programs are growing priorities in schools worldwide.
- STEM disciplines are viewed as a way to boost innovation and bolster national economies.
- Some educators believe there is a need for a more balanced curriculum, integrating disciplines such as the arts, design, and humanities into the sciences.
- The STEAM learning movement, in which the “A” standards for “art+” is gaining traction.
- STEAM focuses on engaging students in a multi- and interdisciplinary learning context that values the arts and humanities, while breaking down barriers that have traditionally existed among different courses and subjects.



Topic Two: Significant Challenges
Impeding K-12 Tech Adoption

Solvable Challenges: Those Which We Both
Understand and Know How to Solve

AUTHENTIC LEARNING OPPORTUNITIES

- Authentic learning experiences that put students in touch with real-world problems and work situations are still not pervasive in schools.
- The term authentic learning covers important pedagogical strategies that can immerse learners in environments where they can gain lifelong learning skills.
- These 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 schools have begun bridging the gap between academic knowledge and concrete applications by establishing relationships with the broader community.
- Through active school/community partnerships, students can experience the future that awaits them outside of school.



Topic Two: Significant Challenges Impeding K-12 Tech Adoption

Solvable Challenges: Those Which We Both Understand and Know How to Solve

IMPROVING DIGITAL LITERACY

- Knowing how to use technology productively and innovatively is an essential 21st century skill in the workplace and beyond.
- Digital literacy also covers a deeper understanding of the digital environment, enabling intuitive adaptation to new contexts, and co-creation of content with others.
- Schools play a central role in developing students' digital citizenship, ensuring mastery of responsible and appropriate technology.
- The drive for digital literacy impacts curriculum design, professional development, and student-facing services and resources.
- School leaders are challenged to build system-wide buy-in, and to support all stakeholders in developing and using digital literacy.
- Frameworks are helping schools assess current staff capabilities, identify growth areas, and develop strategies to implement digital literacy practices.



Topic Two: Significant Challenges
Impeding K-12 Tech Adoption

**Difficult Challenges: Those We Understand but
for Which Solutions Are Elusive**

RETHINKING THE ROLES OF TEACHERS

- We expect teachers to be skilled in a wide range of technology-based, and other new approaches, for content delivery, learned support, and assessment.
- In the technology-enabled classroom, teachers' primary responsibilities are shifting.
- In addition to being subject experts, they're tasked with constructing learning environments that help students build 21st century skills.
- Educators are asked to act as guides and mentors, modeling responsible global citizenship and motivating students to become lifelong learners.
- The ways teachers engage in their own professional development are changing to include social media, collaboration with other educators in and beyond their school sites, and using online tools and resources.
- Pre-service teacher training programs are also challenged to equip educators with digital competencies to ensure academic readiness.



Topic Two: Significant Challenges
Impeding K-12 Tech Adoption

**Difficult Challenges: Those We Understand but
for Which Solutions Are Elusive**

TEACHING COMPUTATIONAL THINKING

- Teaching computational thinking, synonymous with complex thinking, is still evolving, as definitions continue to change and as curricula are built.
- Computational thinking requires creating new forms of pre-service and in-service teacher training to be adequately taught in schools.
- To succeed in the 21st century, young people need to learn computational thinking skills, defined by ISTE as the ability to “develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.”
- Computational thinking is also a method of formalized problem-solving that leverages the power of collecting data, breaking it into smaller parts, and recognizing patterns.
- Coding is one approach to solving problems in an increasingly digital world, but it is only a form of computational thinking.



Topic Two: Significant Challenges Impeding K-12 Tech Adoption

Wicked Challenges: Those That Are Complex to Even Define, Much Less Address

ACHIEVEMENT GAP

- The achievement gap is a disparity in academic performance between student groups, especially as defined by socioeconomic status, race, ethnicity, or gender.
- Peer pressure, student tracking, negative stereotyping, and test bias intensifies this challenge.
- Schools use many success standards to define learning expectations, including grades, standardized test scores and completion rates, comparing student performance at the individual and group level.
- Adaptive and personalized learning technologies are playing a larger role in identifying lower performing students and student populations. These help educators understand contributing factors and address challenges through targeted intervention methods and engagement strategies that help close the gap.
- Focused global attention can address ongoing obstacles to education for children in countries experiencing civil unrest, as well as cultural barriers depriving females of access to school.



Topic Two: Significant Challenges
Impeding K-12 Tech Adoption

**Wicked Challenges: Those That Are Complex to
Even Define, Much Less Address**

SUSTAINING INNOVATION THROUGH LEADERSHIP CHANGES

- Sustaining long-term success is a key consideration when developing any new program.
- External factors such as fluctuating funding and leadership changes can impact short- and longer-term planning.
- The process of preparing for the unknown is not always well-defined, nor is it currently the norm in schools.
- Planning and implementing innovative approaches to improve student success requires the sustained focus and dedication of leaders, faculty, and staff.
- Leadership vacancies or transitions can delay projects or hinder the development and growth of programs to effectively meet student needs.
- Turnover in key district or school positions stalls promising projects, especially if a clear innovation strategy goes without implementation.
- Districts and schools must identify successful strategies for making continued progress on promising innovations in the face of transitioning governance.



MAKERSPACES

- There is a shift in the types of skillsets that have real, applicable value in a rapidly advancing world.
- Schools are grappling with the question of how to renovate or repurpose classrooms to address future needs.
- One promising answer is makerspaces or workshops that offer tools and the learning experiences needed to help students carry out their ideas.
- Makerspaces are rooted in the maker movement, a growing community of artists, tech enthusiasts, engineers, builders, tinkerers, and others with passion for making things.
- Makerspaces can appeal to students of all ages, and are founded on the openness to experiment, iterate, and create. Creativity, design, and engineering are making their way to the forefront of educational innovation.
- Tools such as 3D printers, robotics kits, and 3D modeling web applications are becoming more accessible to more students.
- Makerspace enthusiasts in education highlight the benefit of engaging learners in creative, higher-order problem-solving through hands-on design, construction, and iterations.



ROBOTICS

- Robotics is the design and application of robots – automated machines that accomplish a range of tasks.
- Today, robots in mining, transportation and the military have helped improve operations for industries by performing tasks that are unsafe or tedious for humans.
- The global robot population is expected to double to four million by the year 2020 – a shift that will impact business models and economies worldwide.
- There is substantial debate on how workers will continue to be affected by the global economy's growing dependence on robots.
- Robotics programs are focusing on outreach efforts that promote robotics and programming, as multi-disciplinary STEM learning that can help students develop strong, 21st century problem solving skills.
- Studies also show that interaction with humanoid robots can help learners with spectrum disorders develop better social, verbal, and non-verbal communication skills.



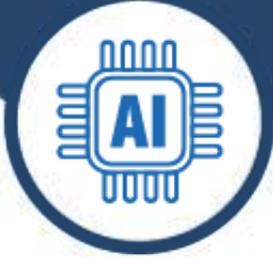
ANALYTICS TECHNOLOGIES

- Big data is the 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, making it easy to identify, analyze, and visualize patterns that may have otherwise gone undetected.
- In education, data mining is already underway to target at-risk students, personalize learning, and create flexible pathways to success.
- As educators become more adept at working with and interpreting big data, they can make more informed decisions that address real learner needs.
- There is a need for better tools and an exploration of the potential for collecting and analyzing data more deeply.
- 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.



VIRTUAL REALITY

- Virtual reality (VR) refers to computer-generated environments that simulate the physical presence of people and/or objects, and realistic sensory experiences.
- This technology takes the form of 3D images that users interact with and manipulate via mouse and keyboard.
- While VR has compelling implications for learning, to date, it has been most prominently used for military training.
- With advances in graphics hardware, CAD software and 3D displays, VR is moving into the mainstream, especially in video games. Head-mounted displays make game environments and actions more lifelike.
- Both games and natural user interfaces are finding applications in classrooms, and VR has the power to make learning simulations more authentic.



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.
- The knowledge engineering that allows computers to simulate human perception, learning, and decision-making is based on access to abundant knowledge including categories, properties, and relationships among various information sets.
- Neural networks, a significant area of AI research, are proving to be valuable for more natural user interfaces through voice recognition and natural language processing.
- AI allows humans to interact with machines similarly to ways they interact with each other.
- Neural networks model the biological function of animal brains to interpret and react to specific inputs such as words and tone of voice.
- As AI continues to develop, it can enhance online learning, adaptive learning software, and simulations in ways that more intuitively respond to and engage with students.



Topic Three: Important Developments in Education Technology for K-12 Education

Time-to-Adoption Horizon: Four to Five Years

INTERNET OF THINGS

- The Internet of Things (IoT) consists of objects endowed with computing power through processors or embedded sensors capable of transmitting information across networks.
- These connections allow remote management, status monitoring, tracking, and alerts.
- Municipal governments and schools are applying the capabilities of IoT, leveraging data to streamline processes and promote sustainability.
- Connected devices are generating data on student learning and activity, informing the direction of content delivery and school planning.
- As more smart devices arrive on school grounds, schools are evaluating implications for privacy and security.
- IoT has the potential to help schools reduce costs, use student data more efficiently, and provide students with tools to create novel solutions to real-world problems.



SUMMARY

NMC/CoSN Horizon Report > 2017 K-12 Edition at a Glance

Key Trends Accelerating Technology Adoption in K-12 Education

2017

2018

2019

2020

2021

Short-Term

Driving technology adoption in K-12 education for the next one to two years



Coding as a Literacy
Rise of STEAM Learning

Mid-Term

Driving technology adoption in K-12 education for the next three to five years



Growing Focus on Measuring Learning
Redesigning Learning Spaces

Long-Term

Driving technology adoption in K-12 education for five or more years



Advancing Cultures of Innovation
Deeper Learning Approaches



www.cosn.org



www.nmc.org



www.mymindsparklearning.org