



2017 K–12 Edition

HORIZON REPORT

DIGITAL TOOLKIT





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About the Horizon Report, 2017 K–12 Edition

Each year, the New Media Consortium (NMC) and the Consortium for School Networking (CoSN) jointly create the NMC/CoSN Horizon Report K–12 Education Edition. As in prior years, the 2017 report addresses new and emerging technologies for learning, and gives education’s technology leaders, innovators and practitioners valuable insights as they develop digital strategies and plans that will help prepare students for the needs of the world beyond the classroom.

The report is produced with the insights of an international panel of experts. Each year, nearly one million educators, policy makers, parents, students and community leaders download the report to use as they plan for schools’, districts’ and community approaches to technology, now and over the next five years.

About the Digital Toolkit

The report itself, and this Digital Toolkit, are made possible by mindSpark Learning, a nonprofit dedicated to evolving education through educators. The report and toolkit are available for digital download at <http://2017-nmc-cosn-horizon-report-k12resources.org>. The Digital Toolkit gives you conversation starters, event ideas, visual resources, and more, to use as you engage colleagues and your community in essential planning, vision, and strategy discussions.



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HORIZON REPORT 2017 K–12 EDITION AT
[HTTPS://GOO.GL/OIND1W](https://goo.gl/OIND1W)

WELCOME TO THE FUTURE OF EDTECH

This Toolkit Will Ignite New Thinking...

When you download the K–12 Edition of the 2017 Horizon Report, you'll find compelling coverage of the trends and technologies that will drive educational change over the next several years. A panel of 55 experts identified these issues, opportunities and challenges, and the report is organized to help everyone involved in education and technology planning think about the years ahead, strategically and imaginatively, informed by expert opinion.

This toolkit offers ideas and resources to use in live, online, and social engagement channels, to spark thoughtful and informed discussions about what's ahead. It's organized to help you plan events, outreach, and other engagement programs that encourage stakeholders to participate in planning, supporting, and sharing the work your school district and other organizations do to prepare students to succeed in a digital world.

Participation Makes a Difference

For 16 years, the NMC Horizon Report has charted the challenges and important developments in educational technology. The report is regarded as the world's longest-running exploration of emerging technology trends and uptake in education. School district leaders around the U.S. have discovered that when they share the report's findings with stakeholders, they build support for their technology and digital transformation initiatives.

Dialogue, shared exploration, and the critical steps of aligning trends to specific community needs and priorities will help every educational leader move forward collaboratively and confidently. And, as stakeholders share in the key work of building technology vision and commitment for their community's schools, they often become invested in supporting innovation and excellence.

We encourage you and your team to use the ideas here as a springboard for your specific needs. We look forward to hearing about your successes.

THE NMC/COSN HORIZON REPORT: 2017 K–12 Edition at a Glance

THE REPORT IS ORGANIZED IN THREE MAJOR SECTIONS, AND IN EACH SECTION THERE ARE SIX SETS OF KEY FINDINGS:

Key Trends Accelerating K–12 Tech Adoption

- Long-Term Trends: Five or More Years
 - Advancing Cultures of Innovation
 - Deeper Learning Approaches
- Mid-Term Trends: Three to Five Years
 - Growing Focus on Measuring Learning
 - Redesigning Learning Spaces
- Short Term Trends: The Next One to Two Years
 - Coding as a Literacy
 - Rise of STEAM Learning

Significant Challenges Impeding K–12 Tech Adoption

- Solvable Challenges: Those We Both Understand and Know How to Solve
 - Authentic Learning Experiences
 - Improving Digital Literacy
- Difficult Challenges: Those We Understand, but Solutions Are Elusive
 - Rethinking the Roles of Teachers
 - Teaching Computational Thinking
- Wicked Challenges: Those That Are Complex to Even Define, Much Less Address
 - Achievement Gap
 - Sustaining Innovation through Leadership Changes

Important Developments in Educational Technology for K–12 Education

- Time-to-Adoption of One Year or Less
 - Makerspaces
 - Robotics
- Time-to-Adoption of Two to Three Years
 - Analytics Technologies
 - Virtual Reality
- Time-to-Adoption of Four to Five Years
 - Artificial Intelligence
 - Internet of Things

**Promote Your
Community
Engagement
Programs Using
the Resources in
This Digital
Toolkit.**

In this toolkit, you'll find ideas for organizing events and outreach that will stimulate discussions around these topics. You'll also find tools and resources to help you make these conversations productive and memorable for the participants who join and contribute to the dialogue.

LET'S GET THE CONVERSATION STARTED... MAKE IT AN EVENT

Live, in-person events connect people and ideas and can help build support for your technology vision and initiatives.

Community Town Hall

Recruit a panel of experts from your district and community supporters to discuss each of the three major sections of the report. Select a moderator to lead the discussion and field audience questions.

- Your moderator can summarize each trend, challenge, and development, and then ask panelists for their views about the specifics outlined in the report.
- A report summary can be provided to attendees.
- Panelists can provide their opinions and views about how they see your community's schools addressing these issues and opportunities.
- You can amplify the impacts of an event like this by live streaming it or videotaping it to share with your community members on your own video channel or an online video channel, such as YouTube or Vimeo.
- You can ask attendees to attend additional meetings or participate in future "working groups" to review and comment on your plans going forward.

Focus Group/Advisory Sessions

Over a four to six week timeframe, you can organize a series of three group sessions (one for each of the report's three main topic areas: Key Trends, Significant Challenges, and Important Developments). Typically, these sessions run for two hours or less and the conversation focuses in-depth on the ideas presented in the report.

- Choose a moderator who is knowledgeable and neutral to moderate the discussions.
- Record the sessions using audio or video, and make these recordings available to your larger community.
- Summarize the attendees' input, and use the summaries as part of your subsequent planning discussions.



LET'S GET THE CONVERSATION STARTED... MAKE IT AN EVENT

Virtual Discussions

You can convene discussions using telepresence solutions such as Google Hangouts, GoToMeeting, WebEx or your own internal distance/collaborative platform. You can host focus groups, weekly discussion working groups, or other panel discussions. You can also consider hosting interactive discussions via social media or secure communication channels such as Slack or Basecamp.

- Post key questions about report findings and ask for group members to respond and discuss the findings.
- Summarize discussion points and key findings to share with your planning and policy teams.

Reach Out and Collaborate

If you already have standing volunteer or staff committees, community outreach forums and programs, or other support and advisory groups in place, you can tap into those sources as well, to share Horizon Report findings and ask for responses and suggestions. However you choose to engage your community, you can use the questions and resources in the next sections to gather input and build support.

Engage New Stakeholder Groups

As you plan new events, consider a session with and for students, so their voices are heard. Other events can include representatives from your neighboring higher education communities, local business leaders, and representatives from local government. These guests can be panelists or invited guests. Their participation will help you gather a variety of perspectives and can help establish important, new connections and relationships.

**Share the
NMC/CoSN
Horizon Report
with Your Team.**

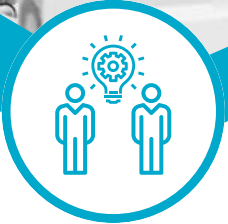
**Download it at
<https://goo.gl/oind1w>**

DISCUSSION QUESTIONS

In this section of the Toolkit, you'll find questions and statements that will open dialogue about each of the NMC/CoSN Horizon Report: 2017 K-12 Edition topics. You can use these questions in your events and community discussions and as part of an overall communications plan.



Long-term Trends: Driving Edtech Adoption for Five or More Years



ADVANCING CULTURES OF INNOVATION

Schools are often seen as vehicles for driving innovation and entrepreneurship. Recently, there has been a shift from simply understanding the value of fostering the exploration of new ideas, to finding ways to replicate promising ideas across diverse and unique learning institutions. Research conducted over the past year offers new understanding about how schools can nurture cultures that promote experimentation. A significant element of progress is the call for K–12 education to alter its status quo to accept failure as an important part of the learning process. The act of integrating entrepreneurship into K–12 education further acknowledges that every big idea has to start somewhere. We can equip students and educators with the tools needed to spark real progress. To keep pace, schools must critically assess their curriculum and implement changes to their evaluation methods to remove the barriers that stand in the way of new ideas.

DISCUSSION QUESTIONS

1. How do we encourage the development of new ideas currently?
2. Does our current learning environment promote experimentation?
3. How do we define success? How do we define failure? Should we re-think these definitions?
4. Are there opportunities to teach entrepreneurship within our current curricula and practices?
5. Are we effective at replicating success across our district? What can we change?
6. What kinds of tools and resources do students and educators need, to explore new ideas and use an entrepreneurial mindset?
7. Do our evaluation methods limit or encourage new ideas and approaches? What changes can and should we make?
8. In preparing students for college and career, is it important for their learning environment to integrate concepts of innovation and entrepreneurship?



Long-term Trends: Driving Edtech Adoption for Five or More Years

DEEPER LEARNING APPROACHES

Deeper learning approaches are growing in importance in K–12 education. The William and Flora Hewlett Foundation defines deeper learning as 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. Pedagogical approaches that shift the dynamic from passive to active learning, enable students to use new information and develop ideas themselves. They can take control of how they engage with a subject. These approaches include problem-based learning, project-based learning, challenge-based learning, and inquiry-based learning. Each encourages creative problem-solving and actively implementing solutions. As the role of technology evolves to enable deeper learning, educators are leveraging these tools to connect the curriculum with real-life applications.

DISCUSSION QUESTIONS

1. How does our learning community approach the challenge of deeper learning?
2. Are our teachers knowledgeable and confident in using approaches such as problem- and project-based learning?
3. Do we have the needed technology infrastructure and resources to support deeper learning successfully?
4. What kinds of curriculum changes can we make to support deeper learning for all students?
5. How do we evaluate and assess deeper learning? Do our current approaches need to change?
6. Are there strategies and tactics we can use to connect our instructional approaches to real world needs and opportunities?
7. How we can we leverage the current work we're doing around connecting curriculum and the "real world"?
8. What are the first steps we can/should take to address this trend?

Mid-term Trends: Driving Edtech Adoption for the Next Three to Five Years



GROWING FOCUS ON MEASURING LEARNING

There is a growing interest in assessment and in the variety of tools and methods used to evaluate, measure, and document academic readiness, learning progress, skill acquisition, and students' other educational needs. 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. They also need to find ways to assess soft skills such as creativity and collaboration. The emergence of data mining software and developments in online education, mobile learning, and learning management systems, is starting to support learning environments that leverage analytics and visualization software. The result is 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.

DISCUSSION QUESTIONS

1. Have our assessment and learning measurement practices kept pace with current expectations for students' knowledge and skills?
2. Are we evaluating both academic and soft skills? Should we measure students' soft skills?
3. Many stakeholders are "sensitive" to "too much testing"—how can we address this concern while making sure we still measure what matters?
4. Are we using available data mining and visualization technologies to inform our instructional decisions?
5. Do we provide students with the opportunity to measure their own learning and evaluate their progress? Should we?
6. Do we share measurement data effectively to positively impact student achievement?
7. What additional technology supports would improve our evaluation and measurement capacity?
8. What are the first steps we can/should take to address this trend?



Mid-term Trends: Driving Edtech Adoption for the Next Three to Five Years

REDESIGNING LEARNING SPACES

Conventional teaching models are evolving. Emerging technologies are gaining solid footholds in classrooms worldwide. In response, formal learning environments are changing, as well, to support 21st century learning practices. Education has traditionally relied on teacher-centric approaches, where lectures were the main source for transferring knowledge. Today, student-focused pedagogies are taking hold to better prepare learners for the future workforce. New approaches to classroom design support this shift. Additionally, innovative thinking in architecture and space planning is influencing the sustainable design and construction of new school infrastructures. This has the potential to impact classroom practices and student learning significantly.

DISCUSSION QUESTIONS

1. Do our facilities support 21st century learning effectively?
2. What kinds of space planning and utilization changes can we make in our current facilities to accommodate today's learning models?
3. How can we plan and budget for facilities upgrades and changes to embark on a path for modernization?
4. Can we identify community resources to help us “re-imagine” our facilities design needs for the next 3–5 years?
5. Where does facilities design fit within our current priorities?
6. Sustainability and environmentally sound facility operations are priorities—how can we develop new facilities plans in keeping with these important mandates?
7. How do we introduce this trend and opportunity to key stakeholders? What kinds of evidence, plans or other supports would we need?
8. What are the first steps we can/should take to address this trend?

Short-term Trends: Driving Edtech Adoption over the Next One to Two Years



CODING AS A LITERACY

Coding refers to a set of rules that computers understand and can take the form of numerous languages, such as HTML, JavaScript, and PHP. Many educators perceive coding as a way to stimulate computational thinking: the skills required to learn coding combine deep computer science knowledge with creativity and problem-solving. Code.org recently 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 from a young age, 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, such as Raspberry PI, Scratch, and LegoNXT are making it easier than ever for students to learn basic coding skills.

DISCUSSION QUESTIONS

1. Should our schools make a commitment to offering (or expanding) coding classes for all learners?
2. What kinds of technology devices and software would we need to start or expand a coding program?
3. Are there critical advantages or disadvantages to investing now in coding programs for our students?
4. How can we evaluate the benefits of including coding in our curriculum?
5. Should all of our students be required to learn coding?
6. Are our teachers prepared to teach coding? If not, what steps do we need to take?
7. Are there community-based resources and experts we should tap to help us launch or expand our current coding programs?
8. Are there other instructional priorities we should consider first, before thinking about adding coding to our curriculum?

Short-term Trends: Driving Edtech Adoption over 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, responding to the STEM trend, 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. The company, STEAM Education, expands this definition to a fundamental philosophy that all disciplines can and should relate to each other to provide students with the big picture of how a wide variety of knowledge and skill sets connect in the real world. For example, technology use does not exclusively relate to advancing science and engineering. 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.

DISCUSSION QUESTIONS

1. Do we, as an educational institution, value the arts and humanities, as critical curriculum components?
2. What strategies and tactics can we consider to expand our current STEM programs to incorporate STEAM learning opportunities?
3. Are our teachers prepared to support STEAM curriculum additions?
4. What new or additional teaching and learning resources would we need to launch STEAM learning?
5. Where does the integration of STEAM fall in our list of instructional priorities?
6. Is STEAM just another passing “fad” or should we view this movement as an on-ramp for educating “the whole child”?



Solvable Challenges: Those That We 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 is used 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 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.

DISCUSSION QUESTIONS

1. Can we create authentic learning opportunities for students without drastically changing curriculum?
2. How can technology support authentic learning opportunities for our students?
3. What kinds of resources and supports will our teachers need to integrate authentic learning into their regular teaching practices?
4. What should the role of local employers, policy makers, and other community leaders be in helping our schools develop and access needed expertise and resources?
5. Are there specific content areas or subjects in which authentic learning opportunities can greatly enhance learning and engagement?
6. What are the first steps we can/should take to address this challenge?
7. What are the measures of success we can apply when we integrate authentic learning opportunities?



Solvable Challenges: Those That We 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 goes beyond isolated technological skills to generating a deeper understanding of the digital environment, enabling intuitive adaption 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 use. This includes online communication etiquette and digital rights and responsibilities in blended and online learning settings, and beyond. The drive for digital literacy impacts curriculum design, professional development, and student-facing services and resources. Because digital literacy encompasses so many skill and knowledge sets, school leaders are challenged to build system-wide buy-in, and to support all stakeholders in developing and using these competencies. Frameworks are helping schools assess current staff capabilities, identify growth areas, and develop strategies to implement digital literacy practices.

DISCUSSION QUESTIONS

1. What programs are currently in place to build educators' and students' digital literacy skills?
2. Do the programs we currently offer support students adequately?
3. Should digital literacy be the responsibility of our school library media specialists?
4. Are there programs we can adopt that would address our digital literacy teaching and learning needs?
5. Today's students are "digital natives". Do we really need to teach them core technology skills?
6. Should teachers be required to demonstrate acceptable digital literacy skills as part of their core skill sets?

Difficult Challenges: Those We Understand But For Which Solutions Are Elusive



RETHINKING THE ROLES OF TEACHERS

Teachers are increasingly expected 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. Now, in addition to providing expert-level knowledge, they're tasked with constructing learning environments that help students build 21st century skills. These typically include creative inquiry and digital literacy. Educators are asked to act as guides and mentors, modeling responsible global citizenship, and motivating students to adopt lifelong learning habits by giving them opportunities to direct their own learning trajectories. Expectations are evolving, and they are changing the ways teachers engage in their own professional development, much of which involves 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 amid other professional requirements, to ensure classroom readiness.

DISCUSSION QUESTIONS

1. Have our expectations of teachers' roles changed? Can we specifically define those new expectations?
2. Are our professional development programs and investments aligned with our changing expectations?
3. Are we providing adequate professional learning opportunities for teachers?
4. Will our changing expectations impact our hiring strategies going forward?
5. Are there opportunities to partner with higher education institutions to shape pre-service training programs to better match our current and future staffing needs?
6. Have we asked teachers about their expectations and perceptions of their changing roles? Should we develop a formal feedback and input process to gather teacher feedback?

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 how to be computational thinkers, defined by the International Society for Technology in Education as the ability for students 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 has also been described as a method of formalized problem-solving, and as strategy 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 one form of computational thinking.

DISCUSSION QUESTIONS

1. Do our current curriculum and instructional approaches help students build computational thinking skills?
2. Do our teachers have the skills and capacity to teach and model computational thinking skills?
3. How do successful schools and districts integrate computational thinking into their existing curriculum approaches?
4. Do our stakeholders support our commitment to building students’ computational thinking capacity?
5. Do we have the resources to teach and evaluate computational thinking skills?
6. What are the first steps we can/should take to address this challenge?

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



ACHIEVEMENT GAP

The achievement gap is often described as an observed disparity in academic performance between student groups, especially as defined by socioeconomic status, race, ethnicity, or gender. Environmental factors, such as peer pressure, student tracking, negative stereotyping, and test bias, intensify this challenge. Schools use many success standards to define learning expectations, including grades, standardized test scores and completion rates, leading to comparisons of 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 and leaders understand contributing factors, and address challenges by enabling and scaling targeted intervention methods and engagement strategies that help close the gap. Focused global attention will be necessary to address ongoing obstacles to education for children in countries experiencing civil unrest, as well as cultural barriers depriving females' access to school.

DISCUSSION QUESTIONS

1. How much do we know and understand about the impacts of the achievement gap in the communities our school district serves? How can we learn more?
2. What can our district do to help children overcome the obstacles of poverty, such as a lack of access to quality health care?
3. How are we addressing our higher need schools? Are our efforts producing the desired outcomes?
4. Is there a greater role for technology in our efforts to close the achievement gap?
5. Are we providing exemplary support and intervention for lower-performing students in time? Are there approaches we should change or add to our initiatives?
6. How can we work more successfully with families and community-based organizations and partners?

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 long-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 focus and dedication of leaders, faculty, and staff. Unfortunately, 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. Sustainable change is stopped and other participants do not feel a sense of program ownership. Districts and schools must identify successful strategies for making continued progress on promising innovations in the face of transitioning governance.

DISCUSSION QUESTIONS

1. Do we have contingency plans for our innovative programs, so we can deal effectively with any leadership changes?
2. Do we evaluate and document the results of innovative programs continually to support sustainability?
3. Have we taken the necessary steps to ensure that innovative programs are a priority component of our district's mission and vision?
4. Have we communicated the value and potential of our innovative programs consistently to teachers, parents, and our network of stakeholders?
5. Do we have a team of dedicated leaders and contributors to support the development and continuation of innovation?



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

Time-to-Adoption Horizon: One Year or Less

MAKERSPACES

As the 21st century progresses, we are experiencing 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 the needs of the future. One promising answer is the concept of makerspaces, or workshops that offer tools and the learning experiences needed to help students carry out their ideas. The driving forces behind makerspaces are rooted in the maker movement—a growing community of artists, tech enthusiasts, engineers, builders, tinkerers, and anyone else with a passion for making things. Makerspaces are intended to appeal to students of all ages, and are founded on the openness to experiment, iterate, and create. In this landscape, 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.

DISCUSSION QUESTIONS

1. Can we incorporate makerspaces into our existing classroom, library, or other school site facilities? Can we re-purpose existing classrooms, labs, or media centers to include maker activities and learning?
2. Are our teachers prepared to serve as facilitators and guides for makerspace learning activities?
3. What kinds of materials, equipment, and technologies will we need? How can we plan for and budget for these investments?
4. Where should makerspaces fit in our current instructional programs? Should they be part of STEM or STEAM? Should they be considered as “specials” or extra-curricular programs?
5. How can we assess student performance and program success?
6. Can we involve community organizations, foundations, university partners, or other organizations, in helping us start and support makerspace programs and activities?



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

Time-to-Adoption Horizon: One Year or Less

ROBOTICS

Robotics is the design and application of robots—automated machines that accomplish a range of activities. Early robots were integrated into factory assembly lines to streamline and increase manufacturing productivity. Today, robots in mining, transportation, and the military have helped improve operations for industries as they perform 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, with a projected market value of \$135 billion in 2019. Robotics is two to three years away from mainstream adoption in K–12 education, but, even now, it's gaining traction for hands-on learning, particularly in STEM disciplines. Classes and outreach programs are incorporating robotics and programming to promote students' critical and computational thinking, along with problem-solving skills. Studies also show that interaction with humanoid robots can help learners with spectrum disorders develop better communication and social skills.

DISCUSSION QUESTIONS

1. Is there a role for robotics in our future STEM and Special Education programs?
2. Will robotics programs and activities support our goals of preparing students for college and career?
3. Should robotics programs be offered as extra-curricular activities that are parent supported?
4. Should we begin planning for robotics by offering training opportunities to interested teachers?
5. How can we ensure that every student has the opportunity to explore robotics?
6. Can we “pilot” or explore the role of humanoid robots in our special education programs? What should be our first and next steps?



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

Time-to-Adoption Horizon: Two to Three Years

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 is where the idea of big data began. What is big data? It's 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 and analyze patterns that may have otherwise gone undetected. With the complexity surrounding such large, diverse data sets, displaying the information is crucial to its use and value. Information visualization uses infographics, the graphical representation of technical data, designed to be quickly and easily understood. 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. At the same time, 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.

DISCUSSION QUESTIONS

1. Are we making effective use of the data we currently gather?
2. How could we use “deeper” data to improve student outcomes?
3. Are our data privacy and security protocols effective? Do they provide barriers to innovative use of student data?
4. Do we have processes in place for sharing select data with the appropriate internal and external audiences?
5. Are there programs and tools that are already available that would support our data-driven improvement and innovation initiatives?
6. Can we leverage the experience and expertise of other districts that have adopted robust data mining and data analytics initiatives?



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

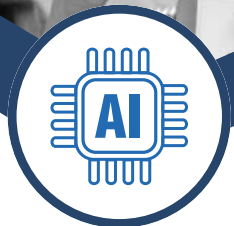
Time-to-Adoption Horizon: Two to Three Years

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. Contemporary applications 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 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.

DISCUSSION QUESTIONS

1. Is VR a technology we should begin planning for and piloting now?
2. Should we attempt to pilot and plan for VR in our curriculum independently?
Should we seek community and university partners to help us build a VR program?
3. Is VR technology a “necessity” for our curriculum or a “nice to have”?
4. Can VR help us address equity issues by introducing all students to global and local landmarks or cultural events and exhibitions?
5. Do we have access to vendors who can help us evaluate options for the future?
6. Should we begin to train a small cadre of teachers in using and teaching with VR?



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

Time to Adoption: 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. The knowledge and 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 currently proving to be valuable for more natural user interfaces through voice recognition and natural language processing. In other words, 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 has the potential to enhance online learning, adaptive learning software, and simulations, in ways that more intuitively respond to and engage with students.

DISCUSSION QUESTIONS

1. Where do we envision the benefits of AI in our learning systems and approaches?
2. Chatbots are envisioned as virtual tutors, eventually helping students as they learn in an online environment. How can we stay current with AI developments so we can make decisions moving forward?
3. Already, there are adaptive learning solutions that leverage AI and natural language processing to identify students' knowledge gaps. Other solutions include conducting individual assessments and then delivering tailored content and support, targeting subject areas and skills where students need additional instruction and practice to achieve mastery. Should we begin piloting some of these solutions now?
4. Who in our district and community (including students or faculty) should help us monitor advances in AI?
5. How can we integrate AI explorations in our current STEM and STEAM programs?



IoT

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

**Time to Adoption:
Four to Five Years**

INTERNET OF THINGS

The Internet of Things (IoT) consists of objects endowed with computing power through processors or embedded sensors that are 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.

DISCUSSION QUESTIONS

1. Where should we begin to explore the potential applications and benefits of IoT?
Should this be the role of our technology leadership team?
2. Should we form a task force or study group to investigate potential uses of IoT?
3. Are there specific needs we have in terms of facilities and equipment operations and maintenance that IoT would support?

DISCUSSION SUPPORT

Discussion Worksheet

Discussion Topic(s): _____

Participants: _____

This form can help you organize your notes during discussions and outreach events.

Points of Agreement/Consensus: _____

Points of Disagreement: _____

Points of Confusion: _____

Ideas Emerging from Discussion: _____

DISCUSSION SUPPORT

Discussion Worksheet

Suggestions for Next Steps: _____

Indications of Priorities: _____

Additional Information Needed/Requested: _____

Individuals Interested in Additional Opportunities for Involvement and Discussion: _____

PROMOTING YOUR EVENTS

In this section of the Toolkit, you'll find materials you can customize to promote your NMC/CoSN Horizon Report: 2017 K-12 Edition. These include:

- A Sample Press Release
- Email and Print Invitation Templates
- Social Media Suggestions
- Follow-Up Communications

You can use these resources to create materials for your local media, school and district communications channels, and regularly scheduled announcements.



PROMOTING YOUR EVENTS

A Sample Press Release

Get Your Colleagues & Community
Engaged in Technology Planning.
Use the NMC/CoSN Horizon Report
as Your Discussion Catalyst.

FOR IMMEDIATE RELEASE

[District Name] to Discuss Future of Education Technology at Community Forum

[City or state name] educators to review report on upcoming education technology trends

[Location] (Date) — As technology continues to change the face of education, teachers and district leaders must remain informed on current and upcoming practices in technology-based teaching. To support community discussion about K–12 technology adoption, [district name] is hosting an event to review the NMC/CoSN Horizon Report: 2017 K–12 edition.

The NMC/CoSN Horizon Report provides a five-year forecast of trends and technologies that will drive educational change. A group of 55 experts work in collaboration to produce the roundup of key trends, significant challenges and important developments. The report serves as a technology-planning guide for educators, school leaders, administrators, policymakers and technologists.

“This discussion is an opportunity for members of our district to learn from the report as well as their colleagues’ interpretations of the key trends,” said [District leader]. “It is a priority for our district to initiate discussions about how we can adapt our strategies to the latest technological pedagogy in order to improve student learning.”

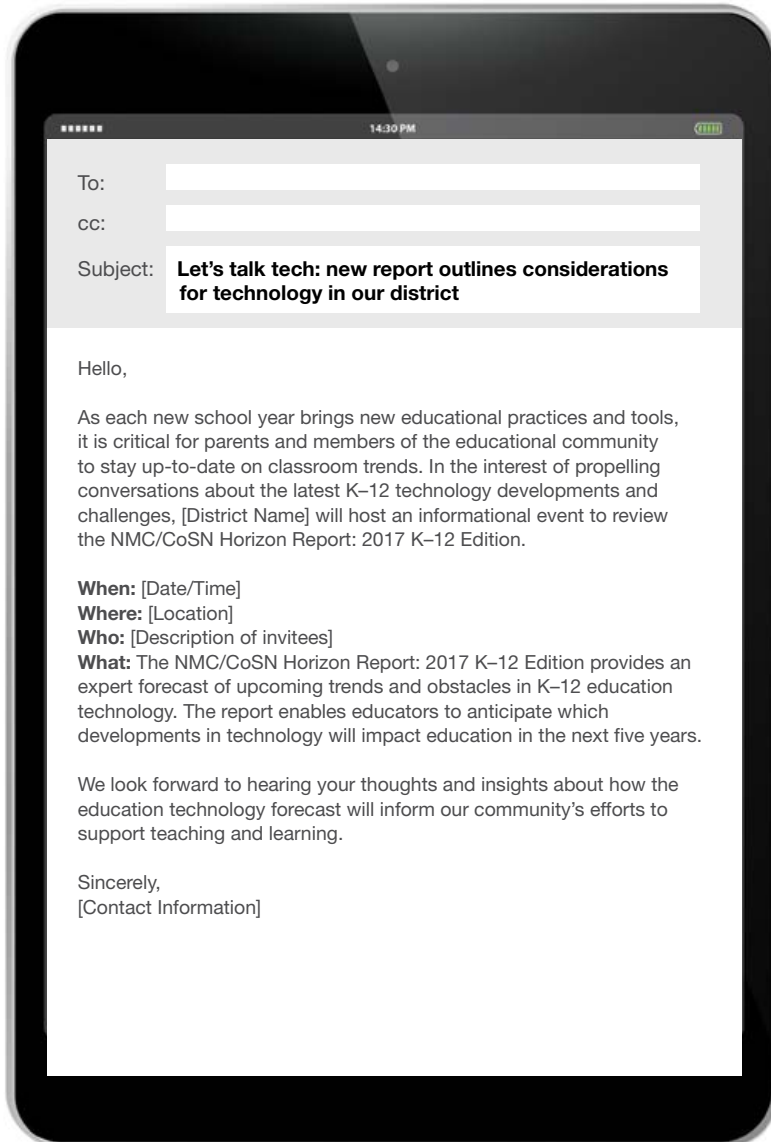
With 16 years of research and publications, the Horizon Report is one of the longest-standing explorations of education technology developments. Trends highlighted in the report are expected to impact the K–12 education community on a global scale.

At the forum, attendees will discuss how issues highlighted in the report apply to [District name]’s technology initiatives moving forward. The event will be held at [location] at [date and time].

To learn more about the NMC/CoSN Horizon Report, please visit [Link to Come]

PROMOTING YOUR EVENTS

Email Invite Copy



Written Invite Copy

Hello,

To generate conversations about the latest developments in K-12 technology, [District Name] will host an informational event to review the NMC/CoSN Horizon Report: 2017 K-12 Edition.

When: [Date/Time]

Where: [Location]

Who: [Description of invitees]

What: The NMC/CoSN Horizon Report: 2017 K-12 Edition provides an expert forecast of upcoming trends and obstacles in K-12 education technology. The report enables educators to anticipate which developments in technology will impact education in the next five years.

We look forward to hearing your thoughts and insights about how the education technology forecast will inform our community's efforts to support teaching and learning.

Sincerely,
[Contact Information]

EVENT FOLLOW-UP CONTENT AND STRATEGY

After hosting an event to discuss the 2017 NMC/CoSN Horizon Report, distributing follow-up communications through multiple channels will encourage further community engagement with the findings in the report. Suggested follow-up includes social media content, an email to the district as well as an email to local media.



SOCIAL CONTENT

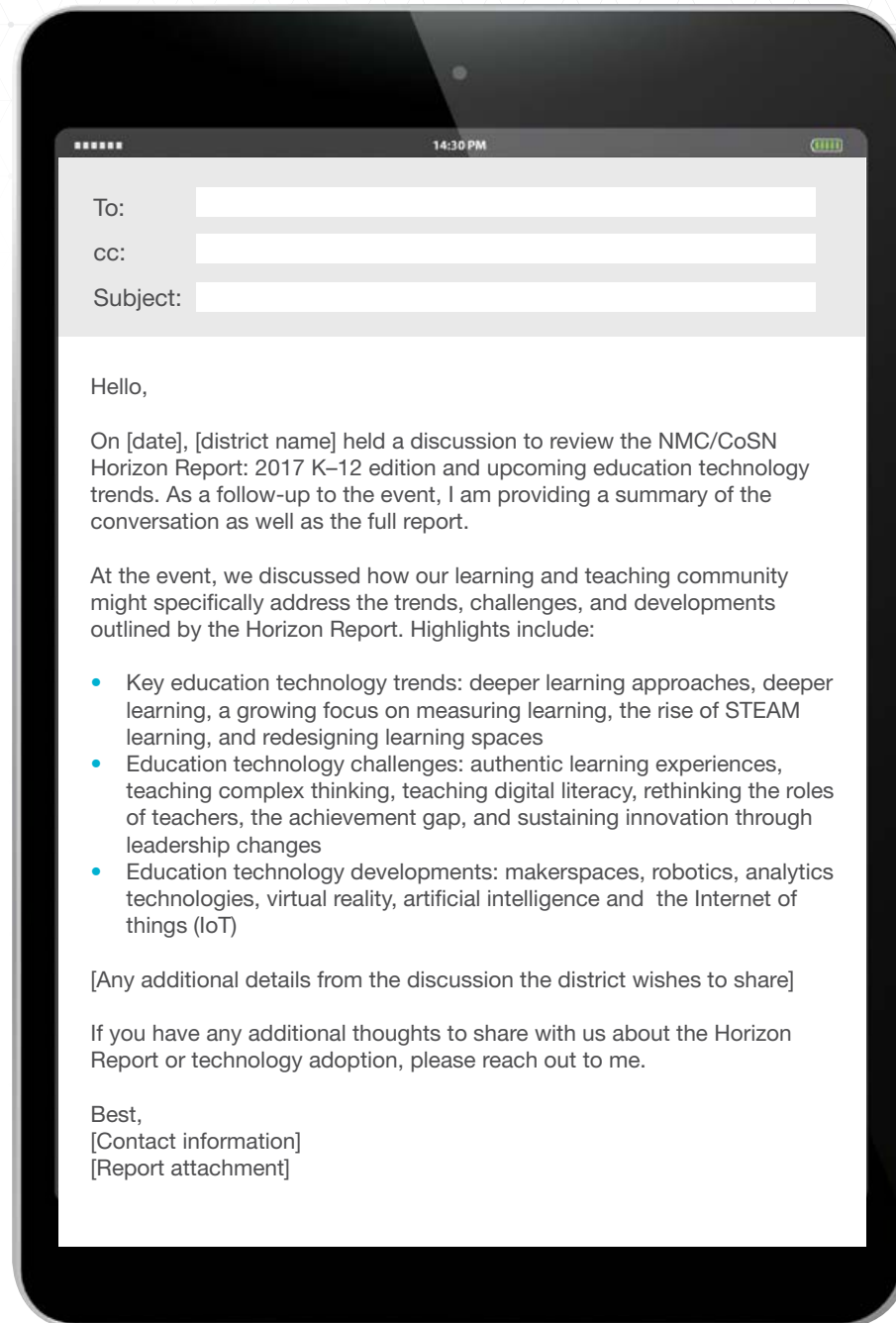
Your district can get extra mileage out of the event by sharing updates and photos after the discussion. Please find social content and suggested timing below:

Facebook		
DAY/TIMING	CONTENT	SUGGESTED MEDIA
Day of event, 3 hours before	Just a few short hours until our review of the NMC/CoSN Horizon report begins. Remember to bring a notebook and your best edtech ideas.	
Day of event, 1 hour after	Thank you to those who attended the Horizon Report discussion. We value the input of our community in next big tech steps.	Photo of event attendees
1 day after the event, 11 AM	Yesterday, we discussed how our district will address challenges in tech implementation. What do you think our next big move should be?	Slide from event presentation
3 days after the event, 2 PM	Still thinking about the upcoming trends in education technology? Share your strongest takeaways from our Horizon Report chat.	Photo from event
1 week after the event, 1 PM	Providing the best #edtech tools and strategies is a top priority in our district. The ideas that came out of our Horizon Report chat will be vital to our continued efforts to adapt to new technologies.	Slide from event presentation

Twitter		
DAY/TIMING	CONTENT	SUGGESTED MEDIA
Day of event, 3 hours before	Don't miss our discussion of the Horizon Report in just a few hours! #edtech	
Day of event, 1 hour after	Thank you to @NMCorg, @CoSN, and to all who attended our Horizon Report review	Photo from event
1 day after the event, 10 AM	Yesterday, we opened up a conversation about the future of #edtech based on the Horizon Report	Event photo
1 day after the event, 3 PM	Do you have any thoughts on which #edtech developments we should keep tabs on for the years to come?	Slide from event presentation
2 days after the event, 11 AM	Members from our community discussed the #AchievementGap & more at the Horizon Report discussion:	Event photo
3 days after the event, 10 AM	Our district is tackling findings from the Horizon Report into our tech plans for 2017 and beyond	Slide from event presentation
3 days after the event, 1 PM	#Makerspaces, robotics & virtual reality, oh my! All this and more was discussed at our Horizon Report chat:	Event photo
1 week after the event, 11 AM	It's been one week since our Horizon Report event. What #edtech topics stuck with you the most?	Event photo

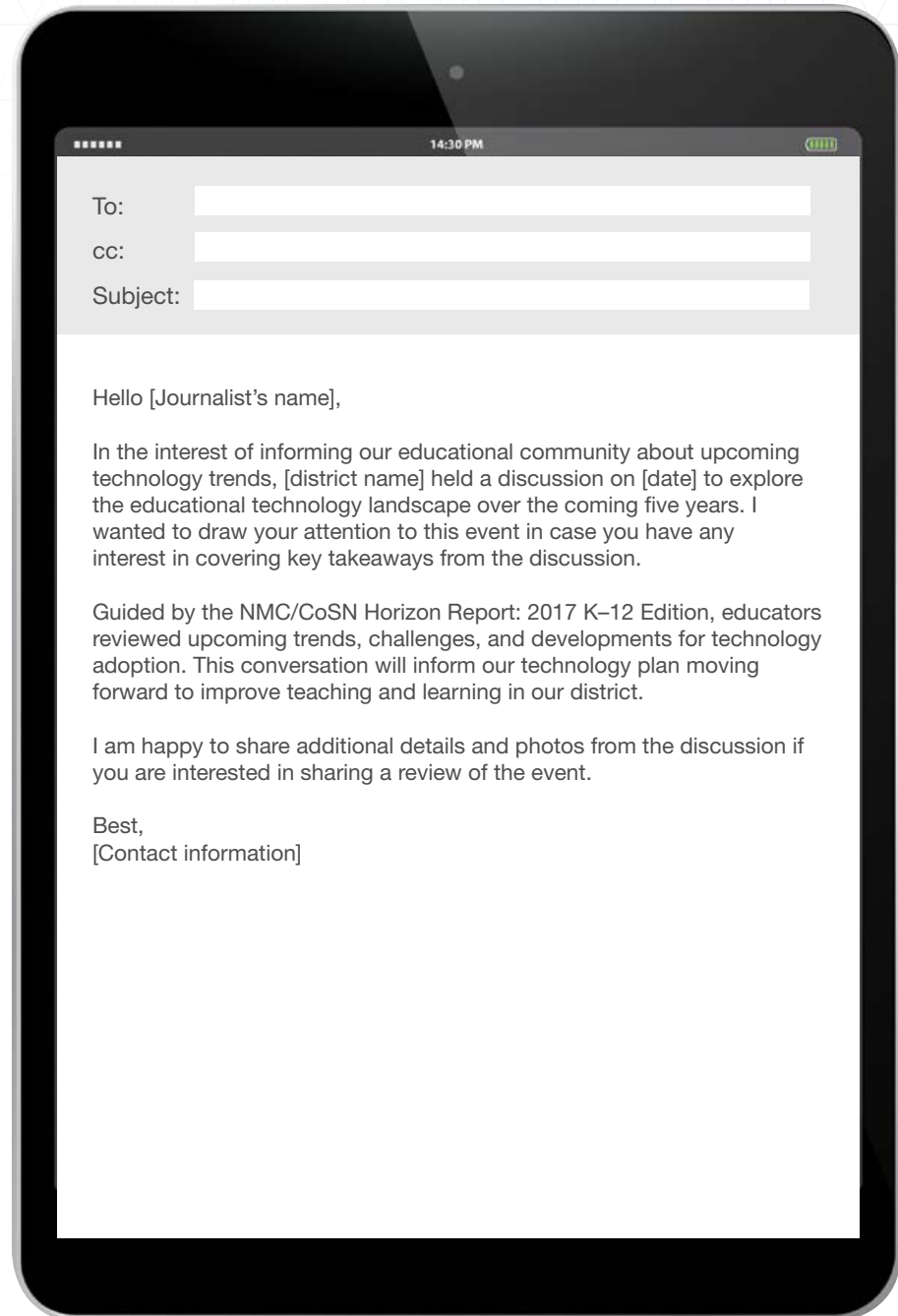
COMMUNITY FOLLOW-UP EMAIL

The purpose of this email is to recap the discussion and encourage further conversation among members of your district. This is also an opportunity to share the full report with invitees along with supporting materials developed by your district. We recommend sending this email two days after the event. Please find sample content:



LOCAL MEDIA FOLLOW-UP EMAIL

We recommend sharing details from the event with journalists from your local media to gain positive visibility for your district. These communications should be sent one day after the event. Please find sample content for email outreach:



RESOURCES & LINKS



HORIZON REPORT RESOURCES

SURVEYS



Survey Monkey

<https://www.surveymonkey.com/>

Survey Monkey is a free survey software that enables users to ask a variety of question types to a targeted audience. This resource will be helpful to those districts that wish to get insight from their community about a Horizon Report discussion or the report in general.

**Helpful Resources and Links
about Each Discussion Topic Are
Available in the NMC/CoSN
Horizon Report.**

Download it for your colleagues and
collaborators at <https://goo.gl/oind1w>



HORIZON REPORT RESOURCES

WEBINAR SERVICES

join.me

<https://www.join.me/solutions/free-webinar-software>

FreeConferenceCall

<https://www.freeconferencecall.com/>

AnyMeeting

<https://www.anymeeting.com/adw/Free-Webinar-Service.aspx>

Rather than hosting an in-person discussion, some districts might prefer to conduct a webinar to review the Horizon Report. There are a number of platforms that provide webinar-hosting services. Each website will vary in price and capabilities.



HORIZON REPORT RESOURCES

FACEBOOK LIVE RESOURCES

Tips for using Facebook Live

<https://www.facebook.com/facebookmedia/best-practices/live>

How to start a Facebook Live video

<http://www.cnet.com/how-to/how-to-use-facebooks-live-video-feature/>

Facebook Live can be used to live stream a video at your Horizon Report event or a message from your district leader about the report. The above resources will help you get started in planning a Facebook Live video that will effectively reach your community members.



HORIZON REPORT RESOURCES

ADDITIONAL COSN RESOURCES

Digital Equity Action Toolkit

<http://cosn.org/focus-areas/leadership-vision/digital-equity-action-agenda>

CoSN's Digital Equity Action Toolkit provides district leaders with information to address digital equity in out-of-school learning. This toolkit supports the Horizon Report by helping schools ensure that each student receives the benefits of future education technology initiatives.

CoSN Blog

<http://www.cosn.org/blog>

The CoSN blog provides up-to-date insights on education technology. The blog frequently addresses trends highlighted in the Horizon Report. For example, previous blogs have discussed digital inclusion and how to measure the impact of technology initiatives.

ABOUT

NMC

The New Media Consortium (NMC) is a community of hundreds of leading universities, colleges, museums, and research centers. The NMC stimulates and furthers the exploration and use of new media and technologies for learning and creative expression. Founded in 1993, the NMC has always focused on the future and implications of emerging technology for schools, museums, universities, and society. The NMC Horizon Report series has a readership in more than 160+ countries. To date, over 50 editions of the NMC Horizon Report have been published, along with 50 foreign language translations in areas including global higher education, K–12 education, libraries, and museums. Every edition leverages the perspectives of a diverse expert panel, and features projects that showcase innovative educational technology in action. www.nmc.org

CoSN

CoSN (the Consortium for School Networking) is the premier professional association for district technology leaders. For 25 years, CoSN has provided leaders with the management, community building, and advocacy tools they need to succeed. CoSN empowers educational leaders to leverage technology to create and grow engaging learning environments. The organization's strategic plan positions CoSN as the only national professional association dedicated exclusively to the education technology leaders who are working to transform and improve learning through visionary, strategic technology leadership. Today, CoSN represents over 10 million students in school districts nationwide, and continues to grow, as a powerful and influential voice in K–12 education. www.cosn.org

mindSpark Learning

The *NMC/CoSN Horizon Report: 2017 K–12 Edition* and this digital toolkit are made possible by mindSpark Learning. By providing workshops and trainings for teachers and school leaders, mindSpark Learning scales the impact of innovative school cultures, supports educators in implementing authentic learning experiences, and empowers students to think critically, collaborate, communicate, and develop creative solutions—all with the ultimate school-level impact of increased student engagement, community engagement, and ignited teachers who send their students home feeling like someone is entirely invested in their learning and the impact it will have on their future. www.mymindsparklearning.org

This Digital Toolkit is brought to
you by NMC and CoSN.



www.cosn.org



www.nmc.org



www.mymindsparklearning.org