



DRIVING
K-12
INNOVATION

Tech
Enablers
2019

Driving K–12 Innovation is an initiative of CoSN (Consortium for School Networking). This initiative addresses a key challenge for educational technology leaders: making smart, strategic decisions to transform learning experiences and environments and preparing students to thrive in a digital world.

Technology is a vital aspect of this endeavor. Technology can facilitate personalized learning with adaptive and engaging digital platforms that students can use to learn on their own, freeing up time for educators to support student needs by differentiating or individualizing instruction.

Technology also can provide educators and students with a wealth of actionable insights on student learning, needs and preferences, empowering them to deliver the right learning resources at the right time for the right students. Technology also can benefit students by enabling individual learning pathways and by providing opportunities to develop valued competencies, including digital fluency, agency and autonomy.

The *Driving K–12 Innovation* annual series of publications explores Hurdles, Accelerators and Tech Enablers to creating a systemic, digital ecosystem—where individual learners can fully realize their potential in engaging, personalized and connected learning environments. CoSN commissioned an international Advisory Board of more than 100 distinguished educational technology experts to identify, rank and elaborate on hurdles, accelerators and tech enablers. A culminating toolkit each year will provide practical guidance to help educators navigate in changing times.

This third report in the series focuses on Tech Enablers. The first report, [Driving K–12 Innovation / 2019 Hurdles](#), was released in January 2019. The second report, [Driving K–12 Innovation / 2019 Accelerators](#), was released in April 2019.



HURDLES

Hurdles are more than pesky obstacles. They are significant organizational and human capacity challenges that force educators to slow down, prepare themselves and—with sufficient practice, knowhow and tools—make the leap to innovation.



ACCELERATORS

Accelerators are megatrends that drive the needs and skills expected of students and educators. Some disruptive shifts are moving rapidly (even suddenly), while others are happening so gradually that their effects may not be felt for years.

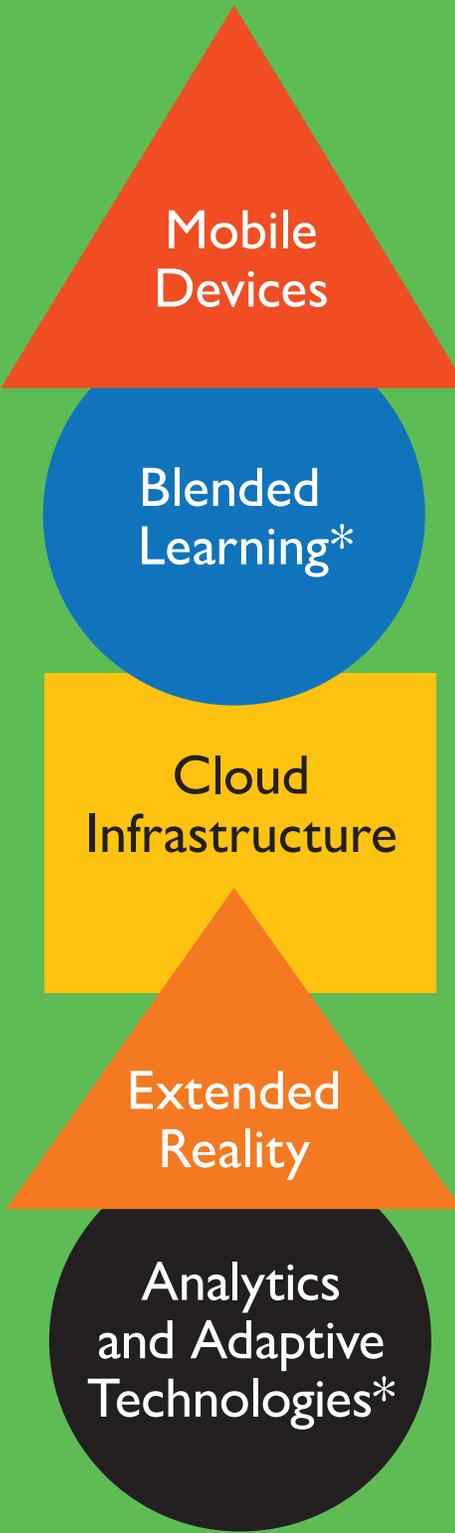


TECH ENABLERS

Tech enablers are supporting tools that smooth the way to more expansive opportunities and solutions in education.

Top 5

TECH ENABLERS



Mobile
Devices

Blended
Learning*

Cloud
Infrastructure

Extended
Reality

Analytics
and Adaptive
Technologies*

1 Hand-held or wearable devices connected to the internet, such as smartphones and quantified-self sensor technologies, enable access to knowledge and creative activities anytime, anywhere. Mobile devices also support global connections, self-curated content and personalized learning. Schools around the world are using mobile devices to try to address digital equity issues—although mobile devices also can exacerbate gaps in learning opportunities.

2 A mix of face-to-face instruction and online learning reflects how people operate in the real world. Every experience seems to be a combination of face-to-face interactions with online components. Blended learning, also called hybrid learning, can provide a more personalized learning experience for students. Blended learning can diversify learning activities, giving students more autonomy and different opportunities to learn in ways that suit their preferences. Blended learning also can free up time for educators to work with individual students.

3 A virtual infrastructure delivered or accessed via a network or the internet enables schools to move hardware and software services away from physical locations. Shifting to cloud services makes teaching and learning resources more readily available in any location—and it can reduce costs. Like mobile devices, cloud infrastructure has implications for equity, particularly since not all students have access to the internet and Wi-Fi services outside of their school buildings.

4 Extended reality (XR) encompasses augmented, mixed and virtual reality—a collection of technologies that enhance the physical world with interactive digital imagery and graphics. Educators are beginning to use these technologies to help students learn complex content and to provide experiences otherwise impossible due to funding, geography or physical challenges.

5 Technologies that measure, analyze, predict and customize student learning and other factors in student success could help educators individualize and adjust learning experiences for individual learners, build on student assets and offer targeted support to address student needs. Adaptive systems vary widely in sophistication, with true adaptive engines still somewhat aspirational.

Top 5 **TECH ENABLERS**

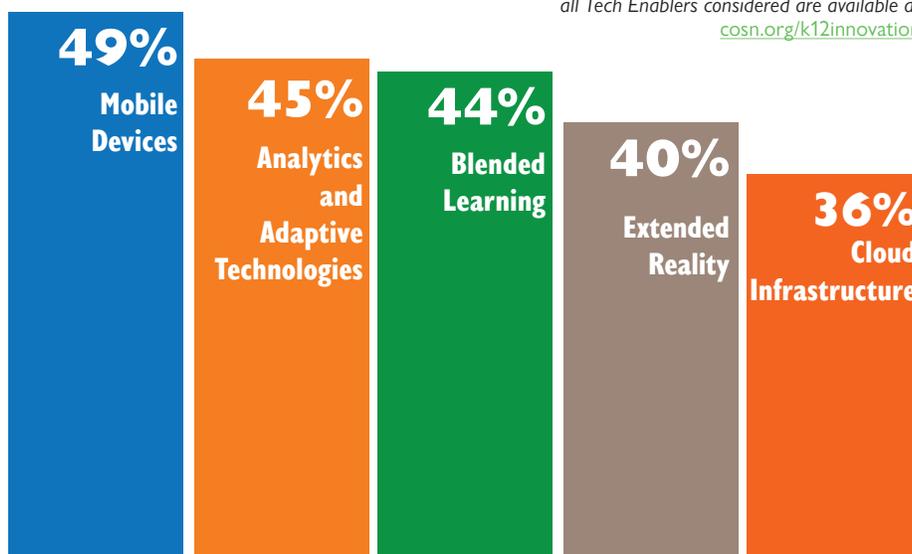
2019 Survey Results

The *Driving K–12 Innovation* Advisory Board includes members of the CoSN Emerging Technologies Committee and leaders from key U.S. and international education organizations and ministries of education. The Advisory Board began its work with a short list of potential tech enablers to consider and then added to the list. In all, these experts considered 27 distinct tech enablers of innovation.

Full survey results and the list of all Tech Enablers considered are available at cosn.org/k12innovation

Most Important **TECH ENABLERS** to Surmount Hurdles and Embrace Accelerators

Percentage of Advisory Board members who believe these tech enablers are the most important for surmounting the top Hurdles and embracing the top Accelerators to drive teaching and learning innovation.

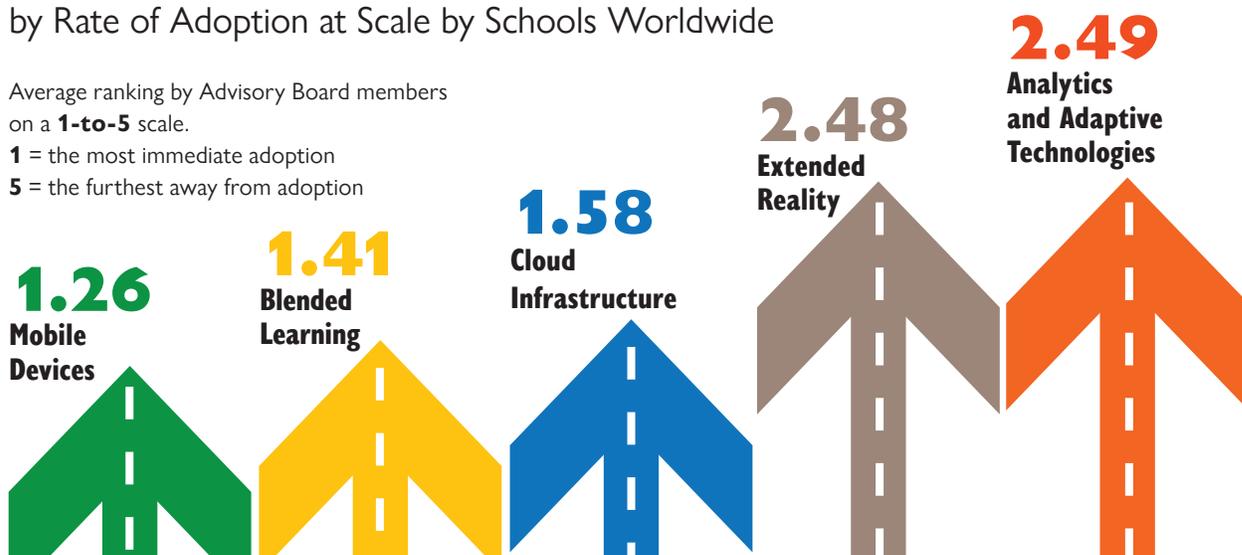


Top 5 **TECH ENABLERS**

by Rate of Adoption at Scale by Schools Worldwide

Average ranking by Advisory Board members on a **1-to-5** scale.

1 = the most immediate adoption
5 = the furthest away from adoption



SPOTLIGHTING TWO TECH ENABLERS

BLENDED LEARNING

This tech enabler gets to the heart of driving K–12 innovation—shifting pedagogy and making digital leaps to transform learning experiences and prepare students to thrive in a digital world. The *Driving K–12 Innovation Advisory Board* considers blended learning a strategy to surmount top hurdles to meaningful education and to embrace top accelerators, especially personalization, data-driven practices and learners as creators.



Exploring the Opportunity

While blended learning has been a trend in education for years, it's worth renewed attention. The influx of ever-more-capable digital technologies into schools and students' lives is amplifying interest in effectively “blending” them into instruction. There's also heightened recognition the world over that digital fluency is not a luxury in learning, but an essential foundation for pursuing knowledge, collaborating, creating and solving problems.

More disciplined and nuanced approaches to blended learning have arisen over the past decade. True blended learning is more than a catch-all phrase for any educational practice that involves technology. According to Horn & Staker:¹ “Blended learning is a formal education program in which a student learns:

1. at least in part through online learning, with some element of student control over time, place, path, and/or pace;
2. at least in part in a supervised brick-and-mortar location away from home;
3. and the modalities along each student's learning path within a course or subject are connected to provide an integrated learning experience.”

The Christensen Institute, which in 2016 launched Blended Learning Universe—an online hub of blending learning resources—identifies seven common blended learning models:²

1. **Station rotation:** Students rotate through learning stations on a fixed schedule, where at least one of the stations is an online learning station.
2. **Lab rotation:** The online learning station occurs in a dedicated computer lab.



3. Individual rotation:

Students rotate through stations, but on individual schedules set by a teacher or software algorithm.

4. Flipped classroom:

Students learn at home via online coursework and lectures, and educators use class time for teacher-guided practice or projects.

5. A la carte:

Students take an online course or courses with online educators in addition to other face-to-face courses.

6. Enriched virtual:

Students complete the majority of coursework online at home or outside of school, but attend school for required face-to-face learning sessions with a teacher. Programs usually don't require daily school attendance.

7. Flex:

Students move on fluid schedules among online learning activities according to their needs. Teachers provide support and instruction on a flexible, as-needed basis while students work through course curriculum and content.

Educators can adopt one blended learning model or use them in combination, giving them many flexible options to blend digital technologies into teaching and learning. In **Chicago**, Intrinsic Schools was designed as a fully blended-learning school system. Students rotate through a variety of learning methods throughout the school day, focusing on collaborative and individual projects in a variety of dedicated digital and physical spaces.

Imagining the Potential

Blended learning is “a bridge to personalization,”⁴ in the words of Caitlin Tucker, a Google Certified Innovator, blended learning coach and author of several books on

“A LARGER ADVANTAGE”

A U.S. Department of Education meta-analysis of empirical studies found that “students in online conditions performed modestly better, on average, than those learning the same material through traditional face-to-face instruction.”³ The effect sizes were larger when students worked collaboratively or at the direction of an instructor than when they worked independently. Blended learning that integrates online and face-to-face elements had “a larger advantage” than either instructional model alone.

blended learning. But blended learning is not synonymous with personalized learning, she points out.

“Blended learning, particularly models supported by adaptive learning programs and tools, enables teachers to match the right student with the right content at the right time. It is a core component of a personalized learning model,”⁵ according to a report by the International Association for K-12 Online Learning (iNACOL). These models “place the student at the center of the learning process, harnessing the power of technology to create more engaging, efficient, and success-oriented learning environments.”

Personalization is a top Accelerator highlighted in the *Driving K-12 Innovation / 2019 Accelerators* report. Refer to that report for definitions and an exploration of the opportunity and potential of this innovation accelerator.

Personalization is difficult to scale in classrooms without digital technologies and the insights they generate on student learning. Blended learning makes personalization possible when

educators and students “make regular use of timely, actionable information about student progress.”⁶ Teachers can guide students to digital learning resources aligned to individual learning needs and preferences. “In blended learning ... teachers often use time and space differently to give students more time for small group or individual work,” which “allows for the delivery of targeted intervention to and acceleration of specific students. Teachers are enabled and empowered to give one-on-one attention to the students who need it most.”⁷

Some examples of how blended learning is taking hold in schools:

► In **Peru**,⁸ businessman Carlos Rodriguez-Pastor wanted to provide middle-class students with an affordable alternative between expensive private schools and “destitute” public schools. He engaged IDEO, a global design company, about a decade ago to design a school system from the ground up. Innova is now the largest private network nationwide, with plans to have 70 schools serving more than 70,000 students by 2020.

The schools rely on blended learning to inspire students with modern technology and

self-discovery. Students spend about 30 percent of their time using digital technologies for guided independent learning and about 70 percent of their time in teacher-led collaborative sessions. Innova takes a holistic approach to blended learning, making time for socializing, recreation and an innovation program for all students to focus on a social challenge. Vibrant school buildings feature flexible spaces that can be rearranged quickly and easily for face-to-face activities. To support educators, Innova created the Teacher Resource Center, a catalog of 20,000 lessons by veteran teachers for younger teachers to study.

“Blended learning can help to improve student voice, choice and engagement in learning. When used appropriately, it can also improve teacher efficiency while accelerating the learning process by personalizing instruction to meet the needs that individual students may have.”

—Darren Draper
Director of Innovative Learning
Alpine School District (UT)

▶ In **Texas**, the Raise Your Hand Texas Foundation is in the midst of a statewide demonstration initiative, Raising Blended Learners, with a vision of “showcasing strategies for using blended learning to personalize instruction, thereby

improving student achievement, particularly among schools and districts with persistent achievement gaps.”⁹ The foundation supports districts selected to participate with grant funding and technical assistance to pilot, scale and sustain blended learning, which will lay the groundwork for statewide expansion.”¹⁰

Two years after Birdville Independent School District began implementing blended learning through this Texas initiative, teachers and leaders see promising signs of academic and non-academic success, including increased student reading levels, agency, choice and persistence. Educators themselves are redefining their understanding of student mastery from a narrow focus on test scores to student growth and competencies.¹¹



Driving Innovation

In part, the popularity of blended learning represents a pullback from online-only coursework, which is best suited to highly motivated K–12 students with highly engaged parents.¹² Too much screen time can be problematic for many students who need and want in-person teacher guidance. Indeed, there is a risk of being out of balance with community expectations: Students and parents in a Kansas school district recently rebelled against a web-based curriculum and instruction program that moved “personalized” learning almost entirely online and limited students’ in-person interactions with teachers.¹³

Blended learning should balance online learning with face-to-face social interaction with educators and peers. Human contact helps students develop communication, collaboration, and teamwork skills. In addition to peer-to-

peer dialogue and self-reflection, students benefit from teacher guidance and support—even as they gain more choice and autonomy in the digital world. Moreover, resounding evidence points to social and emotional skills as foundational to learning more complex cognitive skills.¹⁴ Blended learning programs should not neglect opportunities for students to develop these skills, which include self-advocacy and agency, navigating social situations, managing emotions and resolving conflicts.

“The personalized learning movement is often maligned by those who misconstrue the end goal to be the replacement of human connectivity with technology,” argues Tiffany Wycoff, co-author of *Blended Learning in Action* and co-founder of LINC (Learning Innovation Catalyst). “On the contrary, personalized learning provides teachers with not only the models and tools to help create individual academic paths, but also the time and tools to connect with students on a deeper level.”¹⁵ She considers social and emotional support as “the real urgency of blended learning”—and she sees educators as mentors and “first responders,” who can use rotation models to support students, and technology as a pathway for more student–teacher communication options.

Blended learning can help educators address a range of challenges and opportunities in student learning. In the U.S., districts and schools working with Digital Learning Collaborative are using blended learning program to support a variety of educational goals,¹⁶ including:

- ▶ Offering career and technical education
- ▶ Addressing equity issues
- ▶ Reducing dropout rates
- ▶ Serving at-risk students

Humanizing Online Learning

Humanizing online learning is an emerging motif in education. As educators create more flexible physical learning spaces to accommodate a wider range of personalized learning activities, cyber learning spaces are coming under scrutiny as well. In his book *From the Campfire to the Holodeck: Creating Engaging and Powerful 21st Century Learning Environments*, education technology futurist David Thornburg likens campfires to gathering spaces for teaching, watering holes to informal spaces for social interaction and information sharing, and caves to private spaces for reflection and personal pursuit of knowledge and discovery.¹⁷ These spaces are as relevant to online learning as in classrooms.

To humanize online learning, instructors can establish their presence by telling stories—just as they would to engage students in a classroom—and by showing their true selves in videos or synchronous meetings, and by interacting with students with regular online forums and feedback. Online instructors can develop a social and cognitive presence by engaging early with students to get to know them and tailor the learning experience to their preferences. They can give students different options for navigating collaboration, such as group discussion posts, real-time presentations and social media platforms.¹⁸

These pedagogical strategies are deeply connected to the idea that learners are creators, makers and producers. Technology provides infinite opportunities for students to engage in active learning, while keeping them and their data safe.

- ▶ Providing world languages in a small district
- ▶ Educating during extended emergencies

Driving innovation with blended learning requires planning programs with intent. Many implementation models share similar themes:

- ▶ Identify a problem or an opportunity to address.
- ▶ Define a vision, goals, benefits and measurements.
- ▶ Engage the community.
- ▶ Discuss teaching and learning models and methods to ensure they fit the context of the school system or school.
- ▶ Select digital technologies that support your goals—and make sure the technology infrastructure can support these technologies.
- ▶ Provide professional development for leaders and teachers.
- ▶ Foster a supportive school climate and culture.
- ▶ Create flexible teaching and learning environments.

The *Driving K–12 Innovation* Advisory Board puts particular emphasis on professional development to prepare leaders and teachers for pedagogical shifts. This also addresses a Top 5 hurdle: building the capacity of human leaders.

Some studies show that it takes an average of 20 times of practice for teachers to master a new skill,¹⁹ such as integrating a technology into a classroom. The **Cincinnati** Public Schools is taking a multifaceted approach to supporting teachers to succeed with blended learning. The district's Tech Truck is a training center on wheels, equipped with classroom technology and a one-on-coach. The Tech Truck travels to each of the district's 63 schools throughout the school year, giving teachers practice using current and emerging technologies. The district also offers group workshops, one-on-one coaching in schools, live webinars and self-paced courses, along with a two-day Innovative Practices Conference at the end of the school year.²⁰



ANALYTICS AND ADAPTIVE TECHNOLOGIES

This tech enabler recognizes powerful, behind-the-scenes technologies that are already making an impact on educational practices. Data analytics track student performance and other indicators of student success. Enabled by machine learning and artificial intelligence, adaptive technologies learn as students learn, leveraging analytics to serve up tailored content that reinforces and propels learning. Analytics and adaptive technologies, while still emerging in K–12 education, could help educators overcome barriers and accelerate innovation. Like blended learning, this tech enabler can rouse tensions between people and technology.



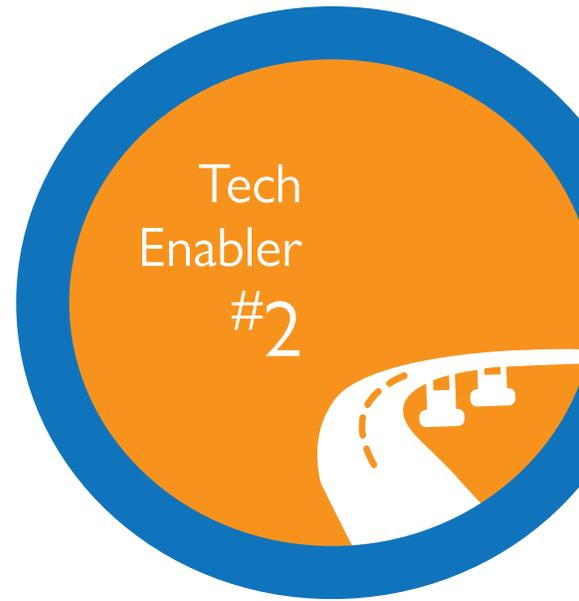
Exploring the Opportunity

Data analytics and adaptive technologies work in combination as tech enablers. Before digital technologies arrived in education, school systems and educators already had plenty of data to digest, from student information and test scores to teacher gradebooks and observations to student work. Online learning platforms add volumes of data to the mix.

Data analytics shifts the tedious human process of sifting through mounds of data to specialized systems, software and algorithms. These technologies can synthesize data from multiple systems and sources, discern meaningful patterns from broad sets of indicators, and communicate data findings with data visualization—charts, graphs, maps. Analytics technologies can generate data-based, actionable information for educators and students, such as just-in-time recommendations of learning resources and activities to keep students progressing along personalized learning pathways.

Adaptive technologies support both data analytics and personalized learning. Adaptive technologies monitor and adjust to student learning in the moment, serving up “the next best lesson”²¹ based on student engagement and success with discrete learning tasks. This can help students immediately when they exhibit wobbly conceptual understanding or competencies and advance them to more challenging content as soon as they have met learning objectives. “Students are able to track their own learning, which helps them develop self-monitoring skills and fully engage in their learning progress.”²²

The **Dominican Republic**, for example, is in the midst of an ambitious education reform initiative. With support from the World Bank and in cooperation with McGraw Hill, the ministry of education is piloting adaptive technologies to better prepare children to succeed and prosper as adults. The idea is to “take childhood curiosity as a starting point and channel it toward math learning, in a way that interests



“I see this enabler being used in even the youngest grades to identify at-risk students in order to boost their competence levels in math and reading.”

—Lisa Gustinelli
Director of Instructional Technology
St. Vincent Ferrer School
Delray Beach, FL

them.”²³ Schools in vulnerable areas of in Santo Domingo are using math software to evaluate student learning levels and then deliver adaptive math exercises, with teachers on hand to provide support and reinforce learning in their lessons. Early results show that students with the lowest performance are showing substantial improvement—and student use spikes during weekends and evenings, an indicator of engagement.

Adaptive technologies also can feed newer kinds of data into data analytics systems, such as eye-tracking to gauge how students view online material and the strategies they use to make their way through it, and log data from digital learning technologies to calibrate engagement, predict learning performance, and monitor online collaboration.²⁴

Imagining the Potential

Educators have long lamented the considerable lag time between the administration of accountability tests and the release of data on student performance. This data has had an outsize impact on education, yet it typically comes to practitioners too late in the learning process to intervene for students who need extra support.

Data analytics may offer a solution to this challenge. Analytics technologies provide more than a static, retrospective examination of a limited set of student indicators. Increasingly sophisticated data analytics combine longitudinal data sets, big data, machine learning and artificial intelligence to provide more timely information—including data from formative assessments in the course of student learning. Frequent, even real-time dynamic updates can make this data more relevant to educators’ daily practice. In addition, this data could

create a better balance between the weight of high-stakes and formative assessment.

Data analytics also can give educators insights into what to expect in the future. An MDRC report explains: “Predictive modeling estimates individuals’ future outcomes or their probabilities for future outcomes ... by building and testing a model using data on similar individuals whose outcomes are already known.”²⁵ Predictive analytics can help school system leaders “address multiple measures of progress on performance, from the student level to the teacher, school, district, system and state levels, through postsecondary performance, and into the workforce,” according to a report from the Southern Regional Education Board. “At the individual student level, failing to identify patterns in data will lead to missed opportunities to create personalized learning programs, or to intervene with at-risk students to ensure they complete high school or college. On a larger scale, that failure will result in misguided policies that invest precious resources in ineffective programs.”²⁶

The Learning Analytics Collaborative, a partnership of educational researchers, data scientists and visionary leaders of schools around the world, is working to harness the power of learning analytics, particularly data visualization. Based in **India**, the collaborative uses “visual data engines” to support student reflection on learning; predict extra supports that students require; help teachers plan learning opportunities, improve current courses or develop new curricula; and make decisions on efficiency and effectiveness measures.²⁷

On the horizon for more schools are prescriptive analytics, which will provide advice on what educators can actually do to address predicted outcomes.

“Adaptive programs in my district are being used to support literacy and math instruction. Analytics from these and other data sources are being used in lesson planning and professional learning communities at both the school and district level to identify needs, allocate resources, and identify and implement effective practices.”

—Susan Moore
Supervisor of Blended Learning
Meriden Public Schools, CT

Driving Innovation

The promise of data analytics is the ability to deeply understand student needs, progress and competencies—in time to actually inform educational practice. But there are headwinds to consider.

Chief among them are concerns about data privacy. Educators must think carefully about which data they will collect, what purpose it will serve, who will have access to this data and how students' personal data will be safeguarded. Blockchain is an emerging technology that may ameliorate these concerns. Delegates from **24 countries** in the Groningen Declaration Network see blockchain as a potential way to address privacy, trust and learner mobility issues, including verifying and sharing digital credentials.²⁸ Blockchain uses cryptography to secure and transfer information between trusted parties.

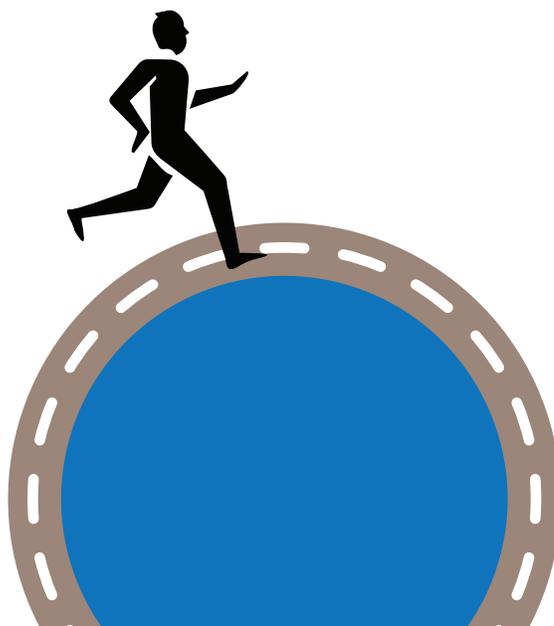
Data quality is an issue with analytics as well. Data experts use the succinct “garbage in, garbage out” to emphasize how important it is to use valid, reliable, accurate and complete data.

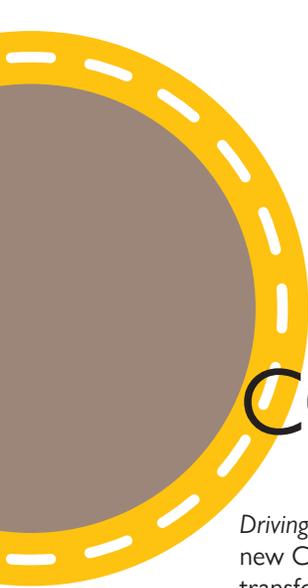
The human role in this burgeoning data ecosystem is another key dynamic to consider. Technologies and algorithms cannot replace educators' knowledge of their students, their pedagogical expertise, or the guidance and support that only teachers can provide. Data analytics should empower teachers and students to make decisions, and adaptive technologies, well used, can support personalized instruction and save time for personal interactions.

Meanwhile, a RAND survey of U.S. educators cites “inconsistent data use among teachers and an overall lack of preparation and skills to use data to inform instructional practice.”²⁹ Teachers need both assessment literacy and data literacy to understand and use data in their practice. “Research shows that teachers' sense of self-efficacy in interpreting and using data is linked to their actual use of data; professional development supports can build this self-efficacy and increase data use,” according to the survey report. In addition, while most teachers reported that they had access to student data through an electronic data management system, fewer teachers had access to more detailed, longitudinal data—or analyzed data. Fewer still had access to instructional resources tailored to student learning needs.

Researchers at the University of Duisburg-Essen in **Germany** have developed a research-based framework to help educators navigate these issues and guide them in the systematic design and development of effective indicators for personalized learning. The Personalization and Learning Analytics (PERLA) framework represents the convergence of personalization and learning analytics and provides a theoretical foundation for effective, analytics-enhanced personalized learning.³⁰

CoSN's popular *EdTechNext* reports align with the reports in the *Driving K–12 Innovation* series. Developed by CoSN's Emerging Technologies Committee, member-only *EdTechNext* reports provide deeper coverage of a top five hurdle, accelerator or tech enabler, including emerging technologies, best practices, guidance and tips for district and educational technology leaders.





CONCLUSION

Driving K–12 Innovation / 2019 Tech Enablers is the third in the new CoSN series focusing on challenges and opportunities to digital transformation.

The two tech enablers featured in this report—blended learning and analytics and adaptive technologies—are at very different stages of adoption. Blended learning is gaining traction around the world, and it is integrally connected personalization, a top accelerator. Analytics and adaptive technologies are still in their early stages of widespread K–12 adoption, and these technologies are evolving rapidly.

Both tech enablers hold promise as mechanisms for providing more learner-centered, differentiated educational experiences that better prepare students for the digital world. Both present opportunities for educators to be more effective at engaging students and working with them as individuals. Both challenge educators to balance powerful technologies with a human touch—and educators’ expertise.

The CoSN *Driving K–12 Innovation* Advisory Board believes that these tech enablers could help educators address virtually all top hurdles and accelerators to innovation. We recommend initiating conversations with your community, considering how you can turn these tech enablers into solutions:

- ▶ What would it take for your students to experience innovative education?
- ▶ How could you enrich student experiences with blended learning?
- ▶ How could blended learning, analytics and adaptive technologies help you to personalize learning?
- ▶ How could you support teachers to strengthen their assessment literacy and data literacy?
- ▶ What types of data would help educators understand their students better?
- ▶ How could analytics and adaptive technologies help you close achievement gaps and improve digital equity?
- ▶ How could you engage students to contribute to their data story and drive their own learning with data?

We encourage you to stay connected with this series at cosn.org/k12innovation.



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CoSN (Consortium for School Networking) is the premier North American professional association for school system technology leaders. CoSN is the only professional association dedicated exclusively to the educational technology leaders who are working to transform learning. CoSN provides thought leadership resources, leadership development, best practices and advocacy tools for an engaged community of peers, helping leaders succeed in the digital transformation. CoSN represents over 13 million students in school districts nationwide and continues to grow as a powerful and influential voice in K–12 education.

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