Broadband Imperative III

Driving Connectivity, Access and Student Success

SETDA

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TECHNOLOGY INFLUENCES PEDAGOGICAL APPROACHES

Pedagogical approaches that utilize the power of technology to personalize learning include blended and virtual learning. Although virtual and blended learning environments are widely thought of as effective instructional approaches, they are not available in all schools for all students. Without access to high-speed bandwidth and devices both at school and at home, teachers and students cannot realize the potential of these approaches. Further, newer approaches to provide project-based and hands-on activities are the reality for some schools and on the horizon for more. Such tools require even more bandwidth, such as augmented reality, virtual reality, mixed reality and game-based learning.

DIGITAL ACCESS AND EQUITY

Virtually all our nation's schools have access to the internet, but the quality and type of connectivity vary greatly across the country. With equitable access to reliable, high-speed broadband access, teachers can utilize digital tools and applications to cultivate student-centered, personalized learning. According to the Parana River group, a learning disruption occurs when there is inadequate bandwidth for a teacher to effectively utilize technology in the classroom causing the teacher to modify his/her pedagogy to NOT use the technology. Proactively providing adequate bandwidth, provisioning a scalable underlying architecture, and having the information necessary to increase bandwidth in time to meet needs in the future supports equitable access across schools and districts for all learners. In addition to equitable on campus access all students need equitable access off campus as well to both devices and broadband.

> "If we teach today as we taught yesterday, we rob our children of tomorrow."
>
> –John Dewey,
> Education Reformer

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Off Campus Internet Access

Off campus internet access for educators and students is essential for ensuring equitable access to digital tools and resources for all students. Unfortunately, many students still do not have adequate access to the internet at home—often referred to as the "homework gap," the gap between students whose internet connections at home are slow or non-existent— and those who have home connections with adequate speed. The Institute of Education Sciences (IES) Student Access to Digital Learning Resources Outside the Classroom report states that the primary barrier to internet access at home is affordability, especially for children from low-income households.

17% of teens
don't have reliable access to a device and as a result can't always finish homework. –Pew Research Center

18% of students
with no internet access or only dial-up access at home was **higher in rural areas**

Examples of Digital Learning in Action

California: California's Chaffey Joint Union High School District serves 23,894 students. Sixty-one percent of students qualify for free or reduced school lunch. The district office is connected at 100 Gbps via fiber-optic cable and shares that bandwidth with several other school districts. Schools connect over nine 10 Gbps fiber-optic connections. Career and Technical Education (CTE) pathways are provided via schools preparing students for future careers.

Illinois: McHenry Elementary School District 15 is preparing grade-schoolers for the jobs of tomorrow that will require creativity and discovery through hands-on innovative STEM and STEAM programming. District 15 provides students with educational opportunities that foster engagement, interaction and achievement through cutting-edge technology utilizing a personalized learning approach.

Ohio: Cincinnati Public Schools developed the AP Blended Learning program to improve students access to rigorous learning opportunities and improve equity of learning. The blended learning program consists of face-to-face instruction and individualized student learning. The district provides every student with a device and wireless internet access. Technology enables many more students access to AP courses, improving their educational experience.

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INFRASTRUCTURE FOR THE FUTURE

There is not a one size fits all for digital learning implementation and districts and schools should determine their digital learning pedagogical goals and administrative bandwidth needs, and then design the capacity of their network to anticipate future growth and utilization, ensuring that schools are not under-provisioning bandwidth that is necessary for digital learning approaches. Proactively providing adequate bandwidth, provisioning a scalable underlying architecture, and having the information necessary to increase bandwidth in time to meet needs in the future is critical. All network leaders should also look to the future with anticipation that schools and districts will ultimately function with innovative, seamless digital learning similar to the corporate structure.

Peak Utilization Broadband Capacity: In considering future projections, experts analyzed four years of internet usage data, identified by school size and rurality for over 300 districts serving 1.8 million students. Appendix A provides detailed information about the methodology and calculations used for this analysis. Based on this in-depth analysis, for the 2023-24 school year, SETDA encourages districts to have the ability to implement the architecture and to provision enough bandwidth to ensure adequate user experiences during peak utilization.

BANDWIDTH UNKNOWNS
There are many variables that affect bandwidth needs, including administrative applications; the Internet of Things (IoT); implementation of smart technologies; and the number of devices per user accessing the network.

KEY QUESTIONS
- Are you using the bandwidth you have?
- Is bandwidth available when you need it?
- Are your bandwidth needs scalable?

- **Small Districts** – At least 2.8 Mbps per user with a minimum of 300 Mbps per district
- **Medium Districts** – At least 2 Mbps per user
- **Large Districts** – At least 1.4 Mbps per user

Wide Area Network Capacity: SETDA acknowledges that as more digital content and applications move to the cloud, the per user bandwidth requirements for WAN and internet access will move closer to convergence; however, WAN plays a critical role and measurements of WAN efficacy and utility should include more than bandwidth alone. SETDA recommends that districts have the capability to support WANs with 10 GB capacity per 1,000 users, where users are administrators, teachers, students, staff and guests.

Planning with Technology Disruptions: As access to innovative pedagogical approaches that utilize digital tools and resources increases, the reliability and speed of the network are critical. In the article, Pursue Digital Equity Through Access and Opportunity – All Means All, the challenges facing many schools include the capacity of the network. "When there is not enough bandwidth to accommodate access and applications don't load or crash, the frustration and waste of instructional opportunities mount." According to the Parana River group, a learning disruption occurs when there is inadequate bandwidth for a teacher to effectively utilize technology in the classroom causing the teacher to modify his/her pedagogy to NOT use the technology. Further, if the disruption occurs repeatedly, then the learning disruptions may impact the future use of technology for teaching and learning. Proactively providing adequate bandwidth, provisioning a scalable underlying architecture, and having the information necessary to increase bandwidth in time to meet needs in the future is critical.

✔ Recommendations

Technology and Pedagogical Approaches
Districts and schools are in different stages when considering access to and the utilization of digital tools. The integration of technology for learning is a unique journey that each school or district may embark upon differently. Leaders must focus on academic goals and leverage technology to support student learning experiences in preparation for college and/or careers in the digital age.

Digital Access and Equity
Addressing digital equity for all students continues to be a challenge and stakeholders must ensure that we consider equitable student access to broadband and devices both on and off campus. Every child, regardless of background, race or economic status deserves equitable access to personalized, student-centered learning experiences to prepare for life and work in the global economy.

> No one technology solution is going to be the only option for every district and/or geographic location. Future technologies can offer new pedagogical options for districts to provide personalized learning experiences for students that were not thought possible several years ago, but are being successfully implemented today.

Planning Infrastructure for the Future
Schools and districts should strategically plan for reliable, high speed networks to support sustained, seamless access to the internet for the implementation of administrative tools, the Internet of Things and teaching and learning activities, without disruption. Districts should consider the recommended peak utilization bandwidth capacity goals and WAN implementation considerations as a guide and then plan according to their current and future needs as they move to teaching and learning environments that mimic the corporate structure.

Building Networks for the Future
In order to create sustainable, robust and reliable networks, administrators and technology leaders must look at the level of digital learning implementation and the administrative and security services relying on the network. Additionally, education organizations must implement the most effective security practices to protect their communities.

Policies and Funding

Federal: The federal government should continue to expand federal funding options to support: (a) state, regional and district broadband networks, (b) districts and schools increasing bandwidth capacity to and throughout each campus, (c) communities in providing access points at anchor institutions, such as libraries and community centers.

State: As schools increase digital learning opportunities, states need to demonstrate leadership to support high-speed broadband connectivity by leveraging policies, networks and purchasing options to support increased broadband access in schools.