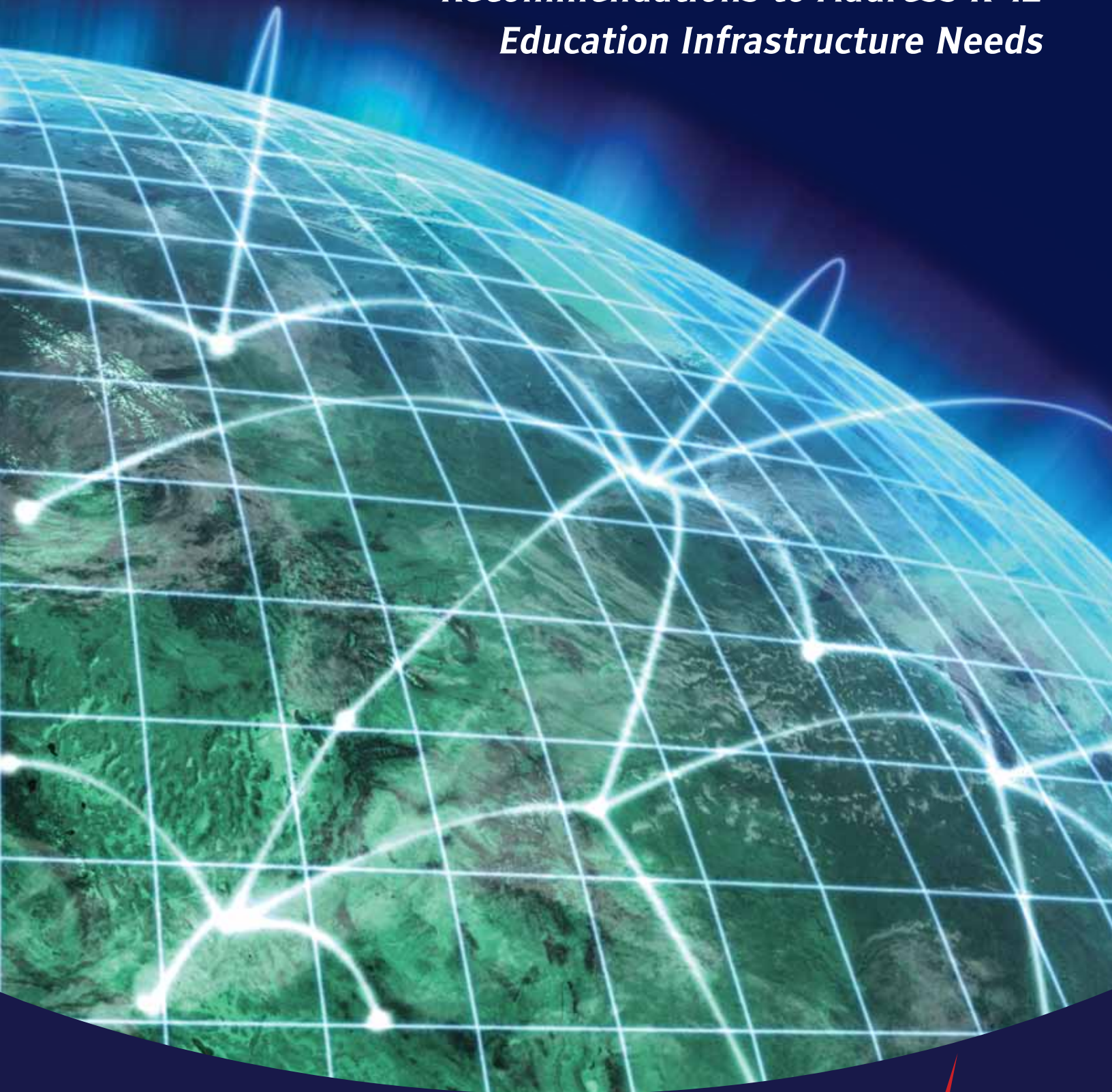


The Broadband Imperative:

*Recommendations to Address K-12
Education Infrastructure Needs*



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Executive Summary

It is a simple fact that access to high-speed broadband is now as vital a component of K-12 school infrastructure as electricity, air conditioning, and heating. The same tools and resources that have transformed our personal, civic, and professional lives must be part of learning experiences intended to prepare today's students for college and careers. College students rely on technology for academic success and to improve personal productivity. In the workplace, everyone from mechanics to accountants to physicians depends on technology to conduct their work, grow their businesses, and collaborate with their colleagues – both locally and globally.

With easy access to reliable, robust, and cost-effective broadband, we can ensure that each student's school experience mirrors evolving societal expectations for public education. Access permits students to create engaging text and multimedia projects such as videos, collaboratively conduct research with students on the other side of the state or the world, take online courses not available locally, and talk directly with authors and experts. Teachers can collaborate with colleagues, participate in professional development online, and immediately analyze the results from online assessments to personalize instruction for each student.



Moreover, thanks to the proliferation of low-cost laptops, tablets, eReaders, and smartphones—and the rise of state and district high-access and 1-to-1 programs—teaching and learning is no longer limited to the confines of a school building or a school day. In fact, out-of-school access to broadband by students and teachers is now arguably as important to the overall quality of the student learning experience as access at school.

Unfortunately, the scope of the nation's educational broadband needs is large and growing rapidly. While a 2010 Federal Communications Commission

survey of E-Rate funded schools found that most had access to some form of broadband service, nearly 80% of respondents reported that their broadband connections were inadequate to meet their current needs. Outside of school, home broadband adoption rates have all but stalled since 2009, leveling off at roughly 65%.

Given that bandwidth availability determines which online content, applications, and functionality students and educators will be able to use effectively in the classroom, additional bandwidth will be required in many, if not most, K-12 districts in this country in the coming years. If we are serious as a nation about preparing all students for college and careers, a concerted national effort will be required to address both school-based bandwidth needs and out-of-school access for students and educators.

Recommendations to Address K-12 Education Infrastructure Needs

Given current trends and the real-world experiences of states and leading districts, SETDA offers four recommendations for policymakers and school leaders committed to charting a course for the future of K-12 education enabled by broadband:

Recommendation 1: Move to Address K-12 Broadband Infrastructure Needs

To reach the goal of sufficient broadband access for enhanced K-12 teaching and learning and improved school operations as outlined in this report, SETDA recommends that schools and districts meet the following *minimum* bandwidth targets between now and the 2017-18 school year:

Broadband Access for Teaching, Learning, and School Operations	2014-15 School Year Target	2017-18 School Year Target
An external Internet connection to the Internet service provider (ISP)	At least 100 Mbps per 1,000 students/staff	At least 1 Gbps per 1,000 students/staff
Internal wide area network (WAN) connections from the district to each school and among schools within the district	At least 1 Gbps per 1,000 students/staff	At least 10 Gbps per 1,000 students/staff

Recommendation 2: Ensure Broadband Access for Students and Educators

To reach the goal of universal broadband access by students and educators, as outlined in this report, SETDA recommends the federal government, states, and districts take responsibility for ensuring easy access to robust broadband connectivity outside of schools including, but not limited to, the home and such publicly accessible institutions as libraries and community centers.

Recommendation 3: Build State Leadership

SETDA recommends all states provide direct leadership in the development and implementation of programs to provide adequate and equitable bandwidth to K-12 schools, homes, and publicly accessible institutions, such as libraries and community centers. State leadership could entail expanding broadband coverage via the implementation of cost-effective state broadband networks and working in partnership with school districts to leverage federal and public-private partnership programs in support of a state's broadband needs.

Recommendation 4: Advocate for Federal Funding

SETDA recommends the federal government increase funding options to support a) states in implementing and maintaining high-speed broadband, statewide networks, b) districts and schools in increasing bandwidth capacity, c) communities in providing access points at anchor institutions including, but not limited to, libraries and community centers, and d) low-income families in providing home broadband access.

Shifting to Technology-Rich Learning

Basic Connectivity for Supplemental Enrichment

A high school might start integrating technology into its curriculum by connecting a group of desktop machines in a standard computer lab to the Internet. In this setting, the students are scheduled to visit a central lab to access locally-run software applications, go online to conduct research for term papers, and compose occasional papers and presentations. Faculty and staff might use the network primarily for email and to post newsletter updates and announcements to the school's website and to track attendance records. A **10 Kbps per student/staff broadband connection** provides these students and teachers with enough capacity to avoid slow downloads and frustrating delays while engaging in these low-bandwidth activities.



Emerging Reliance on Online Educational Tools and Resources

Over time, the school expands its use of Internet-based educational tools and technologies in numerous ways. It implements a partial 1-to-1 laptop program (9th and 10th grades only) and encourages its students to use their devices to access the web for more dynamic content, collaborate with other students, download videos, and receive and post assignments on the school's learning management system. Teachers begin adding some online assessment activities to their lessons, and administrators start to use web-enhanced office management software. To support the increased network traffic generated by these activities, the school upgrades its network to a **50 Kbps per student/staff broadband connection** to best meet the needs of teachers and students.

Transformation to a Technology-Rich Learning Environment

Once Internet-based educational technologies and practices have been integrated into the curriculum, teachers and students naturally begin exploiting the full potential of their connectedness. Students actively use their laptops in class to access rich, multimedia-enhanced educational content from the Internet. They post their content (including audio and video podcasts) to school learning management systems, access their e-textbooks and get their assignments online, and collaborate daily across the network with other students via wikis and other Internet-based applications. Teachers regularly download streaming media to the classroom and take their students on virtual field trips to interact with subject area experts. Classes use videoconferencing systems to interact with other classes on campus, as well as students and content experts around the world. Formative and summative assessments are conducted online for all students. The school expands its curriculum to include online courses, which students access at school, from home, and through various WiFi hotspots in the community. Teachers actively participate in online professional learning communities to share lessons and to participate in professional development. To support these contemporary classroom activities, the school upgrades its network to provide a **minimum of 100 Kbps per student/staff broadband connection**. The reliance on dozens of bandwidth intensive activities, coupled with large numbers of concurrent users, require this jump in bandwidth.

Leveraging the Power of Broadband Access

The Power of 24/7 Broadband Access



Sitting at the breakfast table, Sarah pulls out her laptop and logs onto her tenth grade biology class's wiki to see if her teacher has posted any comments regarding her group's latest project. She and three classmates have been collaborating to create a short multimedia presentation on the pollution levels in local creeks and streams. Her teacher has suggested downloading historical video clips from an open content site to add to the depth of their investigation. Soon her smartphone pings with an online calendar invitation to meet the group after school at the community

center to refine their project. Jumping onto her personalized login page via the school's learning management system, she notices that her journalism teacher has posted the latest assignments and deadlines for the next edition of the school paper. Sarah is supposed to interview the basketball coach, but the team is traveling to the play-offs. She requests an online video chat while the coach is on the road so that she can meet Monday's deadline. She grabs her laptop and phone and dashes to catch the bus. First period is English and she doesn't want to miss the debate about students reading the original edition of Huckleberry Finn. During the debate, students will be chatting online about the debate and submitting questions to the moderator. After lunch, she sells tickets to this weekend's dance and frequently checks Twitter to see how many classmates are tweeting about the event. Later that day in math, after solving several sample questions from their digital geometry textbook, she takes an online formative assessment and then continues individualized practice based on the results of the assessment. At the end of the day, she adds her physical fitness stats from gym class into an app to help track her endurance progress and heads home to watch her teacher's latest geometry video demonstration for homework.

About the State Educational Technology Directors Association

Founded in the fall of 2001, the State Educational Technology Directors Association (SETDA) is the principal association serving, supporting and representing US state, and territorial educational technology leadership. SETDA works in partnership with like-minded individuals and organizations as a forum for inter-state collaboration, cooperation, and best practices. www.setda.org

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Working Group

Dee Appleby, Team Manager, SC Virtual School Coordinator, South Carolina

Jerome Browning, Education Information & Accountability Coordinator, Alabama

Laurence Cocco, Director, Office of Educational Technology, New Jersey

Bob Collie, Senior Vice President and CTO, Education Networks of America

Barbara Denson, Coordinator of Instructional Technology, Tennessee

Rick Gaisford, Educational Technology Specialist, Utah

Jesse Gutierrez, Director, Public and Government Affairs, McGraw-Hill Education

Lillian Kellogg, Vice President, Client Services, Education Networks of America

Mike Kozak, Administrator, Curriculum, Instruction and Innovation, Nebraska

Jeff Mao, Learning Technology Policy Director, Maine

John Miller, Assistant Director, Office of Instructional Technology, West Virginia

Gayle Nelson, Vice President, Customer Services, Education Networks of America

Rusty Rosenkoetter, Coordinator, Office of Quality Schools, Missouri

Stephen Sanders, Director, Instructional Media and Technology Team, Wisconsin

Bruce Umpstead, Director, Office of Education Technology & Data, Michigan

Brenda Williams, Director, Office of Instructional Technology, West Virginia

Andrew Zuckerman, Director of Instructional Services, Lawrence Township Public Schools (NJ)

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