Delivering on the

# Promise of Digital Equity

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Digital Promise®
Accelerating Innovation in Education

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## Acknowledgments

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## About the Author

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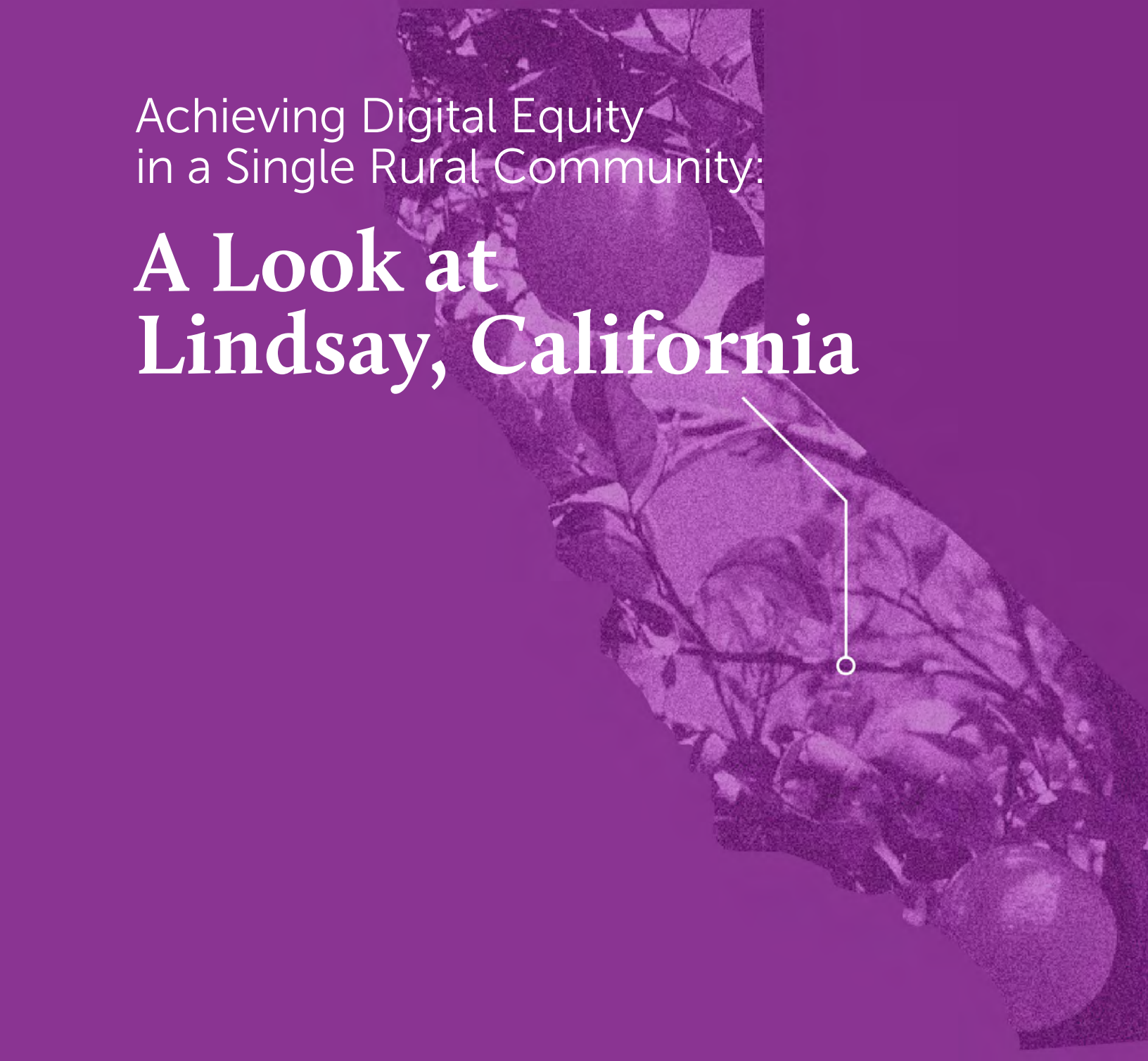
Achieving Digital Equity
in a Single Rural Community:

# A Look at Lindsay, California

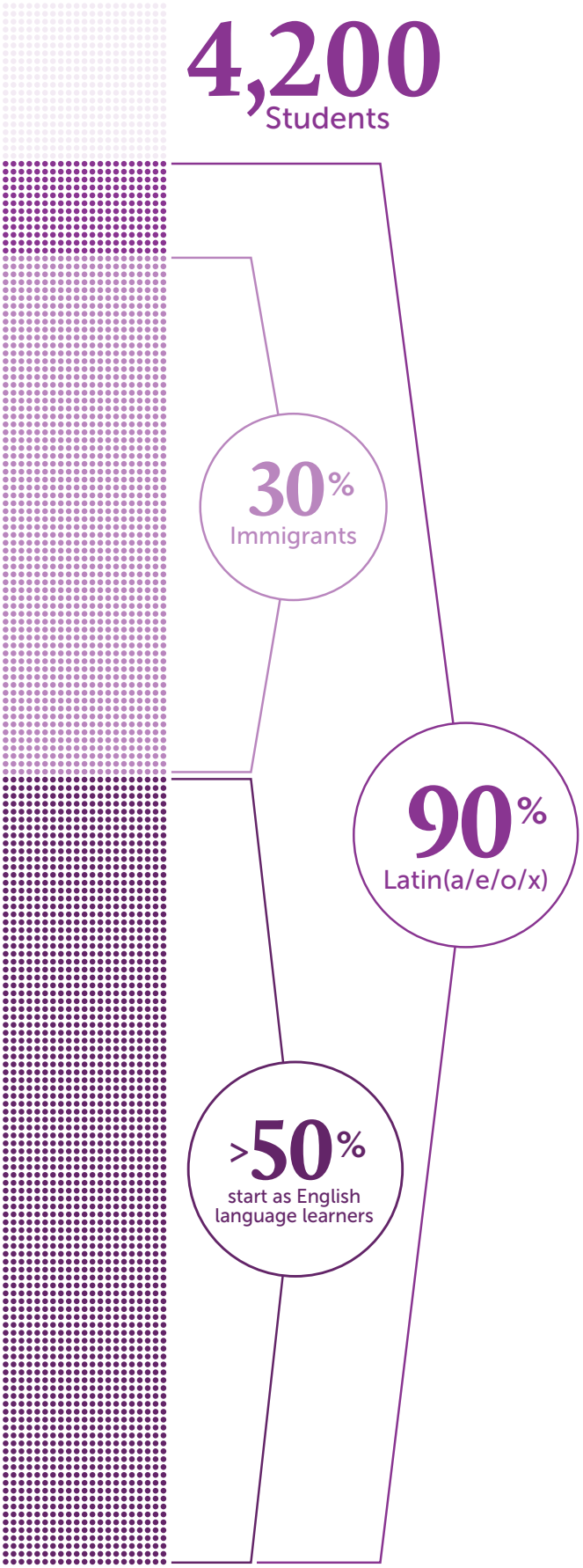


Lindsay is a rural farming community in California's "Citrus Center" and home to one of the nation's largest producers of olive oil. It is also home to a school district that has closed digital divides and used that accomplishment to power a competency-based, personalized learning model enabled by technology. The model has dramatically improved outcomes and life opportunities for students. Of the 4,200 students in Lindsay Unified School District (LUSD), 90 percent are Latino and more than half start school as English language learners. One-third are immigrants. Almost all qualify for free and reduced-price meals.

A Spanish speaker born in Mexico, Veronica Andrade is a Lindsay resident and the mother of three sons. She says that supporting learning in her household during the pandemic "was a very stressful time," but not for reasons some might suspect. Access to devices and connectivity was not an issue for her children or any other LUSD learner (the district now refers to students as "learners" and teachers as "learning facilitators"). Her sons all had devices and connectivity and were able to stream simultaneously.

"Our high schooler wanted everyone to be quiet so he could concentrate, but our youngest was singing songs with other preschoolers," Andrade says. Even during nationwide school closures, there was a lot of learning going on in the Andrade household (watch this video to learn why).

Now, her oldest son is in his second year at Stanford University. Andrade's middle school-aged son has round-the-clock access to the Lindsay curriculum, which is entirely online and allows him to select options to both learn and demonstrate learning. He works at a pace and performance level set by him and his learning facilitator to ensure the tempo of his learning is flexible but



healthy. He advances only when he demonstrates specific competencies. In mathematics, his pace is rapid. Each day, LUSD arranges for him to participate in a virtual, high school-level math course, as his brother did before him. His learning facilitator monitors his progress by viewing his work online and meets individually with him daily and as she works with him in small groups or project teams.

His learning facilitator from last year, herself a former LUSD learner, says that when she returned to the district in 2016, "it wasn't anything like when I was here." So, what happened?

Aerial view of Lindsay, California. Modified still from *Inside California Education: Online Learning in Lindsay*, PBS KVIE (1:02).

After a year-long intensive community engagement effort that included more than 200 parents during the 2006-07 school year, LUSD established a new vision for the district to address its 30 percent math and reading proficiency and 67 percent graduation rates. "When it came time to talk about our vision for technology, at a time when we had very little technology and connectivity, parents told us clearly that they wanted access to learning 24/7," says the district's director of technology, Peter Sonksen.

The new vision included targets for round-the-clock access to curriculum, with variations to account for learner variability, as well as access to a computer and the internet for each learner. LUSD equipped every student with a device by the 2010-11 school year and achieved full connectivity for learners in 2016-17 by building towers, distributing mobile hotspots, and operating its own broadband network, effectively closing the homework gap.

Leaders understood, however, that full access to devices and connectivity was not enough—that high-quality digital use by teachers was essential. The district provided in-depth training on the use of its new digitally powered learning management system that anchors its curriculum and for other technologies. Those trainings continue today on a regular basis. The district also staffs each school with a blended learning specialist, who Sonksen says "goes into classrooms and helps teachers figure out how to leverage technologies, use them to help students stay engaged, and match them to targets learning facilitators want learners to meet."

*Learner Devices* + *Learning Facilitator's Knowledge*

**Connectivity & Full Access** + **In-Depth Training & High-Quality Digital Use**

**Lindsay, California, shows what's possible in the United States...** learners from an underrepresented community have increased access to future learning and social and economic opportunities.


Even before the district secured full internet access for its learners, LUSD's model for digitally enabled learning achieved results. The 2016 graduation rate was 91 percent. More than 40 percent went on to four-year colleges, a rate that was double that of 2010. The graduation rate climbed to more than 94 percent in 2020. Seventy-five percent enrolled in college that year. And in 2019, Lindsay ranked first in English language growth rate among the 63 like school districts in the state.

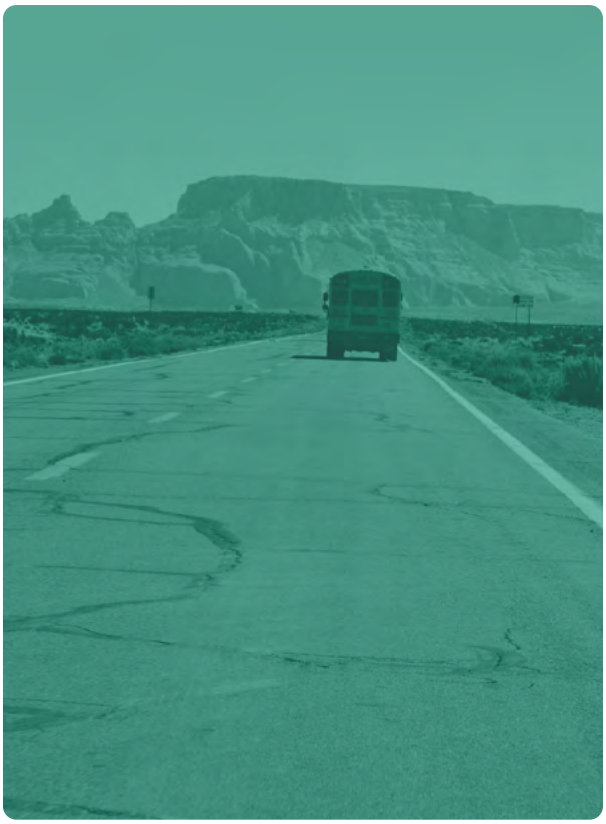
Lindsay, California, shows what's possible in the United States through coherent, intentional, and well-planned efforts to engage community stakeholders; provide equitable access to devices, connectivity, and high-quality technology-enabled learning; and train and support a key workforce—in this case learning facilitators—so that learners from an underrepresented community have increased access to future learning and social and economic opportunities. All learners in the United States can and should have what the Andrade children do.

Achieving Digital Equity for All:

# The Task Ahead of Our Nation

The United States' historic $65 billion investment in digital equity and inclusion through the Infrastructure Investment and Jobs Act (IIJA) provides substantial resources to close digital divides in more underrepresented communities so that Lindsay becomes the norm, not the exception.

As state and local leaders and their partners start the work of closing digital divides, this publication elevates for their consideration the definition of digital equity in both the Broadband Equity, Access, and Deployment and State Digital Equity Planning Grant programs: the condition in which "individuals and communities have the information technology capacity that is needed for full participation in the society and economy of the United States." It demonstrates how intertwined society and economy have become with digital technologies and how gaps in digital infrastructure, skill, and use now deny full participation to far too many underrepresented individuals and communities across the country. Finally, it proposes solutions to our challenges, making the case that K-12 schools are a key pathway to digital equity and essential to sustaining gains we make over the next few years. Ultimately, engaging underserved communities and the entities that serve them in creative and innovative ways will more greatly ensure each state's success.



One analogy for understanding both the challenges and possibilities the IIJA presents comes from 1956. That year, President Dwight D. Eisenhower signed into law the National Interstate and Defense Highway Act, a $25 billion effort that eventually built out the 41,000 miles of interstate highway backbone that has benefited communities and individuals across the country; even those at present without a vehicle or who never travel these highways consume goods and services that rely on the interstate transportation system.

Eisenhower viewed this legacy as one of his greatest accomplishments, reflecting in his memoirs, "...more than any single action by the government since the end of the war, this one would change the face of America. Its impacts on the American economy—the jobs it would produce in manufacturing and construction, the rural areas it would open up—was beyond calculation."

The IIJA presents another significant investment to dramatically expand infrastructure for the benefit of all—high-speed broadband instead of interstate highways, devices that can readily connect instead of cars, and on-ramps not as lanes for entering highways but as strategies for ensuring everyone in the U.S. has the access and ability to use these digital tools to get where they want to be. Importantly, with this investment, governors, state chiefs, superintendents, and community members will decide how and what to build out and where, not a federal agency in D.C.

As leaders planning and implementing the broadband programs of the IIJA get to work, an essential on-ramp from which to build an especially durable new pathway will be the K-12 education system. Success will mean that we close digital divides such as the homework gap (this name refers to the broader challenge of students being able to access learning resources through the internet at home) and the Digital Learning Gap for current and future workers, including the teachers that digitally skill-up the workforce of tomorrow and the parents and families that support that process. Schools, educators, and the communities they serve play a substantial (although currently uneven) role introducing to students and helping them hone the variety of digital skills, mindsets, and resilience they need to become skilled earners and lifelong learners in the digital age.

## The Challenge


of schools report that the steep learning curve for teachers regarding the use of technology is a moderate or large challenge.


of teachers say a lack of training is an obstacle to using technology.

The analogy to Eisenhower's interstate system is inspirational—but also suggests a critical caution. Along with all its many benefits, the building of interstate highways created many side effects and consequences too, most notably in its negative impact on historically Black communities and low-income residents. To find space for its new highways throughout the 20th century, the nation's highway planners physically paved over and uprooted established Black and poorer communities, with racial and economic consequences lingering within those communities to this day.

Today's planners of infrastructure for the 21st century must not similarly pave over the interests, long-term needs, assets, and ingenuity of underrepresented communities and the municipalities and nonprofits that serve them. Instead, the requirements of the new digital equity grant programs, the moral choice, and the pathway to finding the best solutions all lead to engaging and coordinating with these communities in new and significant ways. Doing so will mean careful planning with and learning from communities and acting on what's heard by ensuring their ideas, interests, and needs manifest in

## About Digital Promise and This Publication

This Digital Promise publication is designed to help state leaders (e.g., governors, legislators, state chief technology officers, and state education chiefs and their staff, especially leaders in state education agencies) and local community leaders (e.g., mayors, county executives, school superintendents, nonprofit leaders and education advocates) find innovative and effective ways for using the $65 billion from the Infrastructure and Investment Jobs Act (IIJA) to increase digital equity. It provides an overview of what we know about the digital skills and knowledge necessary for successful participation in the economy and society of the United States, where the data suggests the largest gaps exist, and proposes solutions to close them.

In schools and communities across the country, digital access and use have increased dramatically over the past decade—even as huge gaps still exist. Since its launch in 2011, Digital Promise has been working alongside K-12 stakeholders to identify and scale solutions across research, practice, and technology that create more equitable education systems and close disparities in achievement and postsecondary completion for students. From our vantage point and experience, we have learned a great deal about what it will take to build on the progress made and use the IIJA's significant infusion of resources to truly close digital learning divides.

Our vision, and our goal for this publication, is to help learners transition successfully from K-12 to postsecondary and other pathways to achieve greater well-being and economic security.

That means preparing students both for living-wage jobs that increasingly require digital skills and resiliency, and for participation in increasingly digitized facets of life.

state implementation strategies. That engagement and coordination will take time, effort, and money, but is essential to success—not a grant obligation that simply needs to be met.

The digital divide is a divide of too little broadband access, too few devices, and too few supports for underrepresented populations—and one that IIJA funds have potential to help us resolve. Digital Promise is excited to engage in this work as a partner committed to developing the individual and community digital capacities required for full participation in the economy and society of the United States, contributing whatever and wherever we can to planning efforts that help ensure lasting success in communities and school districts across the country.

### The Challenge

**9 million**

students cannot afford broadband connections.

**6 million**

students have not adopted broadband, even when there are affordable options.

**4 million**

students have existing access, but it is not reliable.

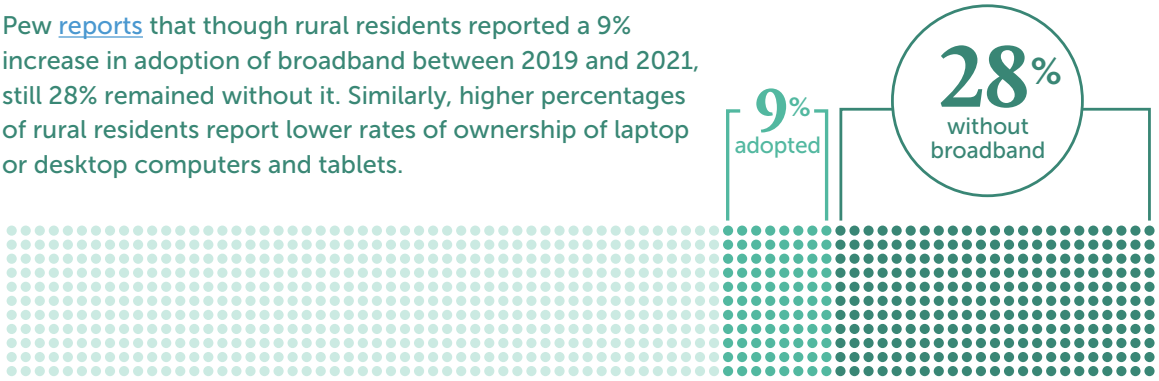
(via The Learning Accelerator)

## Digital capacity is a prerequisite for full participation in the society and economy of the United States.

The institutions, systems, and enterprises that constitute America's society and its economy were trending toward digitization long before the start of the COVID-19 pandemic. Still, the pandemic accelerated these trends, driving more and more services, proceedings, work, and other activities online. Today, it is difficult for anyone to fully engage and transact in many facets of life without access to the internet and devices, the applications they enable, and the skills to use them.

Take healthcare, for instance. Accessing healthcare remotely even as late as 2019 was an American afterthought, with only 11 percent of consumers using telehealth services. That figure rose to 46 percent the following year; notably, 76 percent plan to use it again. And, though the annual revenue for telehealth vendors was an estimated $3 billion pre-pandemic, new estimates suggest that it could grow to $250 billion.

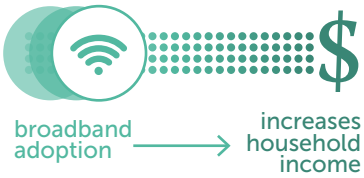
Pew reports that though rural residents reported a 9% increase in adoption of broadband between 2019 and 2021, still 28% remained without it. Similarly, higher percentages of rural residents report lower rates of ownership of laptop or desktop computers and tablets.




The rise of telehealth is of particular importance to rural communities, where the digital divide is large, where the death rate is nearly 126 per 100,000 people higher than in urban areas, and where residents are more likely to die prematurely from heart and chronic respiratory disease and stroke. These figures are in part due to geographical isolation from care facilities and well-equipped, well-staffed hospitals, as well as shortages of doctors and other healthcare professionals. Having access to telehealth services allows residents to utilize recent advances in remote diabetes management, telestroke services, and cardiac care. In fact, cardiac rehabilitation conducted at home under the digital supervision of a medical professional is just as effective as services delivered in an outpatient setting. Many of the advances in telemedicine are currently out of reach to the 28 percent of rural residents who do not have access to broadband or do not have the digital fluency to utilize it.

Civic governments' digital engagement of constituents also became ubiquitous during the COVID-19 pandemic. As in other aspects of society, reports are that it is here to stay. However, the Rand Corporation suggests it is possible that digital engagement might actually limit participation in democratic processes because of "significant discrepancies in the use of the internet across different groups in society," including "varying skills and abilities," and for "geographic or economic reasons."

Even religious activities have increasing digital demands. Online religious services became commonplace during the pandemic; Pew reports that large numbers who attend services in person at least monthly say they are still watching services remotely. And a recent study shows that among millennials especially, "digital religion" plays an important supplemental role to their practice of faith in physical communal settings. That complementary role will remain out of reach for digitally unconnected or unskilled practitioners of their religions.




A recent study found that increases in broadband adoption—as opposed to just availability—in rural communities "are associated with increases in median household income and the percentage of nonfarm proprietors."

## The economy has placed increasing demands for digital skills on workers, and digital skill levels have an impact on earning potential.

The data on the rapid digitization of American jobs will come as no surprise to governors, mayors, and leaders in business and industry who are focused on economic development. Brookings reports that in just 14 years between 2002 and 2016, the percentage of American jobs requiring high levels of digital skills increased threefold. Those requiring mid-level skills increased eight percentage points. And those requiring limited skills declined substantially, from the majority of jobs (55.7 percent) in 2002 to a clear minority of occupations (29.5 percent) in 2016. More than 30 percent of the 13 million new jobs created between 2010 and 2016 demanded high levels of digital skills and another 36 percent mid-level skills.

Between 2002 and 2016, the jobs for which digital skill demands substantially increased were in professions that do not typically require a baccalaureate degree, including construction managers, automotive service technicians and mechanics, registered nurses, welders, cutters, solders, and blazers. Though still requiring low levels of digital skills, even construction laborers saw a sharp increase in the digital demands of their jobs.

Occupations for which the digital demands have increased substantially might surprise some. Take agriculture, for instance—an industry that is in the beginning of a profound digital transformation worldwide. Digital technologies are already being used for the remote monitoring of soil, water quality and quantity, and crop growth; the automation of farm machinery that reduces the need for physical labor; artificial intelligence and data analytics; livestock monitoring with sensors; and drone farming. Estimates suggest that the value add of connectivity to agriculture by 2030 could be as high as $45.7 billion, representing 8.9 percent of the industry's output.

Despite these new, higher levels of digital skill demand, the National Skills Coalition (NSC) reports that 13 percent of all current American earners lack any digital skills. Eighteen percent have limited skills and only a third are at the advanced level. The numbers are far worse for people of color: Half of Black and 57 percent of Latino earners have limited or no digital skills. Although only nine percent of white earners have no digital skills at all, for Black and Latino earners, that figure is 17 and 32 percent, respectively. And while 41 percent of white earners are advanced in their digital skills, only 13 percent of Black and 17 percent of Latino earners are.

We would think these figures would be much better for younger earners who have more recently exited the K-12 system and grown up in the digital age—and are also more likely to be of color. However, one-fourth of all American job-holders with no digital skills are between the ages of 16 and 34. Combined with Americans in that same age group who do not hold jobs, those between the ages of 16 and 34 scored lower on an international assessment of digital skills than all but one of 19 peer nations.


There is a substantial correlation between digital skill level and earnings. NSC reports that 25 percent of earners who have no digital skills are in the bottom quintile of earning, while 32 percent are in the second. Only 10 percent are in the top quintile. Likewise, 47 percent of earners with limited skills are in the bottom two quintiles, a full 21 percent at the bottom and, again, only 10 percent in the top quintile.

## Digital skill gaps across K-12 affect future job opportunities and earning potential.

By 2019, 99 percent of American schools had been wired for high-speed broadband. This was a major national accomplishment. But we know learning does not begin and end in school. Students need high-speed broadband access and laptops, computers, or tablets to complete assignments at home to reinforce concepts and skills they are learning in school, to extend and personalize learning using artificially intelligent edtech tools that are becoming more ubiquitous, and to explore topics of interest to them online. It turns out that lack of access to the internet and devices at home (known as the homework gap) has a substantial impact on digital skill development and consequently earning potential.

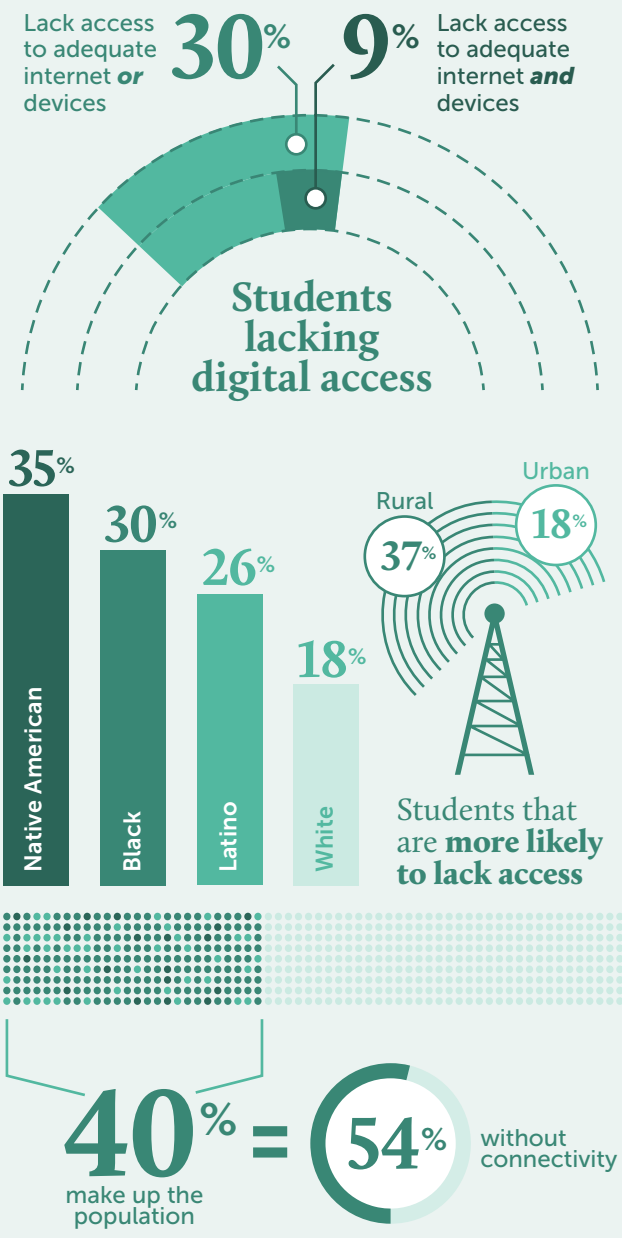
## The homework gap creates digital skill and future income gaps.

Research has shown the cascading effect the lack of high-speed internet access has on student performance, digital skills, and future earning opportunities. A study focused on rural school districts in Michigan found that students with no home broadband access or who only use a cell phone to access the internet are on the losing end of a digital skill gap when compared to those with even slow home internet access: about the difference in skills between an eighth and 11th grader. It also found that these students less frequently plan to transition to colleges and universities. In fact, a student who has only slightly below average digital skills is almost 30 percent less apt to make plans to go on to higher education. And peers with more digital skills are more likely to set their sights on a STEM career, where job growth is exponential and entry-level salaries and career earning opportunities are much higher. In 2019, the average income of a STEM professional was $86,980, nearly $50,000 more than non-STEM workers, whose income averaged $38,160.

## Data on America's Homework Gap

In late 2020, in the midst of many school closures, Common Sense Media and the Boston Consulting Group documented the profound digital divide that existed for students in their homes across the country. Approximately 30 percent—15 to 16 million students—lacked access to adequate internet or devices, while nine million lacked access to both. The percentage of rural students without adequate access (37%) was higher than the still-high rate for urban students (21%). Native American (35%), Black (30%), and Latino (26%) students were far more likely to lack access than white students (18%). And though Native American, Latino, and Black students make up 40 percent of the population, they constituted 54% of those without connectivity. Forty-four percent of the disconnected lived in the South, where eight of the 10 states with the lowest rate of adoption of high-speed internet access resided.

As a result of CARES Act funding, commercial discounts, and the application of other federal, state, local, and philanthropic resources, the nation made at least temporary progress closing the gap, helping states and school districts close connectivity and device gaps by 20 to 40 percent and 40 to 60 percent, respectively. Still, estimates are that 12 million students remain disconnected or are under-connected because of the speed of their internet or the limitations of their devices. To put a finer point on this data, Learning Accelerator reported in July 2022 that even where options for broadband connections are affordable, six million students are not connected. For nine million students, it is too costly, and for four million who have access, it is not reliable.



Black and Latino learners are also less likely to enter STEM professions. This is in part due to the fact that these underrepresented populations historically earn fewer baccalaureate degrees in STEM fields than their share of the adult population suggests that share should be. For white learners, STEM degree attainment is on par with the percent of their total population. Though there are numerous inequities that contribute to this gap and no research correlating it to digital skills (though we can infer the gap is due in part to that), it is worth noting that using census data, the National Academies of Sciences, Engineering and Medicine reported that white people had a median household income of $70,642 in 2018, while for Latinos it was $51,540 and $41,361 for Black households.

## Learners develop and hone their digital skills by using and applying them meaningfully in well-designed learning activities. But not everyone has access to these activities.

Even though nearly all the nation's schools are wired for high-speed broadband access, that doesn't mean that schools are using it to develop students' digital skills and resiliency (the capacity to adapt to new technologies they will encounter throughout their lives) within the context of powerful learning activities that incorporate increasingly advanced digital technologies. The old notion of the digital divide (as one involving access to broadband and devices) has in fact expanded in recent years to include digital use. And usage varies across the country and among socioeconomic and racial groups. The U.S. Department of Education's Office of Educational Technology (OET) notes in its current National Education Technology Plan (NETP) that this aspect of the divide "separates many students who use technology in ways that transform their learning from those who use the tools to complete the same activities but now with an electronic device (e.g., digital worksheets, online multiple-choice tests) and that the divide is present in both formal and informal learning settings and across high- and low-poverty schools and communities." Learning Accelerator's recent examination of a number of research studies on the subject concludes that "over two years into the pandemic and after an influx of technology that should have radically influenced students' learning opportunities, the digital use divide persists."

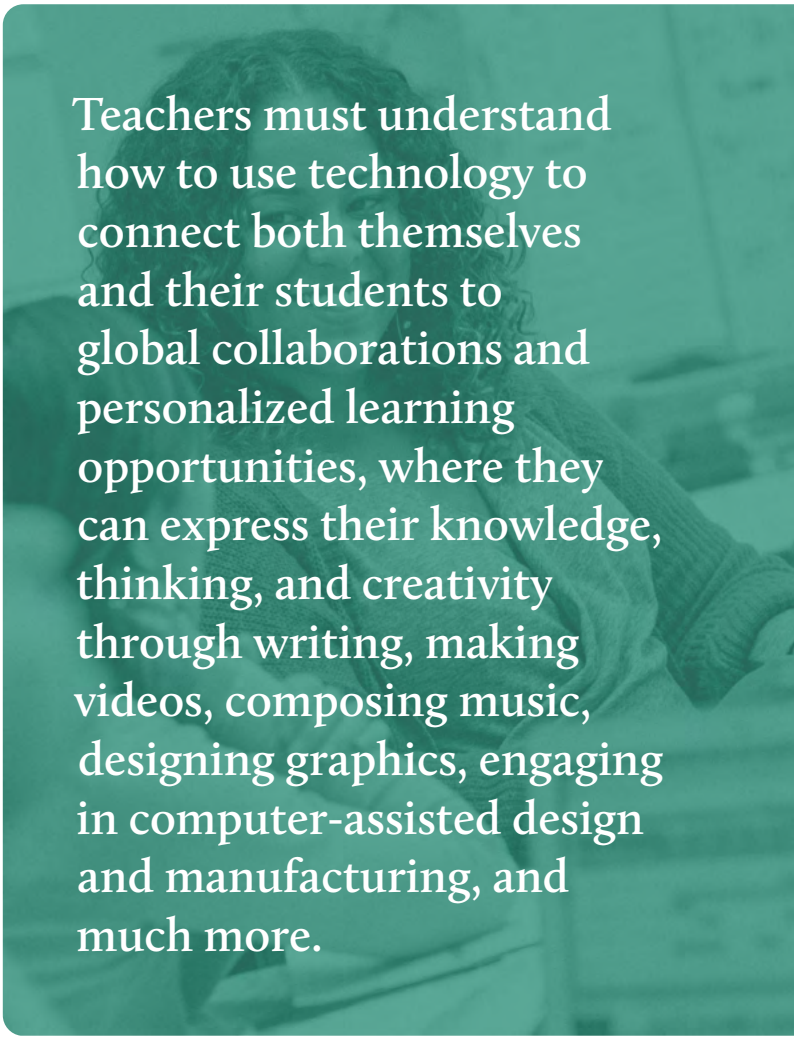
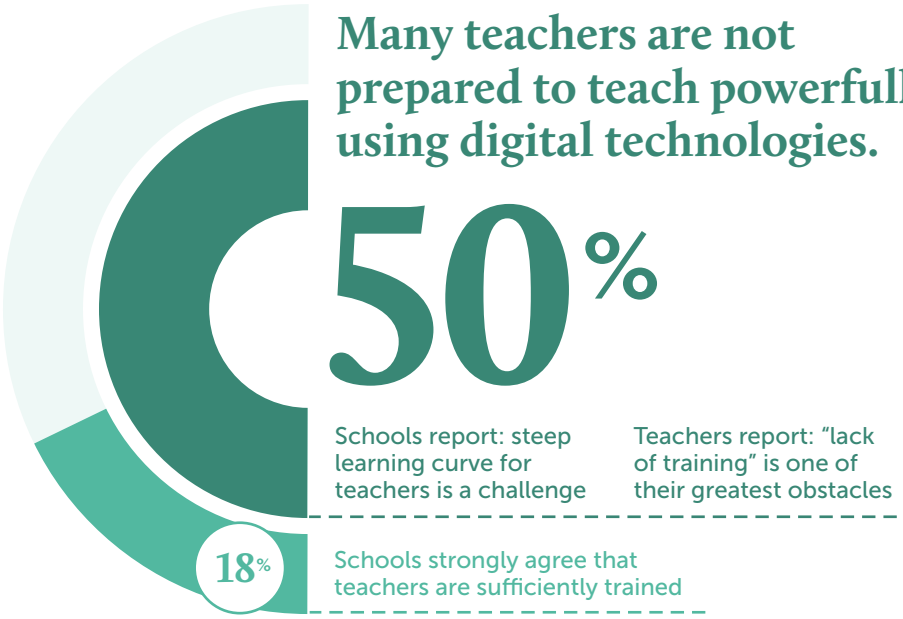



Photo by Allison Shelley/The Verbatim Agency for EDUimages (modified).




It's not hard to understand why. Data suggests that many teachers are not prepared to teach powerfully using digital technologies. A survey conducted by the National Center for Education Statistics shows that only 18 percent of schools strongly agree that teachers "are sufficiently trained in how to use technology" and have enough training to use it for teaching." Fifty percent reported that the steep learning curve for teachers regarding the use of technology is a moderate or large challenge. The NETP observes that 50 percent of teachers report that the "lack of training" is one of the greatest obstacles they have to overcome to integrate technology into their classroom instruction.

## Digital Promise recommends that states make nine big plays in three critical focus areas to advance digital equity.

There are six buckets of funding for the broadband programs of the IIJA, the most substantial of which is the Broadband Equity, Access, and Deployment (BEAD) Program at more than $42 billion. (For a simple and thorough explanation of the funding opportunities, see Common Sense Media's "Federal Broadband Funding Opportunities," which distills for state and local planning teams what each of the six funding opportunities are, as well as other federal funding sources for broadband equity.)

As state and local teams and other possible grant recipients discuss priorities and strategies to build into their digital equity and BEAD plans, we recommend they include nine "big plays" spread across three essential areas to close the digital divides and sustain progress after national grant funds are gone.

**FOCUS AREA 1:**

### Build and sustain systems and infrastructure to ensure all students have constant, reliable access.

**1** Remove barriers to affordable broadband.

**2** Leverage national and state-level broadband programs to close equity gaps in connectivity and device procurement.

**3** Create or revise long-term edtech plans to provide equitable access and sustainable systems.

**FOCUS AREA 2:**

### Upskill the K-12 teacher and leader workforce.

**4** Establish digital skill and digital use competencies for K-12 graduates and educators.

**5** Design professional learning opportunities that increase educators' digital skills and digital use competencies.

**6** Charge a task force to create a statewide plan to upskill the K-12 educator workforce.

**FOCUS AREA 3:**

### Upskill students, parents, families, and caregivers.

**7** Utilize local groups to convene underrepresented populations and gather information.

**8** Scale up community-based efforts to develop the digital skills of students and parents/caregivers.

**9** Create task forces inclusive of underrepresented communities to influence state and local plans.

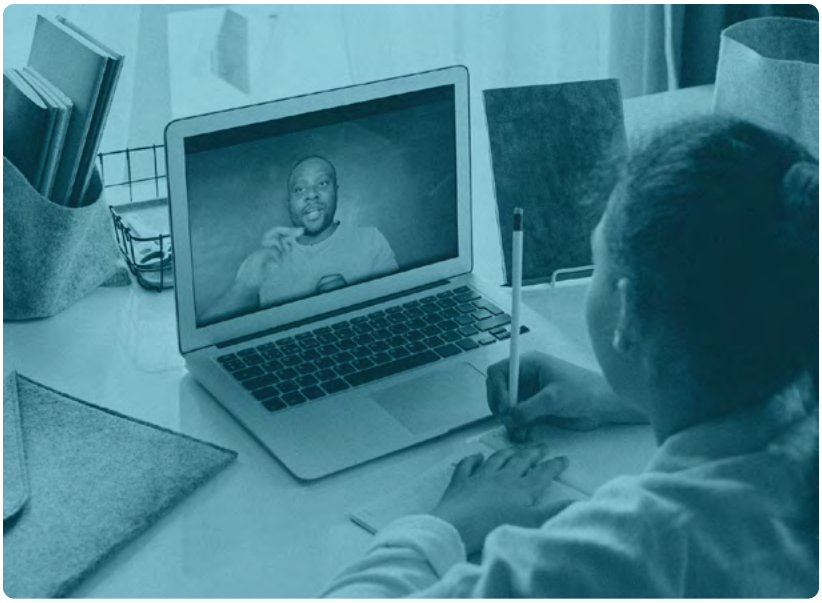
In the pages that follow, we describe each of the areas and big plays within them in detail, with rationale and insights into how states can include them in digital equity and BEAD plans.

FOCUS AREA 1:

# Build and sustain systems and infrastructure to ensure all students have constant, reliable access.

Foundational to closing divides in digital use are efforts to close gaps in access to connectivity and devices, and ensure that system architecture necessary to power digital learning is in place.

The aspiration of the broadband programs of the IIJA is to close the connectivity gap for American homes and other entities in their communities. However, once the grant programs expire, maintenance still will need to be done, technologies will advance, and service will inevitably be upgraded to accommodate them. While affluent communities can pay for what will become more expensive infrastructure, less affluent communities may not be able to. And, while internet service providers (ISPs) have played a vital role in rolling out broadband to larger sections of the country—and some are playing an important role in building out infrastructure, systems, and specific technologies in schools and nonprofit organizations—they might not always be the best, most affordable or sustainable option for some communities.



Similarly, though the nation made progress on the provision of devices during the pandemic using CARES Act funds and other funding sources, those dollars are going away in the same way IIJA funding eventually will. Even for those students who have devices, regular use, wear and tear, and potential upgrades to broadband will render them inoperable. They will need to be replaced regularly.

Finally, there are fundamental, baseline system architectural needs that extend beyond devices and connectivity that need to be developed and sustained to ensure students have 24/7 access to the internet and devices and powerful, digitally enabled learning: procurement processes for affordably refreshing currently outdated hardware and software; provisions for adequate tech support; cybersecurity and digital safety policies and practices; and learning management and professional learning systems that help power more personalized learning, to name only a few.

We recommend that states and their partners make three big plays to address these challenges.

## Big Play 1

## Remove barriers to affordable broadband.

BroadbandNow reports that in 2020, 22 states had "roadblocks" in place to prevent or inhibit the municipal provision of broadband. The BEAD Program tackles this challenge head-on, obligating eligible entities to consider all potential provider types for broadband service subgrants, encouraging states to waive any laws that might inhibit expanded options, and requiring explanations in final proposals of how these policies affected the rejection of any potential provider.

The BEAD Program suggests this obligation will increase competition and ultimately provide communities serving underrepresented populations more affordable and potentially higher-quality options. But opening up options also taps local leaders who know their communities' needs and geographies well. Non-commercial entities have in fact been providing broadband services to great effect across the country. Often referred to as "anchor institutions," these libraries, school districts, community colleges, municipalities, and other institutions are deploying their own broadband services using, among other approaches, WiFi that leverages unlicensed spectrum.


There is evidence now that these anchor institutions can provide more affordable options than commercial ISPs. "Schools and libraries have been at the forefront of promoting digital equity for years—long before COVID revealed the extent of our nation's digital divide," says John Windenhausen, the executive director of the SHLB Coalition. "Every community has unique connectivity needs, which is why anchor institutions and other local leaders can be instrumental in bringing internet to everyone."

Private commercial providers have played an important and vital role in expanding broadband coverage across the nation; with the homework gap and its impact on future earning potential for those who experience it looming large, the moment requires states to enable the ingenuity and capacities of nonprofits and municipalities to meet the broadband needs of the communities they know and serve.

## Big Play 2

## Leverage national and state-level broadband programs to close equity gaps in connectivity and device procurement.

Large federal funding initiatives have the power to create new, much-needed programs at scale. That they take hold and have permanence depends in large part on the creativity, ingenuity, and pragmatism of states and their partners. They will need to deploy these skills as they tackle the enormous challenge of paying for upgrades in broadband and for new devices for students in underrepresented communities after the IIJA and other federal funding sources expire. States have a number of options to drive down costs to ensure future digital equity. Expecting annual legislative appropriations or future federal grant programs are probably not among them. We recommend that states pursue two innovative strategies that leverage the power of the IIJA's programs and their own contractual authority to ensure that underrepresented communities have the same ongoing access to high-quality broadband and devices that more affluent communities do.

First, the IIJA gives states the authority to subcontract with ISPs and other providers to extend service to underrepresented communities, many of which are experiencing poverty. States should leverage this contractual authority while they have it. We recommend that states insert into those contracts clauses to ensure there is permanent equitable provision of broadband services. In other words, when ISPs upgrade broadband in communities that can afford to pay for it, they would be required to upgrade in communities that may not be able to. This should be a permanent requirement, not just over the brief lifespan of the IIJA programs. Up-front knowledge of this requirement will allow ISPs to estimate the total cost of their bids and make plans for future cost and fee structures.

Photo by Allison Shelley for EDUimages (modified).

Second, states can change the incentive structure for Original Equipment Manufacturers (OEMs), leveraging their authority to issue contracts at greater scale than local municipalities or school districts can alone. Some momentum is building around "device as service" models as a sustainability strategy. These models make device procurement an operational and not a capital expense. In the model, a device becomes a service delivered along with hotspots, updates to cybersecurity, maintenance, and replacement. OEMs retain ownership of the devices and distribute them to school districts or regional education systems that in turn distribute them to students.

To foster these models at scale may require a legislative act mandating that a state education or technology agency negotiate a "device as service" contract with OEMs that include set pricings, warranties, and expectations for servicing and replacement. Districts then would have the option of buying into the contract. As more and more districts do, the incentives for OEMs to provide devices as a service would increase, driving down costs to more sustainable levels, especially for rural school districts that do not have the purchasing power of a large urban or suburban school district.

## Big Play 3

## Create or revise long-term edtech plans to provide equitable access and sustainable systems.

State departments of education, technology agencies, and state commissions on educational technology will play an important role in sustaining digital equity efforts. Through the educational technology plans they create, they set expectations for digital equity and learning, as well as the infrastructure necessary to enable and sustain it within school districts. We recommend that each state develop or revise existing educational technology plans to increase the likelihood that digital equity gains we have made and will make as a country endure.

One of the most detailed of these state plans comes from the Massachusetts Department of Elementary and Secondary Education. Its strategic planning guide for edtech, "Sustaining Progress in Access to Equity," begins by establishing how school districts should think about technology: "The key to enhancing teaching and learning with technology is not the technology itself, but strategically integrating high-quality digital tools and resources to deliver deeper, more personalized learning into the existing classroom curriculum."

Within this context, it lays out the infrastructure districts need to deliver on that vision. This includes staffing, not only for systems (i.e., network management, customer service, information and data management systems, and edtech leadership), but also for instructional supports such as coaching for educators. It samples annual prices per student for applications, software and content providers, virtual school courses and bundles, filtering, privacy, multi-device and learning management systems, learner and user analytics, and classroom technologies such as cameras, projectors, and interactive touch and non-touch displays. And it samples prices for teacher and learner devices and teacher certifications in the application of digital technologies. Understanding that schools cannot use their technologies if they are under attack, it devotes three pages to cybersecurity and outlines its per-pupil cost by size of school district.

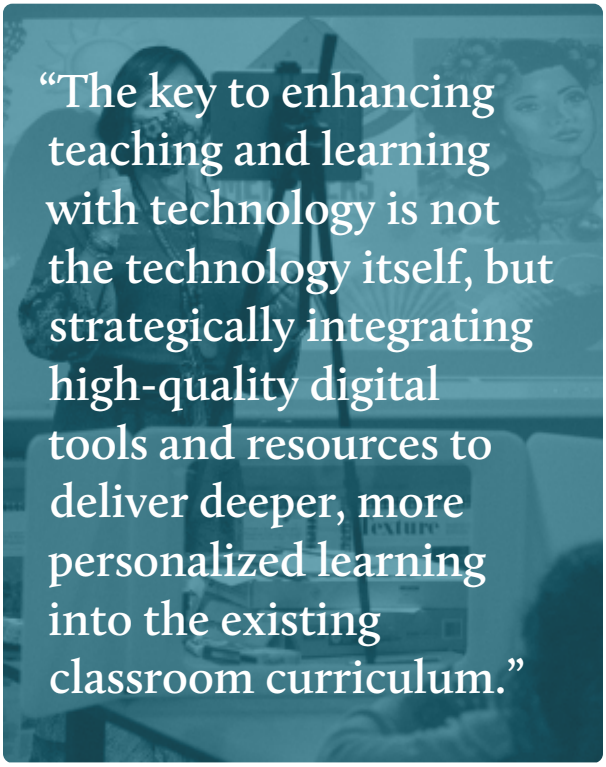
### Verizon Innovative Learning Schools

Since 2014, Verizon has been committed to fostering digital equity and inclusion through Verizon Innovative Learning Schools, a partnership with Digital Promise that now reaches over 560 schools nationwide. Through this program, students and educators at select Title I middle and high schools receive free devices and up to four years of data plans for off-campus access. To sustain technology integration in the schools, the program focuses on developing educators' digital skills with extensive training and access to technology-driven STEM curriculum. In addition to driving pedagogical shifts for educators, the program also promotes upskilling of the educator workforce; each school is required to deploy a full-time learning coach who receives further training from Digital Promise and is dedicated to supporting educators in successful technology usage.

At the end of the program, Digital Promise supports participating schools in creating sustainability plans that both leverage funding streams for digital equity made available through federal programs responding to the pandemic and account for the more typical budgets of the future. Digital Promise has published this toolkit for all school districts to use as they create technology plans, regardless of their participation in Verizon Innovative Learning Schools. The toolkit provides a framework for actions that districts need to take to create sustainability plans and can be a resource for states that build technology sustainability plans into their digital equity and five-year BEAD plans.

The Texas Education Agency's draft long-term technology plan also devotes several pages to cybersecurity. And, when it is released in December and available to the public, it will provide school districts with strategies they can use to ensure sustainability, such as pursuing "device as a service" agreements, using state cooperative contracts to leverage statewide purchasing power, and participating in bulk discount programs for hardware and software. Importantly, it will encourage districts to reduce device refreshing targets from five to a more realistic three years.

State teams planning for the roll-out of the broadband programs of the IIJA will immediately need to start planning for sustainability. State and local educational technology plans in service to digital equity are key tools to enable that sustainability in school districts.

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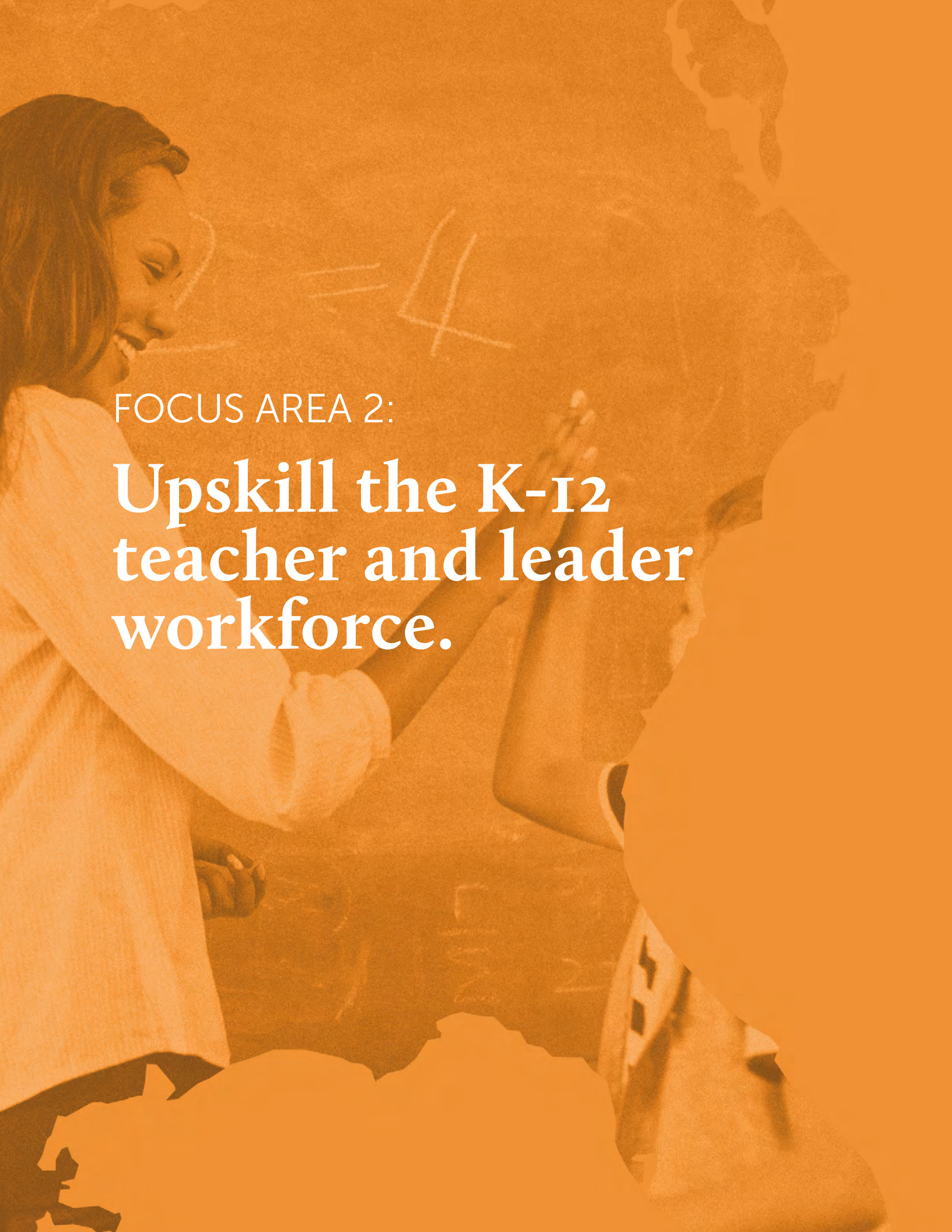


FOCUS AREA 2:

# Upskill the K-12 teacher and leader workforce.

K-12 educators are on the front lines of digital skill development. They are a workforce that plays a vital role in establishing the condition in which all K-12 graduates have the technological capacities for full participation in the society and economy of the United States. Building the digital skills of this workforce is a sustainability strategy—a partial safeguard against that day when federal funds are gone.

(In the case of teaching and leading in K-12, we believe K-12 educators are only partial safeguards because there are other factors that impact teaching and learning, including home, family, and community factors outside of schools and, within them, state and local policies, curriculum, expectations for the pace of instruction, school structures, availability of technologies, and more. These are subjects for future publications.) For now, and for this big play area, we encourage states to create and embed in their plans three big plays to upskill the educator workforce and put all K-12 students on pathways toward full participation in American life.

Photo by Allison Shelley for EDUimages (modified)

## Big Play 4 Establish digital skill and digital use competencies for K-12 graduates and educators.

We believe that one of the most important goals for state roll-out of the broadband programs of the IIJA should be that K-12 students graduate digitally prepared for full participation in the society and economy of the United States and world. States should start the process of achieving this goal by asking and answering a question: *"What exactly does a digitally competent student need to know, understand, and be able to do by the end of 12th grade and at benchmarks along the way?"*

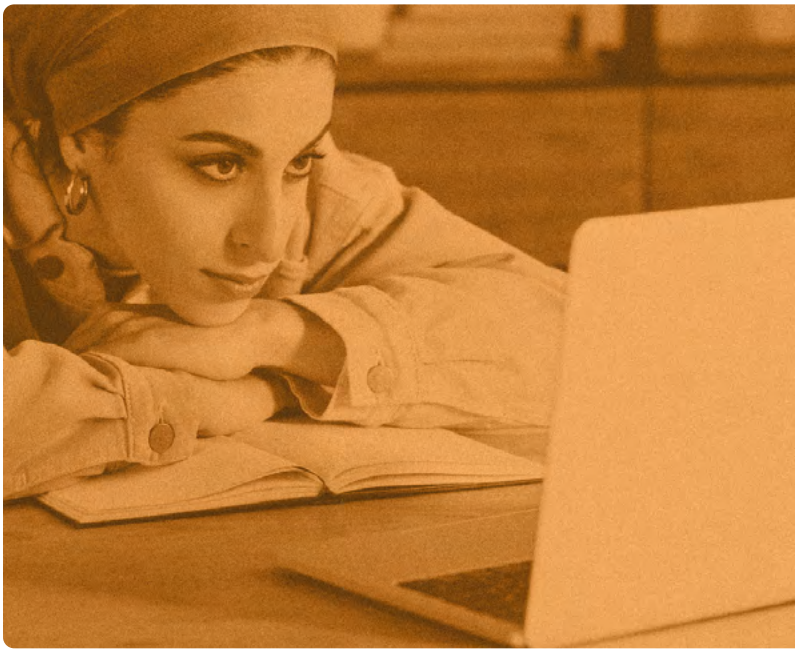
Expectations for that knowledge, understanding, and ability typically live in state and local standards frameworks for student learning. We believe states should examine and create (or revise) standards that elevate a focus on digital skills and usage for K-12 students. This process will have a domino effect in creating expectations for what teachers and leaders need to know, understand, and be able to do to ensure students are digitally competent. Another figurative domino will cascade into educator preparation programs (EPPs). When it drops, it will require states to ask what competencies the faculties of these programs should have to adequately prepare educators to teach and lead in the digital age and what the competency expectations should be for their graduates.

Standards are key levers states have available to them to ratchet up expectations for digital skill and use for students, K-12 educators, and the faculty and graduates of EPPs. We recommend that states build efforts to address digital competence for all these groupings into digital equity and BEAD plans. Plans should enable a process that likely needs to unfold in stages, as expectations for one grouping cascade into expectations for others.

### First, examine and revise, augment, or create and elevate digital skill and usage competencies for K-12 students.

States all have some version of college and career readiness standards, whether they use the Common Core State Standards (CCSS), modified versions of them, or their own frameworks. We understand there are differences in opinion about the CCSS across the United States, and our intent here is not to advocate for them, but rather use them to illustrate a point.

There are more than 90 mentions of technology and digital skill in the CCSS, and it is referenced at high degrees of frequency in other standards frameworks. Expectations for student use of technology are quite high across grade levels and across the country. The CCSS expect elementary-aged learners to use technologies to draw geometric shapes; produce and publish writing; make strategic use of digital media and visual



displays of data to express information and enhance understanding of presentations; gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism; and interact and collaborate with others, among many other competencies.

Among those for older learners are expectations that they can find the inverse of a matrix if it exists to solve systems of linear equations using technology; interpret scientific notation that has been generated by technology; integrate charts, graphs, photographs, videos, and maps with other information in print and digital texts; and make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

These standards are and should be quite high if K-12 graduates achieve the aspirations of the CCSS and likely other frameworks: "to be ready for college, workforce training, and life in a technological society," equipped with abilities to use technology as a tool that facilitates a life of independent, self-directed learning.

Still, regardless of the perceived rigor of these or other standards, states should interrogate them to determine if there are competencies that are missing, if they are specific enough to guide teacher and leader practice, and if they need to be revised or augmented or take on a more prominent role in state standards frameworks. In Big Play Six below, we outline a process to conduct this review and make changes to standards if necessary.

### Next, examine, revise, enhance, or create digital skill and usage competencies for K-12 educators.

Having rigorous student standards for digital skill and use has significant implications for K-12 educators. At a minimum, they need the digital knowledge, understanding, and skills that standards expect of their students. They also need the usage skills to design and implement engaging, digitally informed learning activities that facilitate the development of students' digital skill and resilience **and** enable them to meet state academic standards. Leaders need digital skills, too, as well as abilities to set the table for powerful, digitally informed instruction. They need capacities to work with teachers and others to create visions for technology, strategic plans, and cultures that enable technology's powerful use by teachers and students. Importantly, leaders need to know and understand the technologies available to teachers and know when technologies are or aren't being used effectively—and what to do to help teachers continue to grow regardless of their digital skill and use levels.

What's expected of educators to ensure K-12 students graduate poised for full participation in the society and economy of the United States should be clear in state standards frameworks for educators. Whether they are models for potential district adoption or mandated, state-developed frameworks for educator quality/effectiveness are ubiquitous.

Though the language used across states varies for them, standard frameworks typically set a limited number of standards (e.g., planning and delivering effective instruction to facilitate learning), subdivide the standards into elements (e.g., integrating technology to engage students and provide authentic learning experiences), and further subdivide the elements into levels of practice, one of which meets expectations for competency, and others that are below and above (e.g., evidence that students are self-selecting the appropriate technology tools based on outcomes that are expected of them—an advanced competency). Guidance documents and sometimes even banks of video libraries often supplement the frameworks to explain or show what instruction that meets expectations looks like.

States can use the opportunity presented by the IIJA to examine their educator standards frameworks (including the mandated or model matrices they produce for educator evaluation) to ensure they map back to student digital competencies, are adequate and explicit enough, and that detailed supplemental materials exist (and, if not, need to be created) to illustrate the digital competencies required of educators.

We believe close examination will lead to revisions to standards frameworks and hopefully to the development of video-based or written exemplars that model the expected competencies. We also believe that states have the opportunity to use standards frameworks to ratchet up attention to the digital competencies required of educators to address learner variability, an issue that is particularly important for work in underrepresented communities where learning gaps loom large.

Finally, since all 50 states have adopted competencies for learning, teaching, and leading in the digital age (the ISTE standards) and in some cases states feature them prominently in educational technology plans, we encourage state planners to examine these competencies to determine if they should be featured more prominently in standards frameworks instead of possibly living only outside them.

Big Play Six in this section points to how states can go about conducting this examination and revising, enhancing, or creating competencies for digital-age leading, teaching, and learning.

## Educator preparation programs are redesigning themselves for the digital age.

Saint Leo University and the University of Michigan School of Education provide powerful examples of educator preparation programs that have undergone transformation. Responding to a survey showing their graduates were satisfied with every aspect of their program except how they were prepared to use technology in the classroom, Saint Leo faculty upskilled itself in the use of digital technology. Now, every course taught by faculty uses technology for teaching and learning as a model for their graduate's future instruction. The university built a lab for students to practice using devices, apps, and other digital learning products and equips all its candidates with a digital backpack that includes a tablet, portable projector, and other digital resources for student teaching.

The University of Michigan School of Education now uses a curriculum that reflects ISTE's standards for teachers. Teacher candidates use technology in a series of projects related to each of the five standards. Among these, candidates design and teach a 20-minute webinar to elementary school students as well as a lesson that uses technology to address student needs for their field placements.

## And finally, revise, augment, or create standards for EPP faculty and graduates.

As states examine their standards frameworks for K-12 educators and consider revising or enhancing them to account for what teachers and leaders need to know, understand, and be able to do to graduate digitally skilled learners, the next domino to fall is on EPPs. States will need to ask and answer other questions: *What digital competencies do graduates of teacher preparation programs need to have to meaningfully use technologies from day one? What digital and leadership competencies do school and district leaders need to make powerful learning enabled by technology flourish in buildings and districts they lead?*

It is in EPPs that faculty can model effective, digitally informed pedagogies for future K-12 teachers and leaders, familiarize them with the technologies they will use as practitioners, and provide them opportunities to rehearse their use in EPP classrooms, virtually, and in field placements. Programs preparing leaders can equip them with the knowledge and understanding of leadership practices and pedagogies that facilitate the powerful use of digital technologies in schools.

EPP faculties are an essential workforce for digital equity. Ultimately, they bear the responsibility for preparing the educators who will teach and lead in schools serving underrepresented populations.

Whether teachers are ready to hit the ground running on day one in their first placement depends in large part on whether they had modeled for them effective, digitally informed pedagogy, had opportunities to practice design of powerful learning activities using it, and were exposed to technologies they will use at the point of hire (including those specific to their disciplines and grade levels, digitized learning management systems, and software and platforms that allow them to address learner variability and engage students).

Their ability to implement what they've learned in their EPP will further depend on whether building and district leaders have learned in their own EPPs how to lead schools and systems to enable powerful, digitally informed teaching and learning practices.

The data we shared on the existing teacher workforce's comfort levels with and use of technology suggests that we as a nation are not preparing enough educators to teach and lead in the digital age at the scale we need.

The National Education Technology Plan (NETP) sets an aspiration for EPPs that states should build into plans for digital equity: Schools "should be able to rely on teacher preparation programs to ensure that new teachers come to them prepared to use technology in meaningful ways" and that "no new teacher exiting a preparation program should require remediation by his or her hiring school or district." This target is especially important for schools with high numbers of students experiencing poverty, high numbers of students of color, and rural schools where it is more difficult to attract and retain teachers and staff and turnover is more constant.

The NETP recommends a strategy to achieve this ambitious goal, one we believe states should adopt as well: having "a common set of technology competency expectations for university professors and candidates exiting teacher preparation programs for teaching in technologically enabled schools and post-secondary education institutions."

In response to the NETP, competencies for teacher educators have been developed, though we are uncertain about how broadly they've been adopted. Created through a collaborative process supported by the U.S. Department of Education, the Council for the Accreditation of Educator Preparation (CAEP), the American Association of Colleges of Teacher Education (AACTE), and others, the Teacher Educator Technology Competencies (TETCs) lay out expectations for teacher educators in the digital age. We are not advocating for state or EPP adoption of these competencies; however, we believe they can inform discussions after states ask an essential question that must be answered if the nation is going to achieve digital equity: "What are the digital skill and use competencies faculties of EPPs need to have to prepare graduates to be ready to use technology effectively at point of hire?"

### Sample Competency from the TETCs

Teacher educators will incorporate pedagogical approaches that prepare teacher candidates to effectively use technology.

- Evaluate information.
- Assist teacher candidates with evaluating the affordances of content-specific technologies to support student learning.
- Assist teacher candidates with the selection and use of content-specific technologies to support student learning.
- Facilitate opportunities for teacher candidates to practice teaching with technology.

The NETP makes the case that establishing competencies for EPP faculty will help ensure that school districts no longer need to remediate new teachers' digital skills after they hire them. But EPPs need learning targets to shoot for, which is why the NETP also makes the case that there should be exit standards for digital usage for graduates of teacher preparation programs. Some states have adopted exit standards for teacher preparation beyond those embedded in the basic skills tests they require. Where they exist, they are typically mapped back to standards frameworks for teachers. And expectations for new teachers also may be ensconced in state K-12 teacher standards and evaluation frameworks themselves to account for differentiation in the expected competence of novice and more experienced educators.

Even if they do have exit standards for teacher preparation programs that map back to state standards for teachers—and even if there is a focus on digital skills within them—we still believe they need to ask a question: *"What exactly does a teacher graduating from an EPP need to know, understand, and be able to do to use technologies from day one, and should they be the same as or different than competencies we expect of proficient (not advanced) teachers already in K-12?"*

EPPs need competency-based targets for their leadership preparation programs as well and, again, those leading state digital equity efforts will need to ask and answer a similar question: *"What exactly do school leaders graduating from an EPP need to know, understand, and be able to do to lead the digital transformation of learning in schools?"*

Ultimately, we believe answers to these questions should inspire revisions or enhancements to or the creation of exit standards for EPPs. Those standards will not only set clear targets for teaching and learning in EPPs but also set the stage for the creation of standards for EPP faculty that explicate exactly what a digitally competent instructor knows, understands, and is able to do.

We understand that Big Play Four is a heavy lift—and will have an impact on K-12 teachers and leaders, the graduates of EPPs, and their faculties. Nonetheless, we believe setting clear competencies for digital skill and use for the workforce most directly responsible for digitally upskilling K-12 students is essential to achieving and sustaining our nation's aspirations for digital equity. Big Play Six further below outlines what states can actually do to make this lift.

## Big Play 5

## Design professional learning opportunities that increase educators' digital skills and digital use competencies.

While laying the groundwork to prepare all graduates of educator preparation programs (EPPs) with the digital skills they need to hit the ground running, states will need to tend to the current workforce. Even if states transform their EPPs and their graduates are ready at the point of hire, teachers and leaders will need to participate in learning opportunities that reflect new technologies, effective pedagogies, and evolving competencies.

To this end, we recommend that states build into their digital equity plans another strategy recommended by the NETP: convening stakeholder groups of educators, policymakers, EPPs, and others to design professional learning experiences for educators "powered by technology to increase their digital literacy and enable them to create compelling learning activities" that address the expectations for technology embedded in state standards and reflect the "increased connectivity of and access to devices in schools."

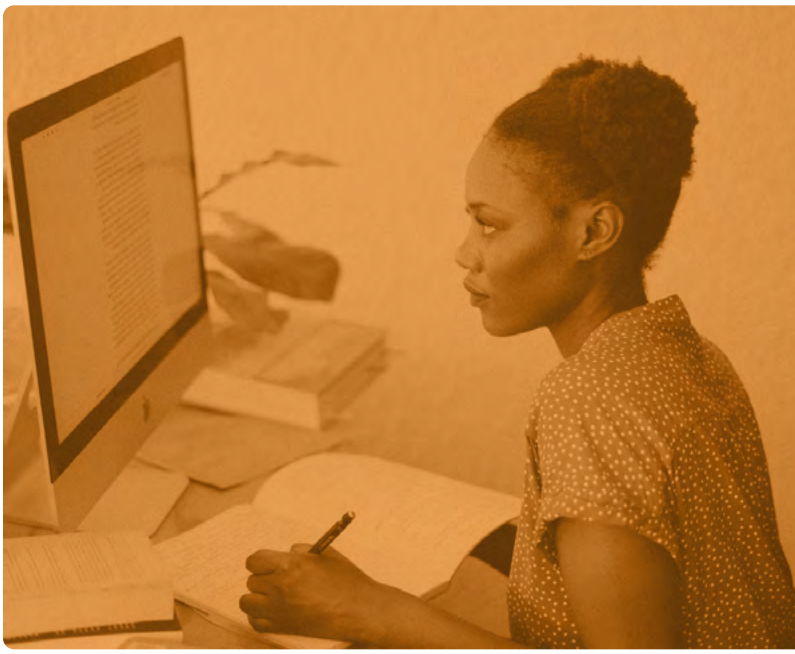
Big Play Six recommends a mechanism for gathering these stakeholders. Regardless of the approach states take to inspire the creation of powerful learning activities for educators, we want to make digital equity planning teams aware of some exciting advancements in professional learning taking place that states and school districts may choose to adopt.

### Digital Learning Coaches

Developing digital skills and instructional capacities is best done in the context of real work educators are doing in schools and often in real time. School-based digital learning coaches is one strategy districts are using in increasing numbers to upskill the educator workforce. Lindsay Unified School District (as illustrated in the opening vignette of this publication) employs blended learning coaches in every school. Talladega County Public Schools, a sprawling school district in rural Alabama, repurposed funds previously used for resource teachers to fund digital learning coaches at each of the district's 17 schools. The digital learning coaching model is also a powerful option for EPPs.

### Micro-credentials

Micro-credentials are digital badges that create opportunities for individuals to demonstrate skills they have acquired, such as using digital technologies to personalize learning. Micro-credentials provide educators with recognition for discrete skills or competencies they develop throughout their careers, regardless of where or how they learn them. They are research-based, personalized, digitally enabled, and can be earned on demand within a flexible schedule. Importantly, they are more rigorous than workshops teachers attend to compile hours for licensure renewal.



Micro-credentials require demonstrations of competency and can be used by educators for their self-directed learning, and by states and school districts to upskill educators in areas of identified need. For instance, the Delaware Department of Education is working with Digital Promise, the state's schools, and higher education institutions to improve early literacy—a priority issue because of lagging performance in the area—by producing high-quality micro-credentials to help teachers improve professional practices. The same might be done for upskilling educators for the digital age. In fact, it already is—and in the context of helping teachers develop the skills to design more personalized learning activities (see "Micro-credentialing in Action" sidebar).

## Micro-credentialing in Action

The Kettle Moraine School District in Wisconsin used the Digital Promise micro-credentialing framework to guide the development of competency-based professional learning to advance district goals. In 2014, 49 staff members started working to earn micro-credentials for personalized learning. They began by taking a self-assessment of their technology proficiencies, which helped them set a baseline for professional growth. They also set goals and benchmarks for progress mapped to competencies tied to specific micro-credentials for approval by the district. To earn micro-credentials, staff needed to provide demonstrations of competence that included specific samples of their work, student work, and personal reflections, which had to be approved by at least seven of 10 reviewing teachers. This work continues today.

There are other credentialing efforts afoot to certify competencies in digitally informed, powerful instruction, in EPPs and outside of them. The University of Rhode Island, for instance, offers a graduate certificate in digital literacy for classroom teachers, librarians, college faculty, and graduate students. The International Society for Technology in Education (ISTE) has also created a credential designed to deepen and expand teacher skill sets as they apply the ISTE competencies adopted by all 50 states. During the certification process, they become prepared to model powerful practice in schools and districts and lead teacher network efforts to integrate technology into instruction effectively. The credential certifies their technology leadership, recognizes their skills, and allows them to earn graduate credit.

There are a number of providers of micro-credentials operating in the country, including Digital Promise, Bloomboard, American College of Education, and the National Education Association. Several micro-credentials related to digitally informed instruction are available from these providers. Micro-credentials are a great option for professional learning for faculty working in EPPs. For instance, the University of Colorado-Boulder's Center for Teaching and Learning has developed its own micro-credential platform for faculty, instructors of all levels, lecturers, postdoctoral scholars, graduate and professional students, and teaching staff.

State and local leaders preparing digital equity and five-year BEAD plans can explore these and other promising practices within the context of Big Play Six below.

## Big Play 6 Charge a task force to create a statewide plan to upskill the K-12 educator workforce.

Recognizing how important the educator workforce is to achieving and sustaining digital equity for all, we recommend that states establish and fund through the broadband programs of the IIJA a task force charged with creating a statewide plan for upskilling the educator workforce in K-12 and EPPs. While much of the work will be shaped by the task force itself, we suggest that state digital equity and BEAD plans set direction.

First, we suggest that these plans elevate the rationale for making upskilling the educator workforce a priority: the connection between educators' own digital competencies and the digital competencies of K-12 students, **and** the vital importance of that workforce to the achievement and sustainability of digital equity. Ultimately, digital equity and BEAD plans need to state that the aim of the effort to upskill the K-12 and EPP workforce is to ensure that K-12 graduates are equipped with the digital competencies they need to be on pathways to full participation in the economy and society of the United States.

Second, the plans should establish goals for the task force after consultation with and engagement of key stakeholders across K-12 and EPPs. These goals should be lofty and ambitious. States should consider two goals that we already suggested in this publication:

1. To revise, augment, or establish and elevate digital skill and digital use competencies for K-12 graduates, K-12 educators and faculties, and graduates of EPPs.
2. To promote the design and/or proliferation of existing professional learning opportunities powered by technology to increase the digital skill and use competencies of K-12 educators and teachers in EPPs.

To these, we would add a third:

3. To remove any policy barriers that may inhibit the proliferation of powerful professional learning designs, or create policies to enable it.

Third, state digital equity and BEAD plans should set a timeframe for the issue of a state report on upskilling the educator workforce that includes rationale, findings, and a plan to address them. Expectations should be that the plan includes goals, strategies, and an implementation timeline. We suggest that the target for completion of the report should be 12–18 months after the task force first

convenes, given the extensive stakeholder engagement strategies we propose below, the nature of the task, and to ensure there is enough time to implement the plan before the clock runs out on BEAD funding.

Fourth, state digital equity and BEAD plans should also set expectations for the composition of the task force, establishing that it be diverse and engage policymakers, K-12 and postsecondary educators and students, administrative and teacher unions and associations, school board and regional education associations, staff from state agencies, and business leadership representing a broad swath of the state, including rural communities. The task force itself will likely create subgroups to tackle specific tasks and thorny challenges, and to encourage engagement.

Fifth, plans should resource the task force with funds for staff anchored at an organization or institution trusted by educators and identified in state planning documents to coordinate and manage the process, communicate with members, engage stakeholders, lead efforts to collect data and other information, and write and disseminate the report. Operating costs should be included (e.g., a line item that allows for travel to and from rural communities for important, in-person meetings).

Sixth, plans should identify the effort as an explicit strategy to meet some of the obligations of the broadband programs to engage and coordinate with local entities.

How the work unfolds in every state that makes this big play will be different. But there are several processes and other issues we believe task forces will need to tend to as they create plans to upskill the K-12 and EPP workforces.

- **Begin with education and inspiration.** Instead of rushing into the important issues of standards, competencies, and professional learning, the task force should begin by educating and inspiring itself, exploring what is already happening to digitally transform learning in classrooms across the country, likely in pockets of each state. It is important that task force members examine and watch powerful, personalized, and project-based learning activities informed by digital technologies and learn more about edtech products, such as those powered by artificial intelligence, that enable greater personalization. They can visit K-12 and EPP classes in which powerful, digitally informed learning is taking place; talk to students, teachers, and leaders; and watch videos currently available in the field, such as the ones produced by the Modern Classroom Project (or Digital Promise). We believe engaging the task force members in this way will build their knowledge and inspire their actions.
- **Examine student academic standards before tackling standards for K-12 and EPP educators and graduates.** Because state student academic standards are the domino that eventually drops on standards for teachers and leaders in K-12 and EPPs, we suggest that the second task of the group is to ask and answer the question we raise in Big Play Four: "What exactly does a digitally competent student need to know, understand, and be able to do by the end of 12th grade and of necessity at benchmarks along the way?" Answering the question will require

the task force (or a subgroup) to examine existing standards frameworks, research, and other materials. They should also talk to and collect information from job-training programs that K-12 students move into or participate in during high school, community colleges and other institutions of higher education, business and industry leaders, and other stakeholders. Then, the task force can compare what it has learned about competencies with those that currently exist for their K-12 graduates. If the task force finds that current standards are insufficient, it can build strategies into the statewide plan to revise or augment them. At that point, the task force can move on to examinations of competencies for K-12 educators and faculty and graduates of EPPs, document what it finds, and develop strategies for revising, augmenting, or creating them to put into the state plan.

- **Conduct a landscape scan of professional learning opportunities.** While the task force is engaged in examining standards, it can simultaneously initiate an effort to understand the professional learning needs of educators, the learning opportunities that are currently available to them, and whether they are effectively building their digital skills. The landscape scan will likely require surveys of educators and focus groups. These efforts should assess current comfort levels with digital technologies, perceived abilities to use them effectively in instruction, how they are actually using the technologies available to them, and the professional supports educators believe they need and currently aren't receiving. The scan should also collect information from district-based technology officers and staff overseeing digital learning efforts, superintendents of rural school districts, and other relevant stakeholders. The scan can also expand nationally and include promising professional learning practices unfolding across the country—some of which we detail in this publication.
- **Ongoing, robust stakeholder engagement will be key to creating a plan with broad support.** Conversations with educators about standards and competencies are often difficult and can trigger fears or cause some to think, "Oh no, here we go again," after a period in which many states have recently revised standards. Undergirding the effort will need to be a fundamental commitment to ongoing engagement of stakeholders in EPPs, K-12, unions, administrator and school board associations, supporting organizations, state agencies, and others to collect and share information, elicit and act on feedback in the planning process, gather ideas from the field, share examples of promising practices, and report on progress.

  While the task force will need to synthesize data already available and issue surveys to collect additional information, it should organize opportunities for in-person or virtual focus groups with educators, discussions with EPP faculties, deans of colleges of education, and K-12 educators and leaders, including superintendents, directors of technology, digital learning specialists, and coaches, among others. As an example, the task force might convene superintendents and school leaders with EPP faculty and leadership to discuss the digital competencies that school districts would like all new hires to have and whether they do.

- **Finally, examine the policy infrastructure in the state, school districts, and EPPs.** Confirm if there are policies that promote or inhibit promising practices that are emerging for professional learning, or if new policies need to be created. For instance, if micro-credentialing proves to be an option the task force wants to pursue, it should examine whether license renewal policies need to be revised so at least some of the renewal requirements can be met by micro-credentials. Further, the task force might also consider whether there are policies at state and district levels that can be enacted to create incentives for teachers to pursue ISTE or other certifications, along the lines of the financial rewards some states and school districts pay for National Board for Professional Teaching Standards certification. The task force may also want to examine whether there are policies that need to be created to require specific digital competencies of graduates of EPPs or if there are college or university policies that make it difficult for EPP faculty to pursue learning opportunities.

We hope as many states as possible make this big play. To reiterate a point we have made across this publication, the **digital skills of educators are essential to the digital skill development of K-12 students** and consequently to the sustainability of digital equity in the years to come.

FOCUS AREA 3:

# Upskill students, parents, families, and caregivers.

While states will lead efforts to close the Digital Learning Gap, states must engage local communities—specifically rural and urban areas and the most underrepresented populations within them—and ensure they play a large role in planning and implementing the broadband programs of the IIJA. State BEAD plans, for instance, must include a description of each state's "external engagement process, demonstrating collaboration with local, regional, and Tribal (as applicable) entities, governmental and nongovernmental entities and include outreach to underrepresented communities, unions, and worker organizations." And states must undertake "specific" and "multiple" strategies that are tailored to underrepresented communities' needs.

From Digital Promise's perspective, these requirements reflect what we believe and try to center in much of our own work. In the context of this national initiative, the requirements reflect an understanding that those closest to the challenge know exactly what the barriers to their digital access and inclusion are and what solutions are likely to work. Solutions designed for and not with them, and delivered by people who live outside their communities and do not share the same obstacles, will likely not be effective.

## People from underrepresented communities may not access programs designed to increase their digital skills if they do not trust the providers or do not want to disclose they need help.

They might prefer, instead, a trusted nonprofit in their community, a recreation center, library, or a municipal program staffed by local individuals who speak their language and understand why they have needs. Similarly, programs that are designed from afar might not address barriers to digital learning that extend well beyond affordable access to broadband, devices, and digital inclusion activities but are the result of the longstanding economic and social realities of families and communities and other factors associated with living in long underserved areas of the country.

If engagement and coordination are done within the spirit and letter of the grant requirements, they will necessitate a significant outlay of resources. Multiple methods of engagement through surveys, public meetings, written communications, telephone interviews (such as the ones that Hawaii recently completed with nearly 900 of the state's residents for its Digital Literacy and Readiness Study), and even digital speed tests performed in public housing and rural communities will yield valuable information. Among the many options states can select from, some will be lighter lifts; others will carry heavier weight. The big plays we recommend are those that will be a bit heavier than holding public meetings or issuing surveys. All require coordination with trusted local entities and/or residents.

## Big Play 7 Utilize local groups to convene underrepresented populations and gather information.

The BEAD program prioritizes coordination with local government, nonprofit organizations, tribes, and others, and requires states to document their activities with them. These entities are uniquely positioned to engage with the underrepresented people they already serve in the languages they speak to collect and respond to information. Although there are numerous ways to engage local municipalities, Tribal governments, and nonprofits in data collection for BEAD plans, states can fairly immediately ask them to assemble groups of their constituents to meet the BEAD requirements for asset mapping using proven engagement strategies, such as the Asset-Based Community Development approach advocated by the Benton Institute for Broadband & Society.

Community-based organizations are also uniquely positioned to gather information on divides outside those that are digital and that inhibit the broadband programs' aspirations for digital equity for full participation in the society and economy of the United States. States should consider using mapping and other information-gathering opportunities to better understand the barriers to digital equity that are as of yet not well-documented but very real. In so doing, they will tend to an admonition from the State Planning Grant Program: "Many on the wrong side of that [digital] divide require equipment, digital skills, financial resources, and more to realize the internet's full potential. Those who lack these resources face substantial barriers to digital equity, even in places where fast broadband connections are physically available. This digital divide is particularly acute for communities of color, Tribal nations, and lower-income areas, and spans both urban and rural areas of the country."

Community-based organizations can connect with people to share their lived experiences in ways that surveys, interviews, public meetings, and outside consultants cannot. By relying on community-based engagement efforts, states can collect information on barriers to digital inclusion that we are not considering, but need to document and act on. These include obstacles related to economic and social mobility and family history within that context; physical well-being and safety; prior experiences with federal, state, and local programs designed to address their needs; social safety net capacity, food security, and a host of other issues.

The broadband programs of the IIJA provide a unique opportunity to collect information about gaps outside of digital divides that contribute to digital inequities and then act on it.

## Big Play 8 Scale up community-based efforts to develop the digital skills of students and parents/caregivers.

In September 2022, the U.S. Department of Education's Office of Educational Technology (OET) released "Advancing Digital Equity for All," a report that offers recommendations for developing effective digital equity plans. The recommendations result from a series of roundtables the Department and its partners, including Digital Promise, conducted with leaders of organizations embedded in underrepresented communities. These leaders identified a number of barriers that families and caregivers face for digital adoption in their communities. Among these are limited access to digital literacy efforts and technical supports. Without digital literacy skills, the report suggests, "when learners—particularly young learners—are using technology, their families/caregivers are unable to troubleshoot difficulties" or use district-based learning management systems and support the use of educational software.

Community-based organizations will be key to increasing access to digital literacy efforts and technical support. In fact, many already are providing these opportunities and supports to students and adults in and outside the context of K-12. Delivery of services to adults is often done in the context of their job interests. But upskilling for work also upskills adults' ability to support students' digital learning.

In communities across the country there are vital local assets that can help states meet their goals for digital inclusion. We suggest states should scale them up.

Libraries have long played a central role in the digital skill development of adults. They are delivering learning through a variety of in-person and digital approaches. The Denver Public Library, for instance, offers a wide variety of classes and workshops for computers, Microsoft Office,

video-chat, and smartphone and tablet basics, and more advanced courses in 3D printing and other technologies. It also provides a suite of video-based resources designed for people "to teach themselves technology."

The Chicago Public Library provides CyberNavigator Technology Tutors at 11 branches across the city, many of which provide services in Spanish. Participants make an appointment with a tutor by calling the branch, and they begin a program powered by more than 25 short interactive videos in English and Spanish. Participants learn computer and internet basics, including how to use email, complete online forms and applications, create documents, explore digital content, and acquire job skills.

Learning lounges are another approach libraries employ. Staffed by librarians, volunteers, or professional educators, lounges can be either virtual or physical and provide on-demand access to online or other digital resources in a comfortable environment. Those who staff lounges circulate and work with individuals or groups, helping them navigate and use digital resources to achieve their learning and employment goals.

Digital navigator programs are also upskilling adults. This new, promising community-based approach to closing equity gaps in digital access and usage in underrepresented communities took hold during the COVID-19 pandemic when more traditional in-person providers of digital skill development—principally libraries—shuttered their doors. "Digital navigators," who can be volunteers or trained part- or full-time staff, provide residents with opportunities to learn foundational digital skills through on-demand tech support one-on-one, in small group settings, or even over the phone via hotlines. Digital navigators are typically anchored at a trusted community-based organization and can accommodate the needs of families and caregivers as they support their K-12 learners at home. Digital US has compiled a suite of helpful resources that includes a playbook for digital navigator programs as well as a resource hub.

Long-embedded, trusted nonprofits and institutions are also providing opportunities for K-12 learners and adults. The Urban League and its partners provide a recent example. Urban Leagues, nonprofits, and Boys & Girls Clubs are partnering with AT&T across New York State to implement the company's New York Digital Literacy Lab initiative, designed to provide access to broadband, devices, and support after school and on weekends in community centers. In 2022, initiative partners will roll out labs in five locations, including in East Buffalo where digital divides in access and use are significant. The lab will offer students and families access to devices, high-speed broadband, and digital literacy programming.

Sometimes, assets for digital skill development appear in places we do not always suspect in the community, such as churches. In California, University AME Zion Church plays a central role in addressing the digital learning needs of its adult congregants. In the church's program, participants learn how to turn on a computer, apply for a job online, or enroll their children in schools. The church also launched a digital ministry technology team. This team of volunteers helps congregants step outside their comfort zone and learn the practical application of digital skills during weekly services.

After-school programs are also an untapped solution to closing digital divides. After-school programs are commonly operated by trusted community-based organizations serving underrepresented populations, such as LA's Best and Boys & Girls Clubs. They provide opportunities for students to develop digital tech skills in the context of exciting, often project-based learning activities. The National AfterSchool Association argues that "after-school programs are poised to help close the digital divide" and cites research that in order to close the digital gaps, after-school programming needs to extend beyond using technology to complete homework and "offer deeper learning opportunities," such as those provided by LA's Best and Boys & Girls Clubs.

We at Digital Promise recommend that states scale up what's working in local entities, some of which might be undiscovered gems. If done thoroughly in partnership with community-based organizations, state asset-mapping will uncover these programs—whether they are at libraries, nonprofit organizations, community centers, religious institutions, or in after-school programs. Where they are absent, they will need to be built.

We want to caution that local entities engaged in digital equity efforts will need more than just funding for staffing and potentially infrastructure. Research suggests that the absence of training for the locally based provision of digital-skill building is an obstacle, with library staff generally reporting that they have little time for it and a minority of others suggesting they had little interest. Nonprofit providers interviewed for the research study also suggested that training was problematic for them. And staff of after-school programs have a clear need of the training and other supports required to achieve comfort with digital technologies and their creative and engaging application. Resources are available to help, including Literacy Minnesota's Digital Navigation Training Toolkit and the National AfterSchool Association's Afterschool Tech Toolkit, which includes a module on staff training and support.

## Big Play 9 Create task forces inclusive of underrepresented communities to influence state and local plans.

Among the three big plays we suggest states make in this area, the third is perhaps the most ambitious. It challenges the more traditional practice of stakeholder engagement and aspires to deep collaborations with underrepresented communities. Through the work we have undertaken with our Center for Inclusive Innovation, Digital Promise has witnessed that change efforts in historically underrepresented communities work best and have a far better chance of taking hold if members of those communities take ownership of solutions through a process of co-creation and design.

Based on this experience, we want to underscore and expand on one of the recommended engagement strategies from the BEAD program—namely that states should consider the creation of statewide task forces or advisory boards with representatives from underrepresented communities. To this, we would add the creation of local or regional task forces in the most underserved communities to consider and advise on issues of access, affordability, and use. It is in these places where underrepresented communities can truly engage and have their voices heard as part of this major national initiative.

States can fairly immediately establish a statewide task force, if they have not already. States can also roll out local and regional task forces as part of the BEAD program to meet their engagement obligations.

As they consider the formation of these groups, states and local communities should keep in mind the following:

- **A sizable number of the people at the table** should be from underrepresented communities (we typically set 50 percent as a target). This is important because it eliminates feelings of tokenism often experienced by members of these communities and helps assure them that their voices matter as much as those of consultants, government officials, superintendents, and others with positional power who might be in the room. It also ensures that the entire group has a rich bank of knowledge of lived experience that must be taken into account if plans are to be successful. Among these participants should be parents of K-12 students, as well as representatives of K-12 leadership—perhaps two superintendents, one from a rural district and another from an urban district serving underrepresented communities.

- **The group should be facilitated** by someone with experience designing processes that establish trust and the mindset that perspectives of members of underrepresented populations have value and will become priorities. The lived experience of underrepresented communities is often that initiatives begin with a great deal of excitement about stakeholder engagement but end with their contributions on the cutting room floor.
- **All participants should be engaged as co-researchers and co-designers of solutions**. They must examine data critical to decision-making and use that data to discuss and debate strategies the groups will deploy to improve access and inclusion. Common practice is that an authority walks into the room, shares predeveloped findings, and then asks participants to respond to solutions that have been predetermined as well. Everyone needs to struggle with the data and contribute to solutions.
- **Stipends should be provided** to people from underrepresented communities. Often an obstacle to their participation is that they cannot attend meetings for financial reasons. Paying them also acknowledges that their contributions are every bit as valuable as the consultants, government officials, and others who are getting paid for their time. Paying stipends to participants from underrepresented communities is an allowable expense under the BEAD program.
- **Municipalities, school districts, or nonprofits** can serve as conveners of the local councils and should have representation on them; nonetheless, it is important that a trusted member and champion of the community has a prominent leadership role and identifies community participants. This leader can be a local pastor, a representative from a trusted local nonprofit, the proprietor of a small business, or other community member.

The broadband programs of the IIJA should not be **for** underrepresented communities; they should be **with** them, especially when it comes to solving challenges presented by divides in digital access and inclusion they know so well. The deep engagement we are proposing here is not easy, but it pays off in community ownership and results.


# Moving Forward

The United States is at a key moment in its history. Its economy and society are rapidly digitizing. At the same time, far too many Americans cannot fully participate in that economy and society because they don't have access to broadband or devices, or they have too few digital skills. Whether they are age 10, in elementary school and living in public housing; age 40, in a low-income, one-wage family and employed at a distribution center; or age 70 and miles away from the nearest doctor, they are not able to do what so many in more affluent, connected communities take for granted. The IIJA provides a unique and historic opportunity to bring everyone greater digital equity and fuller participation in American life.

This publication argues that to achieve the vision of the broadband programs of the IIJA, states need to prioritize K-12 education—that it is the enterprise that will sustain gains states make in digital equity and inclusion—and that K-12 educators need to be skilled digital users to build the digital skills of the American populace. It argues that there are infrastructure issues that will require constant attention to ensure we permanently close the homework gap and enable more powerful, personalized models of learning. And it argues that states will need to deeply engage underrepresented communities and the organizations that know and serve them to develop and implement solutions that work.

Digital Promise is an organization that focuses on education, which is why this publication addresses that enterprise. We understand that while K-12 education is essential to digital equity efforts, there are other sectors that state and local planners must tend to. We also acknowledge that we have not addressed other issues directly affecting educators and their capacities to design and facilitate powerful learning activities using technology as a tool. These are issues that we will take up in a second publication scheduled for release in early 2023.

Focused on the "digital transformation of learning," the publication will aspire to a day when we do not think of edtech and education as explicit domains, but rather one and the same, with students at the center, with educators as skilled and empowered facilitators of learning, and with systems engineered to take advantage of new technologies and effective pedagogy to close historic gaps in achievement and postsecondary completion.

The digital transformation of learning in and out of school is not the matter at hand now, however. State and local leaders and their partners have their hands full making plans to build out infrastructure for and develop the digital capacities of the underrepresented populations of the country. These are big lifts.

We wish state and local digital equity and BEAD planners great success. Let us hope that decades from now, as we contemplate the impact of the broadband programs of the IIJA, we share the same sense of accomplishment President Eisenhower had as he reflected on the legacy of the nation's interstate highway system that resulted from another massive national investment. He believed it changed the face of America, opened up rural areas of the country, transformed and powered the economy, and made life better for us all.

Similarly, we have the chance to change the face of the country and open up disconnected parts of America to greater opportunity by building physical and virtual onramps to the internet highway, again making life better for us all. And we have the responsibility to ensure that generations from now those onramps still exist, alongside the interstate highway system that remains nearly 70 years after America took on another tough challenge and built it.

As a nation, we know we can rise to the occasion.

# References


"2019 State of the States." Education Superhighway. Accessed September 28, 2022. https://stateofthestates.educationsuperhighway.org/?postalCd=VA#national.

Ali, T., et. al. Looking back, looking forward: What it will take to permanently close the K–12 digital divide (2021). San Francisco, CA: Common Sense Media. Accessed September 28, 2022. https://www.commonsensemedia.org/sites/default/files/research/report/final_-_what_it_will_take_to_permanently_close_the_k-12_digital_divide_vfeb3.pdf.

"Applying a racial equity lens to digital literacy: How workers of color are affected by digital skill gaps." National Skills Coalition. Accessed September 28, 2022. https://nationalskillscoalition.org/wp-content/uploads/2020/12/Digital-Skills-Racial-Equity-Final.pdf.

Barbara Bush Foundation for Family Literacy, and Digital Promise, eds. Publication. Promoting Digital Literacy for Adult Learners: A Resource Guide, 2022. https://www.barbarabush.org/wp-content/uploads/2022/04/Digital-Literacy-Resource-Guide-for-Adult-Learners-.pdf.

Bergson-Shilcock, Amanda. "The New Landscape of Digital Literacy" National Skills Coalition, 2020. Accessed September 28, 2022. https://nationalskillscoalition.org/wp-content/uploads/2020/12/05-20-2020-NSC-New-Landscape-of-Digital-Literacy.pdf.

Bestsennyy, Oleg et. al. "Telehealth: A quarter-trillion-dollar post-COVID-19 reality?" McKinsey & Company, July 9, 2021. Accessed September 28, 2022. https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/telehealth-a-quarter-trillion-dollar-post-covid-19-reality.

"Building Skills and Literacy for Equitable Advancement." EdTech Center. World Education. Accessed September 28, 2022. https://edtech.worlded.org/our-work/draw/.

Cacicio, Sarah, and Lorena Cuffy. "Boosting Digital Literacies for a Purpose." Digital Promise, May 13, 2022. Accessed October 3, 2022. https://digitalpromise.org/2019/08/07/boosting-digital-literacies-for-a-purpose/.

Calabrese, Michael, Raul Katz, and Matthew Marcus. Connect all students: How states and school districts can close the digital divide (2020). San Francisco, CA: Common Sense Media. Accessed September 29. 2022. https://www.commonsensemedia.org/sites/default/files/featured-content/files/common_sense_media_partner_report_final.pdf.

Calabrese, Michael and Matthew Marcus. "The 'To and Through' Opportunity: Case Studies of School and Community Networks Able to Close the Homework Gap for Good." Open Technology Institute, August 2022. Accessed September 29, 2022. https://newamericadotorg.s3.amazonaws.com/documents/Anchor-Nets-Case-Studies-comp4.pdf.

Capka, J. Richard. "Celebrating 50 Years: The Eisenhower Interstate Highway System." U.S. Department of Transportation, June 27, 2006. Accessed September 28, 2022. https://www.transportation.gov/testimony/celebrating-50-years-eisenhower-interstate-highway-system.

Center for Digital Government Research. The Key to Closing the Homework Gap for Good: Building Broadband 'To-and-Through' Anchor Institutions (2022). Accessed September 29, 2022. https://www.newamerica.org/oti/policy-papers/the-to-and-through-opportunity/.

Center for Strategic Initiatives. Sustaining Progress in Access and Equity: EdTech Strategic Planning Guide. Massachusetts Department of Elementary and Secondary Education, 2021. Malden, MA. https://www.doe.mass.edu/edtech/edtech-guidance.pdf.

Chamberlain, Kendra. "2020 Report: Municipal Broadband is Roadblocked Or Outlawed in 22 States." Broadband Now, December 7, 2021. Accessed September 29, 2022. https://broadbandnow.com/report/municipal-broadband-roadblocks-2020/.

Chandra, S., et. al. Connect all students: How states and school districts can close the digital divide (2020). San Francisco, CA: Common Sense Media. Accessed September 29. 2022. https://www.commonsensemedia.org/sites/default/files/featured-content/files/common_sense_media_partner_report_final.pdf.

Common Sense. Federal Broadband Funding Opportunities. Accessed September 28, 2022. https://d2e111jq13me73.cloudfront.net/sites/default/files/featured-content/files/federal_broadband_funding_guide.pdf.

Council on Graduate Medical Education. Special Needs in Rural America: Implications for Healthcare Workforce Education, Training, and Practice (2020). Accessed September 28, 2022. https://www.hrsa.gov/sites/default/files/hrsa/advisory-committees/graduate-medical-edu/publications/cogme-rural-health-policy-brief.pdf.

de Brey, C. et. al. Status and Trends in the Education of Racial and Ethnic Groups 2018 (NCES 2019-038). U.S. Department of Education. Washington, DC: National Center for Education Statistics. Accessed September 28, 2022. https://nces.ed.gov/pubs2019/2019038.pdf.pubsearch/.

Detlor, Ph.D., Brian, Heidi Julien, Ph.D., Tara La Rose, Ph.D., and Alexander Serenko, Ph.D. Working paper. Local Community Digital Literacy Training: An Exploratory Investigation of Digital Literacy Training Programs Led by Public Libraries and Other Local Community Organizations. McMaster Digital Transformation Research Center, 2020. https://macsphere.mcmaster.ca/bitstream/11375/25935/6/Working%20Paper%20102%20-%20Local%20Community%20Digital%20Literacy%20Training.pdf.

"The Digital Navigator Playbook." Digital US. Accessed September 29, 2022. https://digitalus.org/digital-navigator-playbook/.

Dubow, Tabitha, Axelle Devaux, and Catriona Manville. "Civic Engagement: How Can Digital Technology Encourage Greater Engagement in Civil Society?" Rand Corporation, 2017. Accessed September 28, 2022. https://www.rand.org/pubs/perspectives/PE253.html.

"EPPs for Digital Equity and Transformation." International Society for Technology Education. Accessed September 29. 2022. https://iste.org/EPP-pledge?_ga=2.263998412.1164263657.1662205019-850601926.1660150961.

Gallardo, Robert, Sharon Strover, and Brian Whitacre. "Does rural broadband impact jobs and income? Evidence from spatial and first-differenced regressions," The Annals of Regional Science Volume 53(3) (2014): 649-670. Accessed September 28, 2022. https://www.researchgate.net/publication/272008852_Does_rural_broadband_impact_jobs_and_income_Evidence_from_spatial_and_first-differenced_regressions.

"Getting a BEAD on Community Asset Mapping." Benton Institute for Broadband & Society. August 25, 2022. https://www.benton.org/blog/getting-bead-community-asset-mapping.

Goedde, Lutz et. al. "Agriculture's connected future: How technology can yield new growth." McKinsey & Company, October 2020. Accessed September 28, 2022. https://www.mckinsey.com/~/media/mckinsey/industries/agriculture/our%20insights/agricultures%20connected%20future%20how%20technology%20can%20yield%20new%20growth/agricultures-connected-future-how-technology-can-yield-new-growth-f.pdf?shouldIndex=false.

Goodman, Madeline, Anita M. Sands, and Richard J. Coley. "America's Skills Challenge: Millennials and the Future." Educational Testing Service, 2015. Accessed September 28, 2022. https://www.ets.org/research/policy_research_reports/publications/publication/2015/jtwh.html.

Gray, L., and Lewis, L. Use of Educational Technology for Instruction in Public Schools: 2019–20 (NCES 2021-017). U.S. Department of Education. Washington, DC: National Center for Education Statistics. Accessed September 28. 2022. https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2021017.

Hampton, K. N. et. al. "Broadband and Student Performance Gaps." James H. and Mary B. Quello Center, Michigan State University, March 3, 2020. Accessed September 28, 2022. https://doi.org/10.25335/BZGY-3V91.

Holland, Beth, and The Learning Accelerator team. "From Digital Access to Digital Equity: Critical Barriers That Leaders and Policymakers Must Address to Move Beyond 'Boxes & Wires.'" The Learning Accelerator, July 2022. Accessed September 28. 2022. https://docs.google.com/document/d/10ZLRUEtyZD58Xfc6x8_EEFI9iXojUHz-kfOzeqxMHxo/edit?rm=minimal#heading=h.b2g812qv93q6.

Iglehart, John K. "The Challenging Quest to Improve Rural Healthcare." The New England Journal of Medicine, February 1, 2018. Accessed September 28, 2022. https://www.nejm.org/doi/full/10.1056/NEJMhpr1707176.

Katz, Raul. "The 'To and Through' Opportunity: An Economic Analysis of Options to Extend Affordable Broadband to Students and Households via Anchor Institutions." Telecom Advisory Services LLC, August 2022. Accessed September 29, 2022. https://newamericadotorg.s3.amazonaws.com/documents/Off-Campus-Deployment-Economic-Assessment-final.pdf.

Melore, Chris. "'Digital religion' is sparking a 'spiritual revolution' among millennials." Study Finds, July 27, 2022. Accessed September 28, 2022. https://studyfinds.org/digital-religion-millennials/.

Muro, Mark et. al. "Digitization and the American Workforce." Metropolitan Policy Program at Brookings, November 2017. Accessed September 28, 2022. https://www.brookings.edu/wp-content/uploads/2017/11/mpp_2017nov15_digitalization_full_report.pdf.

"New technologies and digitalization are transforming agriculture and offering new opportunities to improve policy." The Organization for Economic Co-operation and Development. Accessed September 28, 2022. https://www.oecd.org/agriculture/topics/technology-and-digital-agriculture/.

Office of Educational Technology. Home Access Playbook: Strategies for State Leaders Working to Bridge the Digital Divide for Students (2021). Accessed September 28, 2022. https://tech.ed.gov/files/2021/07/Home-Access-Playbook.pdf.

Office of Educational Technology. Reimagining the Role of Technology in Education: 2017 National Education Technology Plan Update (2017). Accessed September 28, 2022. https://tech.ed.gov/files/2017/01/NETP17.pdf.

Rimes, Ben. "Every Common Core Standard Related to Technology and Digital Media." Mattawan, October 27, 2015. Accessed October 3, 2022. https://docs.google.com/document/d/1-5el3aJjDd9j0WlJGA2gdtKQ8jwwuOCP98vx5zzJl6s/edit#!

Rosenworcel, Jessica. "Addressing the Homework Gap." Federal Communications Commission, February 1, 2021. Accessed September 28, 2022. https://www.fcc.gov/news-events/notes/2021/02/01/addressing-homework-gap.

Russell, Christina A. Rep. Empowering Afterschool Professionals for Digital Learning. National Afterschool Association with support from Google, 2017. Accessed September 28, 2022. https://indd.adobe.com/view/a2a6e485-190a-458f-90e7-17fd9c2b38f9.

Schools, Health & Libraries Broadband Coalition. To and Through Anchors: A Strategy to Connect Rural Communities (2018). Accessed September 29, 2022. https://www.shlb.org/uploads/Policy/Infrastructure/SHLB_ToAndThrough_Overview.pdf.

State of Hawai'i Department of Labor & Industrial Relations. Hawai'i Digital Literacy & Readiness Study (2021). Accessed September 29, 2022. https://labor.hawaii.gov/wdc/files/2021/11/Final-Statewide-Digital-Literacy-Survey-Report-from-Omnitrak-11.15.2021.pdf.

Stone, Lisa Cacari et. al. "State health disparities research in Rural America: Gaps and future directions in an era of COVID-19." The Journal of Rural Health Volume 37 (2021): Accessed September 28. 2022. https://doi.org/10.1111/jrh.12562.

"Teaching." Office of Educational Technology, June 12, 2020. Accessed September 28, 2022. https://tech.ed.gov/netp/teaching.

"Technology Sustainability Toolkit." Verizon Innovative Learning Schools, July 11, 2022. Accessed October 3, 2022. https://verizon.digitalpromise.org/sustainability-toolkit.

"Telehealth in Rural Communities: How CDC Develops Programs That Deliver Care in New Ways." Centers for Disease Control and Prevention, September 8, 2022. Accessed September 28, 2022. https://www.cdc.gov/chronicdisease/resources/publications/factsheets/telehealth-in-rural-communities.htm.

Tooley, Melissa and Hood, Joseph. "Harnessing Micro-credentials for Teacher Growth: A Model State Policy Guide. New America, Washington D.C. Accessed September 28, 2022. Harnessing Micro-credentials for Teacher Growth: A Model State Policy Guide (newamerica.org).

U.S. Bureau of Labor Statistics. "Employment in STEM occupations," Table 1.11, Employment Projections (September 8, 222). Accessed September 28, 2022. https://www.bls.gov/emp/tables/stem-employment.htm.

Vogels, Emily A. "Some digital divides persist between rural, urban and suburban America." Pew Research Center, August 19, 2021. Accessed September 28, 2022. https://www.pewresearch.org/fact-tank/2021/08/19/some-digital-divides-persist-between-rural-urban-and-suburban-america/.

Warner, Gina. "Afterschool Programs: A Solution to Technology Access and Learning for Young People." Professional Development. National AfterSchool Association, December 18, 2017. Accessed October 3, 2022. https://naaweb.org/professional-development/item/784-afterschool-programs-a-solution-to-technology-access-and-learning-for-young-peop