A GUIDEBOOK FOR SUCCESS:
STRATEGIES FOR IMPLEMENTING PERSONALIZED LEARNING IN RURAL SCHOOLS

April 2017

FUTURE READY SCHOOLS®
PREPARING STUDENTS FOR SUCCESS

A PROJECT OF THE ALLIANCE FOR EXCELLENT EDUCATION

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Acknowledgments

This guidebook was developed for Future Ready Schools®, a project of the ***Alliance for Excellent Education****, with assistance from* ***Bellwether Education Partners*** *and sponsorship by* ***AASA, the School Superintendents Association,*** *and the* ***National Rural Education Association (NREA)****.*

The ***Alliance for Excellent Education*** *(the Alliance) is a Washington, DC–based national policy, practice, and advocacy organization dedicated to ensuring that all students, particularly those who are traditionally underserved, graduate from high school ready for success in college, a career, and citizenship. During 2015, the Alliance created FRS as a separate project under its umbrella to help school districts develop comprehensive plans to achieve successful student learning outcomes by (1) transforming instructional pedagogy and practice while (2) simultaneously leveraging technology to personalize learning in the classroom.* ***www.all4ed.org*** ***www.futureready.org***

Bellwether Education Partners *is a national, nonpartisan nonprofit organization of more than fifty professionals dedicated to helping education organizations become more effective in their work and achieve dramatic results, especially for the most underserved students.* ***www.bellwethereducation.org***

AASA, the School Superintendents Association*, advocates for the highest quality public education for all students, and develops and supports school system leaders. Founded in 1865, AASA is the professional organization for more than 13,000 educational leaders in the United States and throughout the world. Members range from chief executive officers, superintendents and senior level school administrators to cabinet members, professors and aspiring school system leaders. AASA members advance the goals of public education and champion children's causes in their districts and nationwide. In addition, AASA members set the pace for academic achievement. They help shape policy, oversee its implementation, and represent school districts to the public at large.* ***www.aasa.org***

The ***National Rural Education Association (NREA)*** *is the voice of all rural schools and rural communities across the United States. Originally founded as the Department of Rural Education in 1907, it is the oldest established national organization of its kind in the United States. Through the years, the NREA has evolved as a strong and respected organization of rural school administrators, teachers, board members, regional service agency personnel, researchers, business and industry representatives, and others interested in maintaining the vitality of rural school systems across the country.* ***www.nrea.net***

Deer Isle, a remote fishing village off the coast of Maine, is home to approximately 2,400 residents.[1] About 110 students attend Deer Isle–Stonington High School (DISHS).[2] In 2009, just 58 percent of them graduated—the worst high school graduation rate in the state. School leaders noted that students did not lack ability or industriousness, as demonstrated by students' lives outside of school in this tight-knit community. The school simply was not doing enough to engage students and make their learning experiences meaningful and relevant. "Our students were inquisitive and hardworking just not when they walked through our doors during the school day," explains DISHS principal Todd West.

Five years later, 91 percent of DISHS students earned a diploma. Only three students from the Class of 2014 dropped out, compared to seventeen in 2009. "Our current tenth-grade class came in with a reputation of being a really bad class," says West. "In seventh and eighth grade, those kids would say they would drop out at age sixteen. And their parents were scared to death.... All those kids are now still in school."

What catalyzed such a dramatic improvement in DISHS's graduation rate? In 2010, a team of DISHS staff members, teachers, and community members embraced personalized learning as part of a schoolwide improvement plan. The plan included deliberate efforts to help students pass their classes and formalize teacher collaboration. But most importantly, the team reimagined the high school curriculum, creating a marine studies academic pathway. This pathway forges direct connections between the classroom and students' interests and bridges the gap between academics and the community's main industry—lobstering. Students can take up to 75 percent of their core curriculum requirements in this pathway, exploring traditional academic topics through marine themes. They learn algebra and geometry, for example, through boat building and maritime navigation. The learning primarily is project-based and emphasizes real-world experiences in the community and on the water.

What Is Personalized Learning?

Personalized learning is a student-centered approach designed to help all students develop a set of skills collectively known as the deeper learning competencies. These skills include thinking critically, using knowledge and information to solve complex problems, working collaboratively, communicating effectively, learning how to learn, and developing academic mindsets.

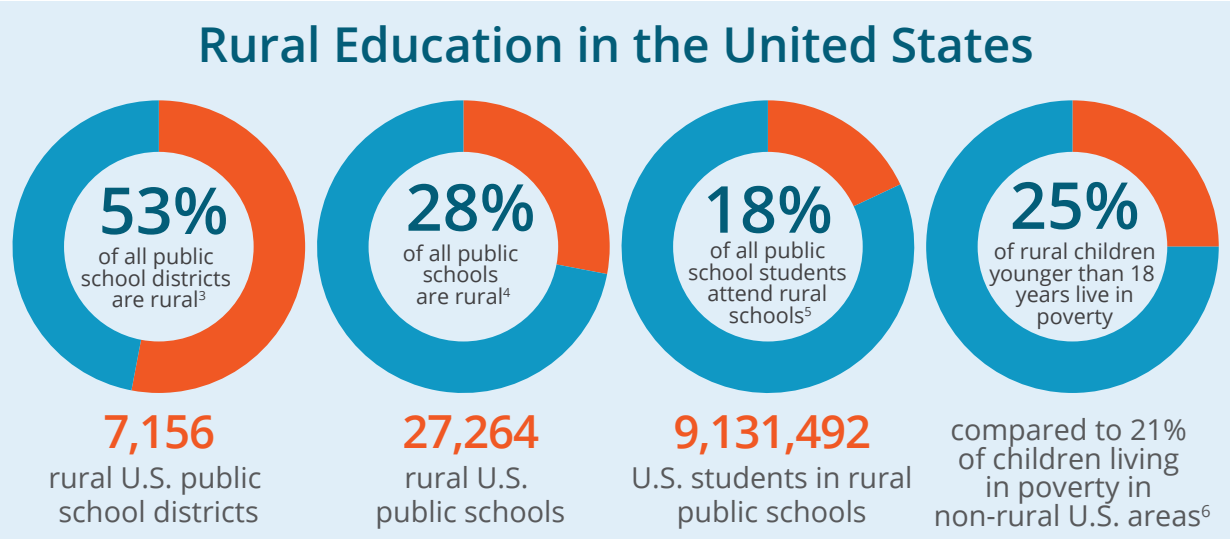
Under a personalized learning approach, teachers, school staff members, and as appropriate, other adults

- develop caring and trusting relationships with their students who, because of these relationships, are more engaged in their education and put more effort into their school work;
- connect the curriculum to students' interests, strengths, and aspirations;
- provide students with tools to monitor their progress in mastering critical knowledge and skills, enabling them to take greater ownership of their learning;
- provide students with targeted instruction, practice, and support in areas where they are struggling, while ensuring they learn challenging academic content and skills;
- create more flexible learning environments, incorporating multiple instructional approaches and the effective use of technology; and
- connect learning to real-world applications.

The shift to personalized learning—a model where students' interests drive instructional decisions—helped DISHS better meet the academic and real-world needs of its students. The success experienced in Deer Isle demonstrates the promise of personalized learning to address some of the unique challenges facing rural schools.

Why Personalized Learning in Rural Schools?

To date, personalized learning primarily has been an urban phenomenon, but this model holds promise for rural schools to address needs common across geographies and those unique to the rural context.



Personalized learning provides opportunities for students that often are not available in many rural districts. With its focus on individual learning and the use of emerging technologies, personalized learning helps to transcend many of the limitations confronting rural students such as geography and limited course opportunity and access. Districts that have embraced personalized learning have seen success by focusing on opportunity and the needs of students, instead of barriers that in the past have limited access to quality academic programs. Personalized learning is helping to reduce the opportunity gap that often restricts student learning in rural school districts.

Although rural schools and districts continue to face teacher and administrator recruitment issues, personalized learning provides students in rural communities with access to the same relevant learning experiences as students in large school districts with more specialized teachers and programs, and expands access to course work that supports students' goals for college, a career, and life.

Personalized learning provides rural schools an opportunity to capitalize on their assets to drive improved outcomes for students. For instance, rural schools often are the center of a community, drawing together neighbors for sporting events or local activities, and serving as a gathering place for young and old. Rural schools also often are the primary major government agency in a community, serving as a connection point to health and other social services. Rural school districts frequently are one of the largest employers in a community. This deep community integration fosters a culture of strong personal relationships and trust among teachers, students, and families.

When implemented with fidelity and purpose, personalized learning maximizes these relationships to support teachers in tailoring lessons and learning activities for individual students, tapping students' interests and passions to increase classroom engagement and success.

As the Deer Isle example shows, personalized learning can support rural schools in creating meaningful classroom experiences that connect to real-life opportunities in the community. Technology can be useful in these endeavors as well by supporting educators in meeting individual student needs, accessing varied course work and learning opportunities, and connecting students with resources beyond their immediate communities to spark interest and make learning relevant and meaningful.

The benefits of improved student engagement and learning benefit any school anywhere; but personalized learning has the potential to help rural schools tackle persistent challenges that too often characterize their unique context.

Unique Challenges of Rural Schools

The challenges facing rural schools manifest in a complicated set of student outcomes. On one hand, student achievement among students in rural schools can be compared to those students attending schools elsewhere. Students in rural schools outperform their urban peers on the National Assessment of Educational Progress (NAEP), a trend mirrored on some state assessments as well.[7] However, overall NAEP proficiency rates remain low among students in rural schools, as is the case across community types.[8]

Rural schools also boast higher high school graduation rates than urban schools.[9] Yet, despite comparable or better academic outcomes in high school, far fewer graduates from rural schools go to college. Only about one-third of students in rural schools matriculate to a postsecondary institution compared to about half of students in urban communities.[10]

This seeming paradox likely is influenced by several factors, including economic disadvantage, lower levels of educational attainment among adults from rural areas, earlier marriage, and strong ties to the community among students in rural schools that discourage them from leaving to further their education.[11] But with an increasing proportion of jobs requiring at least some postsecondary training, the low rate of participation in education beyond high school threatens economic stability for rural high school graduates and poses a challenge for rural communities.

Admittedly, troubling student outcomes and increasing pressure to prepare students for more rigorous postsecondary training and education are not exclusive to rural schools. However, rural schools face some unique practical constraints to addressing these challenges, largely as a result of their geographic isolation.

For one, human capital is a perennial challenge for rural schools. Rural communities often have difficulty attracting and retaining high-quality talent, as the isolation from population centers and cultural amenities and long commute times are barriers for many applicants. As a result, many teachers in rural areas take on multiple subjects and grades, resulting in a lower likelihood that teachers have the relevant certification in all of their subjects.[12] Rural schools especially struggle to hire teachers to fill positions in science, technology, engineering, and math—subjects crucial to preparing students for the twenty-first century. Moreover, rural schools and budgets may be unable to justify hiring teachers for highly specialized or very advanced courses that may be relevant for only a handful of students. These practical constraints translate to fewer opportunities for students in rural schools to engage in advanced course work and to explore as wide a range of subjects and experiences as their peers in more urban areas.

Second, rural school districts also face challenges related to funding, shared resources, and long travel times. Most state school funding systems allocate funds to districts based primarily on the number of students the district serves. Although some states adjust funding to offset the inherent disadvantage this system creates for small and rural schools, rural school budgets often are tight. The cost of shared resources that schools in more populated areas spread among more schools and students suffer from diseconomies of scale in rural communities. School transportation provides a prime example. In sparsely populated communities, buses often run long routes to serve relatively few students. The inefficiency of long travel times with relatively few riders means that rural school districts spend a higher proportion of their total budgets on transportation compared to districts in nonrural areas.[13] In addition, these long bus rides to and from school infringe on students' and families' time for non-school activities.

To address these and other challenges, some leaders in rural areas have turned to technology to expand options for students, particularly through online courses or distance learning. But to date, few rural schools have integrated technology fully and adopted a holistic, integrated, and personalized learning model. Some of this lag results from struggles among many rural schools and communities to keep up with changing technology. Wireless connection speeds tend to be slow, schools often lack enough devices to serve students,[14] and only about half of students in rural schools have broadband access at home (compared to 67 percent and 70 percent of students in urban and suburban communities, respectively). These barriers make it difficult for schools and teachers to leverage online platforms and other internet-based technologies that support students' learning.

Implementing Personalized Learning

Future Ready Schools® (FRS) can help rural districts overcome these challenges. FRS has developed a research-based framework and five-step planning process to guide schools and districts as they transition to a personalized learning model centered on individual student learning and facilitated by innovative instruction accelerated by the smart integration of technology. The framework breaks the components of a holistic, integrated, personalized instructional model into seven "gears," or categories of work, listed below and on the next page. Meanwhile, the planning process flexibly guides districts as they assess their readiness for personalized learning and develop and implement their personalized learning plans, allowing district leaders to customize and adapt the steps to suit their specific needs. When these plans align with all seven gears effectively, a district is prepared to implement a personalized digital learning model successfully.

FRS Gears

1. **Curriculum, Instruction, and Assessment:** Teachers customize instruction, content, and assessment on a student-to-student basis to ensure mastery.

2. **Personalized Professional Learning:** Through technology and digital learning, educators access professional resources and learning opportunities that can lead to improvements in their students' academic success.

3. **Budget and Resources:** Districts align their budgets with personalized learning priorities including ongoing support for quality technology and infrastructure.

4. **Community Partnerships:** Schools and districts partner with local businesses and industries to advance the school's learning goals.

5. **Data and Privacy:** Districts and schools establish policies and procedures for collecting, analyzing, storing, and reporting student data that ensure student privacy and data security.

6. **Robust Infrastructure:** Teachers embrace technology and online platforms to access tools, resources, data, and systems necessary to tailor student learning.

7. **Use of Space and Time**: Through technology and a new approach to classroom structure, teachers and schools leverage in-school and out-of-school time to meet the needs of individual learners.

The FRS Framework in the Rural Context

Innovations in education often manifest differently in different contexts. Personalized learning is no different, and state and local leaders may need to consider ways the seven gears in the FRS personalized learning framework look different in a rural community than they would in a suburban or urban community. School leaders in rural areas should feel empowered to adjust and adapt the gears as they see fit to best meet the needs of their students, staff members, and communities.

This guidebook offers a gear-by-gear analysis of the FRS personalized learning framework, including a definition of each gear and relevant strategies to support implementation in rural schools. While there are unique considerations for each gear, two strategies are critically important to supporting personalized learning implementation across all gears:

1. **District leaders must develop and communicate a clear vision and plan of action** for transitioning to a personalized learning model. Because rural schools often serve as the heart of their communities, changes to long-standing norms and traditions and tradeoffs tied to investments in innovation and change must be vetted and embraced by the community. Clearly communicating articulated goals and a rationale for significant change early and often will engage communities and build buy-in among staff members, students, families, and the community.

2. **Rural district leaders should pursue partnerships with other FRS districts** to share knowledge and expertise and capitalize on economies of scale to command better prices for large purchases of materials, technology, and other resources.

In addition, state-level governments and departments of education can be powerful allies for rural districts undertaking personalized learning. States can provide start-up grants, one-time investments of funds for purchasing technology or other resources, and/or ongoing funds to support implementation. These dollars can provide a critical influx of capital to enable rural districts to embrace personalized learning fully. States also can facilitate partnerships among rural districts, connecting schools and districts aiming to merge buying power and creating forums for communities of practice.

FRS State Leadership Programs

State leadership is critical to ensuring success of personalized learning. FRS's state programs offers state-level resources, communications strategies, and networking opportunities for state leaders as they support districts in meeting their personalized learning goals. For example, the **Wyoming Department of Education's** digital learning and support team helps the state's school districts take advantage of technology both in the classroom and through virtual learning platforms. The state developed a digital learning plan for School Years 2017 through 2021.[15]

The **Indiana Department of Education** (IDOE) has been pursuing digital learning since 2009. IDOE's Office of eLearning provides programs and professional learning opportunities to support teachers and enhance student learning.[16]

Curriculum, Instruction, and Assessment

A foundational component of personalized learning is a flexible, consistent, and customized approach to designing curriculum, instruction, and assessment that

- provides students with multiple sources of high-quality academic content to facilitate critical thinking, deep understanding, and mastery of content and skills;
- provides teachers with adaptive tools to allow them to customize instruction for groups and individual students based on students' individual needs and levels of mastery;
- leverages technology both to enhance and customize instruction and to facilitate the collection and use of data for diagnostic, formative, and summative assessment; and
- engages in data-driven decisionmaking around instructional design.

Unique Assets in Rural Contexts

The small size of many rural schools often fosters a deep sense of community where teachers form personal relationships with individual students and their families. Because of this, teachers in rural areas often already capitalize on these relationships in less formal ways to tailor instruction to meet individual students' needs. As a result, the leap to systematically collecting data on student learning and customizing instruction may not be as big as it may first seem. With fewer students, teachers have fewer data points to collect and track, easing the transition to providing each student with a unique, tailored curriculum that meets his or her learning needs.

Barriers to Implementation in Rural Contexts

Re-orienting curriculum, instruction, and assessment to reflect the level of customization and integrated use of technology required to implement personalized learning is a heavy lift generally, and even more so for rural schools where members of small staffs already often play multiple roles. Human capital constraints in rural schools present significant challenges to managing what amounts to a fundamental shift in the way teachers work.

Teachers and staff members may have limited capacity to dedicate additional time and energy to selecting and learning new curricular resources, tools, and methods and engaging in professional development about them. Rural schools also may struggle to connect educators with high-quality professional development opportunities related to personalized learning and classroom technology implementation.

Strategies for Implementation in Rural Schools

Leaders in rural areas must take time to articulate a clear rationale and goals for changes to their curriculum and assessment practices. They also must identify opportunities for partnerships and collaboration with other districts. Strategies that can help local leaders navigate time and capacity constraints include the following:

- **Adopt an extended timeline for implementation.** An extended timeline could include a dedicated pre-implementation planning period and phasing in implementation over time, perhaps beginning with a subset of grades or a cohort of students.
- **Create and protect time for staff members to learn, adapt, and collaborate on the new approach.** Release time is a precious commodity in all schools, particularly in rural schools where staff members frequently wear multiple hats. Creating time and space for teachers to collaborate, learn, and adapt to new instructional methods and materials is essential to successful implementation and should be considered as a vital component of the implementation timeline.
- **Select new materials and resources carefully to ensure alignment with program goals and capacity for support.** New curricular resources and instructional materials should align closely with the vision and goals of the personalized learning model, needs of students, and needs of teachers. Engaging teachers in product selection can help ensure this alignment and create ownership for their use. School leaders also should consider the short- and long-term costs for supporting curricular materials and resources through training, updates, and technology to guide purchasing decisions.
- **Utilize varied and innovative professional development models.** Models include supporting teacher collaboration and sharing knowledge, identifying and supporting staff members to serve as personalized learning leaders and coaches, and supporting teachers in earning micro-credentials to bolster in-house expertise.[17] An innovative approach to professional development

can help rural schools access the knowledge and skills necessary to support shifts in teachers' curriculum, instruction, and assessment. For additional strategies related to teachers' professional development, see the next section of this guidebook, Personalized Professional Learning.

Resources: Curriculum, Instruction, and Assessment

- *1:1 Change Management Guide*: Developed by the Hawaii Department of Education, this guide offers a starting point for district and school staff members as they plan for a shift to 1:1 technology, where every student receives a device for individualized learning.
- National Writing Project Digital Is: This website contains resources, reflections, inquiries, and stories about what it means to teach writing in a digitally connected world, with a focus on digital literacy.
- *Developing a System of Micro-credentials: Supporting Deeper Learning in the Classroom*: This report explores a set of forty educator micro-credentials that recognize educators who have developed the competencies necessary to support deeper learning in their classrooms.

Personalized Professional Learning

Through online professional development opportunities, educators connect with professionals in districts across their state and the country, gaining access to a broad network of ideas and strategies to help their students succeed. Because digital learning offers a broad range of opportunities for professional development, educators must develop a shared ownership and responsibility for their own growth and proactively seek out opportunities to learn.

Unique Assets in Rural Contexts

Small rural schools with fewer students and smaller staffs, may have an easier time identifying issues that impact the whole school and engaging all staff members in professional development to address that set of issues. It also may be easier for school leaders to foster teamwork within a small staff, where everyone knows each other and works closely with one another on a regular basis, both at work and in the broader community.

Barriers to Implementation in Rural Contexts

Technology infrastructure—in particular, access to high-speed internet—is the major barrier rural schools face in implementing this gear. Without fast, reliable access to online platforms, teachers will have difficulty taking advantage of virtual professional learning communities, modules, and platforms.

In addition, rural schools with high rates of teacher turnover will have a difficult time benefiting from investments in professional learning. When teachers leave, the benefits of professional development for students are not sustained. While this is not a challenge unique to rural areas, the small staff size of rural schools means fewer teachers hold and can transfer the knowledge and skills gleaned from professional learning and turnover may be even more disruptive than in larger school contexts.

Strategies for Implementation in Rural Schools

There are several strategies state and district leaders can use to support rural schools in implementing personalized professional learning:

- **Provide additional teacher support.** Providing substitute teachers or leave time makes it possible for teachers to participate in professional development opportunities.

- **Embrace nontraditional forms of professional development.** The same technology platforms that expand opportunities for instruction for students can facilitate professional learning for teachers. Teachers can access professional development online and partner virtually with mentors and instructional coaches for individualized instruction and support. They also can access professional development opportunities through podcasts, networks of professional learning through social media, and other online tools.

- **Address barriers related to infrastructure.** For more information related to addressing infrastructure needs, see the section Robust Infrastructure later in this guidebook.

- **Take advantage of local professional development opportunities.** Edcamp,[18] for example, offers free, participant-driven professional learning opportunities across the nation and the world.

Resources: Personalized Professional Learning

- *Teaching in the Connected Learning Classroom*: This book is a collection of examples of practice that teachers have shared online through the National Writing Project.
- *Culture Shift: Teaching in a Learner-Centered Environment Powered by Digital Learning*: This report outlines the primary components of a learner-centered environment, the role of the teacher, and the importance of professional learning for teachers.
- *Professional Development Modules and Courses*: Developed by Student Achievement Partners, these modules provide professional learning opportunities for teachers on topics related to the Common Core State Standards.

Budget and Resources

Funding a holistic personalized digital learning model requires strategic short- and long-term budgeting. The purchase of devices likely will come at a significant upfront cost and districts must be prepared to maintain these devices over time so they continue to benefit students. Districts must develop a financial model that includes the metrics and processes to determine both total cost of ownership for developing and sustaining a quality digital environment and to ensure accountability for determining the return on investment.

Implemented well, digital learning may improve the efficiency of teaching and learning and create cost savings for the district. In fact, research suggests that on average, overall per-pupil costs for schools that implemented either a blended-learning model or a fully virtual model are comparable and sometimes lower than the national average of $10,000 per student for traditional brick-

and-mortar schools. For blended-learning schools, per-pupil costs tend to range from $7,600 to $10,200.[19] In order to realize cost savings, the budget must align clearly with district priorities and include a consistent funding stream for technology-enabled learning tools.

Unique Assets in Rural Contexts

Research suggests that the financial discipline needed to run a good rural school makes leaders more willing and able to cut or change programs that are not working.[20] As a result, some school leaders in rural areas may be positioned better to adjust their budgets to accommodate the implementation of a personalized digital learning model and to align expenditures with these goals.

Depending on the state, some rural schools also may qualify for waivers from certain state requirements or for additional funds through various state programs, which can enable greater budget flexibility and allow leaders to implement digital learning.

Barriers to Implementation in Rural Contexts

Successfully managing a major shift in a school's instructional program requires resources to support everything from staff training and collaboration time to purchasing and maintaining new curricular resources and technology. Freeing up funds to support such a change requires tradeoffs; in cash-strapped districts, those tradeoffs may be significant and must be supported by the community.

For small rural schools in particular, fixed costs—like updating facilities for compatibility with the newest technology—are spread over fewer students, making per-student costs higher than those in a more populated urban district. Passing a local bond issue to support the transition to a personalized digital learning model also might not be feasible for schools located in economically struggling rural communities.

Strategies for Implementation in Rural Schools

Budgeting for a fundamental shift in a district's instructional program is no small task. Rural district leaders can do the following to support their schools as they undertake this change:

- **Manage relationships proactively.** Ensure staff and community members understand the impact to existing programs.
- **Reduce or cut ineffective programs.**
- **Take advantage of existing state and federal waivers.** Such waivers can free up funds to support the transition.
- **Ensure a well-designed, coordinated procurement process.** This process must enable clear analysis of utilization rates and other data to inform decisionmaking about investing in resources.
- **Join or form consortia to command better pricing.**

Resources: Budget and Resources

- K–12 Total Cost of Ownership Tool and Case Studies: The Consortium for School Networking developed a methodology that allows districts to measure and understand the costs of acquiring and maintaining all their networks, computers, devices, and staff time prior to purchasing technology.
- *Transformative Budgeting for Digital Learning*: This report identifies important budget-related challenges and opportunities for districts as they shift to digital learning.
- *Improving EdTech Purchasing*: This report identifies key obstacles and potential solutions for procuring K–12 personalized learning tools.

Community Partnerships

Digital communications, online communities, social media, and digital learning environments can facilitate partnerships between schools, families, and the broader community. Parental engagement is a key feature of the FRS framework through which parents partner with teachers and students to shape learning. This type of involvement requires schools to connect with parents through various communication channels, including internet-based solutions.

Rural schools frequently serve as the hub of the local community and thus can partner with local organizations and industries to extend learning into community centers, enable students to participate in apprenticeships or internships, implement community-based exhibits of student work, and coordinate afterschool and extracurricular programs and activities. Meanwhile, schools can use online platforms to raise students' and community members' awareness of global events and other cultures and connect them to resources available in other places.

Unique Assets in Rural Contexts

Rural schools are woven deeply into the fabric of their communities, facilitating partnerships between schools and community organizations. Local business and industry leaders can provide students with internships and schools with expertise that might otherwise be unavailable or cost prohibitive. The hands-on learning that local experts provide to students enhances the content and skills they learn in the classroom, brings learning to life, and makes content accessible and relevant. In turn, local industries gain a pipeline of talent. This symbiotic relationship develops the talent necessary to maintain thriving rural communities.

Barriers to Implementation in Rural Contexts

Depending on the context of each rural community, a lack of local industry or extreme poverty could prevent schools from forging meaningful partnerships with community organizations. Where local businesses or industries are limited, districts must proactively develop relationships through online platforms. This can be more challenging or time-consuming than simply working face-to-face with local business owners.

Schools planning to alter the way they operate also may face resistance from local community members. If school leaders do not clearly articulate the school's theory of action and rationale for reconceptualizing instruction, students, families, and community members may not fully

understand such large, fundamental changes and resist them. These barriers may make it difficult for rural districts to make tradeoffs in programs and resources required to achieve dramatic changes to students' school experiences.

Strategies for Implementation in Rural Schools

There are several strategies state, district, and school leaders can employ to develop strong school-community connections:

- **Leverage relationships with local business owners and industry leaders to develop off-campus learning opportunities for students.** Learning activities include project-based learning, internships, externships, and apprenticeships.
- **Collaborate with local business leaders on curriculum.** District leaders can work with business leaders to craft curricular modules that develop students' skills in areas relevant to local industry needs.
- **Cultivate online communities.** School officials can partner with school or district leaders in other parts of the state or nation to share ideas and collaborate.

Resources: Community Partnerships

- The Expanded Learning and Afterschool Project: This fifty-state initiative harnesses the power of networks and leaders to help schools and communities leverage afterschool, summer, and expanded-learning programs to accelerate student learning.
- ExpandED Schools: This organization focuses on expanding the school day for all students.
- Connecting Families: Rethinking Education and Parenting in a Digital Age: This organization works to support rich and relevant community conversations about children's digital lives throughout the school year.

Data and Privacy

The use of data gathered through regular diagnostic, formative, and summative assessments enables personalization by giving teachers the knowledge to design lessons that meet each student's unique learning needs. To do this, teachers must have access to current data and systems to analyze that data in real time. Accessible data fosters a culture of data-informed decisionmaking, where teachers, students, and parents actively use data to improve learning.

School district leaders are charged with implementing processes to ensure data privacy and security at the district, school, classroom, and student levels. This includes using federal laws like the Family Educational Rights and Privacy Act (FERPA), Children's Internet Protection Act (CIPA), Children's Online Privacy Protection Act (COPPA), and Protection of Pupil Rights Amendment (PPRA), as well as relevant state and local laws to guide policies and practices for collecting, storing, analyzing, reporting, transmitting, and archiving data safely and securely. Teachers must become fully data literate, meaning that they understand and embrace the processes for protecting student data and have the skills to use data to plan effective instruction.

Unique Assets in Rural Contexts

In rural schools where class sizes are small, teachers have less data to interpret and analyze and fewer lessons to plan and adjust, allowing a teacher to spend more time personalizing the content and instruction for each student. Small class sizes also enable teachers to develop strong personal relationships with students and their families. Teachers likely already are making personalized decisions for individual students based on informal data gathered through these relationships.

In addition, in many rural schools, teachers teach multiple subjects or grade levels. The use of data can be a significant asset for students' learning in this context, as a teacher can identify trends in data across subjects or years and can provide consistent instructional strategies across time and/or content areas.

Barriers to Implementation in Rural Contexts

States increasingly are prioritizing getting student data into the hands of teachers, but a variety of barriers continue to challenge teachers' abilities to use this data in meaningful ways, regardless of their geography. Some of these barriers include a lack of preservice instruction on data use, insufficient training on translating data into decisions about instructional practices, limited time to gather and analyze data, and inadequate technology to support regular access to data.[21] Access to education and training around good data practices may be even more limited for schools in rural areas. Rural districts also may have limited capacity and resources to navigate complicated federal, state, and local legal requirements related to protecting student information.

Strategies for Implementation in Rural Schools

Using and protecting individual student data effectively are critical to implementing personalized learning successfully. District leaders can do the following to support rural schools as they address challenges related to data and privacy:

- **Support teachers.** Provide ongoing, high-quality training to teachers as they develop data-literacy skills.
- **Partner with other districts.** Partnerships can offset the costs of training and provide opportunities for teachers to engage with other professionals.
- **Expand teachers' communities of practice.** Districts can use online professional development resources to provide teachers with high-quality learning opportunities.
- **Create data teams.** Teams organized by subject area or for subsets of students can streamline data collection and use.

Resources: Data and Privacy

- "Getting the Facts Straight about Education Data": This brief provides state and local leaders with practical information about laws governing student data and privacy.
- "Federal Privacy Laws That Apply to Children and Education": This brief highlights key federal policies related to education records, health information, and online activities of children.
- *Roadmap to Safeguarding Student Data*: This report highlights key focus areas for state education agencies in safeguarding student data.

Robust Infrastructure

When used as part of a comprehensive educational strategy, technology provides access to tools, resources, data, and support systems that all increase teaching and learning opportunities. Such environments enable individualized, competency-based learning that can take place anywhere and anytime.

This requires districts to have the following elements in place:

- High-quality devices that are readily available to all staff members and students
- A robust network infrastructure with adequate bandwidth to ensure consistent access to online resources
- Adequate and responsive technical and instructional support to address quickly issues that arise
- Formal processes for monitoring technology and ensuring upgrades and replacements are made efficiently

Unique Assets in Rural Contexts

The Federal Communications Commission (the FCC) operates several programs designed specifically to help rural schools and communities improve technology access and connectivity, including the Schools and Libraries Program (commonly known as E-rate), the Connect America Fund, and the Lifeline program.[22] Through these programs, rural schools and communities can access additional funds to support upgrades to digital infrastructure.

In addition to federal programs, many rural communities have adopted creative initiatives to address connectivity barriers, such as loaning or providing individual hotspots to students at discounted rates to share cellular data and upgrading buses to be wireless-enabled so students can access the internet during their commutes.[23] National nonprofits, like EveryoneOn.org, also work to provide families with access to affordable internet and devices.

With the support of federal funds, nonprofit organizations, and local creativity and problem-solving efforts, rural schools have a variety of opportunities to improve their digital infrastructure.

Barriers to Implementation in Rural Contexts

Infrastructure is perhaps the largest challenge facing rural schools implementing a personalized learning model. Internet access in rural areas often is limited compared to more densely populated communities.[24] Both inadequate access to the internet and slow internet speeds inhibit schools in rural communities from taking advantage of the online components of personalized learning, as online platforms and materials will be harder to use.

But speed is not the only issue. Rural schools tend to pay about two and a half times as much for bandwidth compared to schools in urban communities.[25] Moreover, many rural school facilities need significant infrastructure upgrades to handle new technology, a cost that many communities simply cannot bear.

Even when communities largely have addressed their infrastructure needs, other barriers may remain. Rural schools may find it challenging to recruit and retain technology experts to keep devices up to date, support teachers and students as they learn to use devices and platforms, and troubleshoot issues as they arise. Affording the devices necessary to enable many digital components of personalized learning also may prove challenging.

Strategies for Implementation in Rural Schools

Local leaders can use the following strategies to strengthen rural schools' technology infrastructure:

- **Leverage existing federal and state infrastructure support programs.**
- **Inform low-income families of available subsidies.** The FCC's Lifeline program can offset the cost of high-speed home internet connections.
- **Collaborate with local government officials and neighboring communities.** Districts can work with local officials and agencies to develop a comprehensive business proposal to broadband providers to bring high-speed fiber technology into the community and create or join purchasing consortia to increase their collective buying power.
- **Pursue creative community-driven solutions for expanding internet access.**

Resources: Robust Infrastructure

- Making Smart IT Investments: The Consortium for School Networking developed a set of strategies to address the cost and choices of technology projects and infrastructure.
- Building Your Roadmap to 21st Century Learning Environments: This free planning tool helps school leaders get the most value out of their investments in high-speed broadband and digital content.
- Compare & Connect K–12: This online tool creates transparency for K–12 broadband speeds and pricing across the country, enabling district technology directors, superintendents, and state leaders to access this information and make smart network purchasing decisions.

Use of Space and Time

Personalized learning gives teachers the opportunity to rethink how they structure their classrooms and how they use instructional time. As teachers leverage technology to meet their students' individual needs and preferences, learning becomes much more flexible. Students can access content and learning experiences in the classroom, at home, and in the community. Classroom time can be used for individual support or to enable students to collaborate on a complex project. Structured class periods and rigid daily schedules give way to flexible instructional time that reflects the needs, pace, interests, and preferences of individual learners.

Unique Assets in Rural Contexts

Strong community ties and an all-hands-on-deck attitude that characterize many rural communities represent a significant asset to rural schools looking to rethink classroom space and time. If a classroom teacher needs a few extra adults to monitor and support students as they rotate through stations, community members may willingly lend a hand. The local library or community center may be able to create a quiet space for students to use after school and access computers and the internet if they lack access at home. Rural schools with close ties to local industries also may be well-positioned to leverage those relationships to create internships, externships, and other partnerships that extend students' learning opportunities outside of school and develop workforce skills and knowledge beneficial to both students and local employers.

Barriers to Implementation in Rural Contexts

There are two major implementation barriers that rural schools may face when reorganizing their use of instructional space and time. The first and most significant is the substantially lower percentage of rural households with high-speed internet access compared to those in urban and suburban communities. If students do not have adequate out-of-school internet access, schools cannot effectively implement a "flipped classroom" model, where students engage with online lessons at home and then use classroom time to complete related work or projects. Further, teachers are limited in their ability to leverage out-of-school learning activities that rely heavily on online access.

Second, the geographic isolation of many rural communities may make it difficult for schools to extend the school day or utilize non-school facilities or institutions to broaden their students' learning experiences. Many rural communities lack proximity to community and cultural resources, making it more challenging for students to take classes at a local college or university or attend a half-day internship at a local business, for example. Rural schools also may struggle to transport students at off hours to community-based learning opportunities. Extending the school day by even an hour may mean students get home much later in the evening, making it difficult for them to participate in extracurricular activities, eat dinner as a family, and get to bed at an appropriate time. Technology can address some of this, but a lack of access to a broad network of community resources limits options for out-of-school learning.

Strategies for Implementation in Rural Schools

Several strategies can help district leaders mitigate challenges related to space and time, including the following:

- **Develop a flexible schedule.** Districts can adopt a schedule that allows students to participate in off-campus learning activities during regular school hours.
- **Consider alternative ways of organizing students and classes.** Districts can allow students to progress through content based on individual competency—rather than seat time—and rethink how students are assigned to classes. Schools could embrace multi-age classrooms or regularly assess and flexibly regroup students to address individual needs related to specific content.
- **Be creative with school space and staff members' time.** Schools can arrange classrooms and other school spaces to support varied instructional strategies and maximize strategic use of staff members' time. For example, a school could designate quiet spaces staffed with an instructional aide where students can practice concepts independently through adaptive software, while teachers work with individual students or small groups who need extra help or enrichment. Spaces set up to support student collaboration can include access to media center resources and expertise for research. Teachers can record direct instructional modules that

students access via technology, reserving face-to-face time for more individualized, targeted instruction and enabling their expertise to be shared with a larger number of students than a traditional classroom model allows.

- **Help students access the internet outside of school.** For specific ideas, see the previous section of this guidebook, Robust Infrastructure.
- **Partner with existing community organizations.** Libraries or community centers may be able to offer computer and/or wireless access to students during before- and after-school hours. For additional information about how organizational partnerships can support rural schools, see the section Community Partnerships earlier in this guidebook.

Resources: Use of Space and Time

- "Six Keys to a Classroom Makeover": This article offers teachers and school leaders six keys to transforming classroom space to make it a brain-friendly learning environment.
- Redesigning Learning Spaces: This webinar examines how physical classroom space can support student learning in a digital environment.
- *Linked Learning: Using Learning Time Creatively to Prepare Students for College*: This report highlights schools implementing Linked Learning pathways, which reconfigure the use of time to better support students' learning.

Conclusion

The rapidly changing economies of many rural communities and the shifting landscape of the American job market means that now, more than ever, rural schools must find new ways to address their persistent challenges to set their students up for success in college and a career.

The standardized teacher-centric "factory model" of education—with inflexible seat time and curricular requirements and a one-size-fits-all instructional model—no longer is appropriate. Students need a learning experience tailored to their unique strengths, passions, and interests—one that will engage, inspire, and challenge.

Students in rural schools need access to the very best teachers, materials, and experiences so they can be fully prepared to succeed in twenty-first-century jobs. Teachers in rural areas need access to top-notch resources and training that will enable them to excel in the classroom. Rural communities need dynamic, flexible schools that can shift and adapt to meet the needs of their families, students, and communities.

Personalized learning can enable rural schools to do these things and more. By creating an individualized learning experience for students that accounts for their unique strengths and needs, personalized learning holds great promise for helping students in rural areas reach their full potential.

Moreover, personalized learning can help rural schools address many of their persistent challenges. Those struggling to attract or retain teachers for specialized subject areas or offer their students a robust set of courses, for example, can use flexible instructional models to extend the reach of teachers, create community-based learning opportunities that connect school work with real-world experiences with local businesses, and leverage technology to connect with expertise and course work outside the immediate community. Small, isolated schools can use personalized learning to bridge the geographic gap between their students and issues of state, national, and global significance.

While the shift to personalized learning is big, its promise for generating student success is even bigger. Successful implementation will require deliberate, thoughtful efforts from state and local leaders. FRS's personalized learning framework can help education leaders capitalize on existing assets while addressing their community's challenges. The strategies and suggestions presented in this guidebook offer leaders in rural communities a path toward creating a successful personalized learning experience for their students that makes sense for their unique contexts.

Case Study: Personalized Learning in Fordland R-III District (Missouri)

Long rides to school through Missouri farmland are not unusual for the more than 600 students of Fordland R-III School District, located thirty minutes east of Springfield.

When Chris Ford joined the district as its new superintendent in 2014, he "started asking questions," he recalls, "trying to find out where we were" instructionally. He grew concerned about the district's ability to prepare its students for the twenty-first century, college, and a career. Among other constraints, faculty had not received training on how to personalize student learning, or how best to use technology to support the instructional approach.

Ford rebuilt **curriculum**, **instruction**, **and assessment** in the district to match student needs and rethought the district's use of **time and space** to provide more flexible learning opportunities. Prior to Ford's arrival, teachers in Fordland R-III already received stipends for up to fifteen hours of professional development activity each year. Ford creatively restructured these stipends to include training on the personalized learning instructional approach and to allow teachers to **personalize their individual professional learning**.

Starting small, Ford initially focused on a group of intrigued early adopters, who he calls his "go-getters," in just one school to build teacher buy-in. Using formative assessments to evaluate success and shortcomings, Ford and his go-getters piloted a variety of instructional practices, like project-based learning, in classrooms. Eventually this buy-in effort snowballed, and teachers involved in the pilot program shared their experiences and excitement with other teachers through internal professional learning events.

All the while, Ford knew that his **vision for student learning** of instructional flexibility required better **technology and infrastructure** to offer its greatest benefits to students. He recalls arriving to the district to find a "very antiquated system" in the schools, and merely 8 percent of Fordland R-III students have wired internet connections at home creating the potential for a wide "homework gap." Teachers assign homework accordingly, and Ford's plan includes offering Wi-Fi hotspots that can be checked out from the library. This will offer new opportunities for anytime, anywhere learning and collaborative projects.

Superintendent Ford admits he felt skeptical about classroom technology in the past. For a long time, he says, "districts were trying to equate the use of technology with improved test scores." But Ford realized that districts could use technology meaningfully to build twenty-first-century skills to connect students' curiosity through online resources, activities, and expertise, and in turn, better prepare them for modern life and work. Ford uses **data** collection tools to report progress and usage to the school board about the return on investment to date.

Ford encourages relevant professional development to allow, rather than force, teachers to incorporate technology into their instruction. Fordland R-III teachers attend and present at inter-district consortia, districtwide professional development camps, and regional educational technology conferences.

Ford built a crucial cross-functional team by hiring a technology director paired with faculty expertise on effectively incorporating digital learning strategies into instruction. This team

maximizes the investments made in school technology infrastructure through Wi-Fi systems with coverage across school campuses to realize the vision for improved student learning outcomes.

Finding the necessary **budget and resources** is always a challenge. The school district received federal funding from the Federal Communications Commission's E-rate program for discounts to renovate its technology infrastructure but needed to reallocate local funding as well to cover the upgrades described above. Ford carefully reduced his staff of paraprofessionals through retirements and trimmed textbook spending to cover remaining costs related to professional development and technology infrastructure.

Three years into Fordland R-III's transition to personalized learning, teachers in the district are honing their skills with flexible and personalized instruction and sharing that expertise with other educators. More importantly, students in the district demonstrate a deeper understanding of their course work, according to Ford.

When Ford sees students eagerly expanding their knowledge and producing "beautiful" work, he says he knows the outcome warranted the effort. Superintendent Ford is surveying teachers to see where he can offer additional professional development opportunities and looking for ways to help students develop responsible digital behavior.

Ford suggests that district leaders considering similar changes keep a learning mentality, support efforts to try new financial models, and seriously engage in **community partnerships** to navigate this shift in learning models.

Endnotes

1 Deer Isle–Stonington Chamber of Commerce, "Welcome to Deer Isle and Stonington," http://www.deerisle.com/ (accessed February 8, 2017).

2 Maine Department of Education, "Public School October 1st Attending Enrollment," http://www.maine.gov/education/enroll/attending/statefallpub.htm (accessed February 8, 2017).

3 U.S. Department of Education, National Center for Education Statistics, "Table A.1.a.-1 Number of Public School Districts, by District Urban-Centric 12-Category Locale and State or Jurisdiction, 2013–14," *Rural Education in America,* https://nces.ed.gov/surveys/ruraled/tables/a.1.a.-1.asp (accessed February 17, 2017).

4 ———. "Table A.1.a.-2 Number of Public Elementary and Secondary Schools, by School Urban-Centric 12-Category Locale and State or Jurisdiction, 2013–14," *Rural Education in America,* https://nces.ed.gov/surveys/ruraled/tables/a.1.a.-2.asp (accessed February 17, 2017).

5 ———. "Table B.1.b.-1 Number and Percentage Distribution of Public Elementary and Secondary Students, by Race/Ethnicity and School Urban-Centric 12-category Locale: Fall 2013," *Rural Education in America,* https://nces.ed.gov/surveys/ruraled/tables/B.1.b.-1.asp (accessed February 17, 2017).

6 U.S. Department of Agriculture Economic Research Service, "Rural Poverty & Well-Being, Poverty Demographics," https://www.ers.usda.gov/topics/rural-economy-population/rural-poverty-well-being/poverty-demographics/ (accessed February 9, 2017).

7 Pioneer Institute Public Policy Research, "Poor Students in Rural Massachusetts Outperform Their Urban Counterparts and Are Improving More Rapidly," news release, April 23, 2012, http://pioneerinstitute.org/press_releases/poor-students-in-rural-massachusetts-outperform-their-urban-counterparts-and-are-improving-more-rapidly/.

8 On the 2015 NAEP, only one in three rural eighth graders met the proficiency standards for math and reading. Although students in rural schools outperformed their urban peers by 3 percentage points in math and 4 percentage points in reading, proficiency rates for students in rural schools declined compared to 2013 results. While scores for students from urban and suburban areas also declined, declines in scores for students in rural schools were greater.

9 U.S. Department of Education, National Center for Education Statistics, "Table B.3.a.-1: Average Freshman Graduation Rate for High School Students, by Locale*,* 2009–10*" Rural Education in America*, https://nces.ed.gov/surveys/ruraled/tables/b.3.a.-1.asp (accessed February 9, 2017). More recent data from School Year 2013–14 shows that states with large populations of students in rural schools—such as Vermont and Iowa—have some of the highest high school graduation rates in the country. J. Mader, "Rural States Post High Grad Rates, Native Rates Stagnant," *Education Week*, December 16, 2015, http://blogs.edweek.org/edweek/rural_education/2015/12/rural_states_post_high_grad_rates_native_rates_stagnant.html. U.S. Department of Education, National Center for Education Statistics, "Table 1: Public High School 4-Year Adjusted Cohort Graduation Rate, 2013–14," https://nces.ed.gov/ccd/tables/ACGR_RE_and_characteristics_2013-14.asp#f1 (accessed February 9, 2017).

10 P. T. Hill, *Breaking New Ground in Rural Education* (Rural Opportunities Consortium of Idaho, 2014), http://www.rociidaho.org/wp-content/uploads/2015/01/ROCI_2014NewGround_FINAL_0115.pdf.

11 J. Schiess and A. Rotherham, *Big Country: How Variations in High School Graduation Plans Impact Rural Students* (Rural Opportunities Consortium of Idaho, 2015), http://www.rociidaho.org/wp-content/uploads/2015/10/ROCI_HSRigor_Final.pdf.

12 Z. A. Barley and N. Brigham, *Preparing Teachers to Teach in Rural Schools*, (REL 2008–No. 45) (Washington, DC: U.S. Department of Education, National Center for Education Evaluation and Regional Assistance, July 2008), http://ies.ed.gov/ncee/edlabs/regions/central/pdf/rel_2008045.pdf.

13 The Rural School and Community Trust, "The U.S. School Transportation System Is Massive," January 27, 2012, http://www.ruraledu.org/articles.php?id=2832. A. Howley and C. Howley, "Rural School Busing," ERIC Clearinghouse on Rural Education and Small Schools, 2001, http://www.ericdigests.org/2002-3/busing.htm.

14 B. Herold, "The Slowest Internet in Mississippi," from *Reversing the Raw Deal*, *Education Week*, November 19, 2015, http://www.edweek.org/ew/projects/2015/rural-schools-broadband/the-slowest-internet-in-mississippi.html.

15 Wyoming Department of Education, "Digital Learning and Support," https://edu.wyoming.gov/in-the-classroom/technology/ (accessed February 9, 2017).

16 Indiana Department of Education, "Future Ready Indiana," http://www.doe.in.gov/elearning/future-ready-indiana (accessed February 9, 2017).

17 Micro-credentials, such as those offered by Digital Promise, formally recognize teachers for the skills they develop during their careers. See Digital Promise, "#LovetoLearn: Educator Micro-credentials," http://digitalpromise.org/initiative/educator-micro-credentials/ (accessed February 9, 2017).

18 Edcamps bring together educators for professional learning opportunities that are designed and facilitate by the participants themselves. See Edcamp Foundation at www.edcamp.org.

19 T. B. Battalino, M. Haldeman, and E. Laurans, "Creating Sound Policy for Digital Learning: A Working Paper Series from the Thomas B. Fordham Institute" (Washington, DC: Thomas B. Fordham Institute, 2012), http://files.eric.ed.gov/fulltext/ED528948.pdf.

[20] M. Roza and G. Heyward, *Highly Productive Rural Districts: What Is the Special Sauce?* (Rural Opportunities Consortium of Idaho, 2015), http://www.rociidaho.org/wp-content/uploads/2015/09/ROCI_SuperProductiveRuralDistricts_Final.pdf.

[21] Data Quality Campaign, "Teacher Data Literacy: It's About Time" (Washington, DC: Author, 2014), http://dataqualitycampaign.org/wp-content/uploads/2016/03/DQC-Data-Literacy-Brief.pdf.

[22] The FCC's Schools and Libraries program, commonly known as E-rate, was designed to make telecommunications and information services more affordable for schools and libraries. Eligible schools can receive discounts ranging from 20 percent to 90 percent on services including internet access and broadband services. Higher poverty and more rural schools and libraries qualify for higher discounts. See FCC, "FAQs on E-Rate Program for Schools and Libraries," https://www.fcc.gov/consumers/guides/universal-service-program-schools-and-libraries-e-rate (accessed February 9, 2017). The FCC's Connect America Fund subsidizes telecommunications companies to provide infrastructure and service in rural and remote areas. See FCC, "Connect America Fund Phase 2 FAQs," https://www.fcc.gov/consumers/guides/connect-america-fund-phase-ii-faqs (accessed February 9, 2017). The Lifeline program subsidizes the cost of telecommunications services for low-income Americans in any community. In 2016, the FCC revamped the Lifeline program to include broadband as a part of the services it provides to families. See FCC, "Lifeline Program for Low-Income Consumers," https://www.fcc.gov/general/lifeline-program-low-income-consumers (accessed February 9, 2017).

[23] Piedmont City Schools in Alabama, for example, loans Verizon MiFi hotspots to students at a discounted rate. These hotspots enable students to have home internet access during the school year. Personal communication, M. Akin, February 4, 2016. See also Digital Promise, "Piedmont City School District," http://digitalpromise.org/district/piedmont-city-school-district/ (accessed February 9, 2017). Other districts upgraded their buses to be wireless-enabled. Eminence Independent Schools in Kentucky, for example, parks wireless-enabled school buses in low-income apartment complexes during after-school hours. While the lack of residential density in rural communities may make a "park and surf" strategy ineffective, wireless-enabled buses could transform long rural bus rides into instructional time. See K. Johnson, "For Internet Access, Hop on the Bus—and Discover What Really Prevents Teachers from Using Digital Tools," *EdSurgeNews* (blog), EdSurge, March 1, 2016, https://www.edsurge.com/news/2016-03-01-for-internet-access-hop-on-the-bus-and-discover-what-really-prevents-teachers-from-using-digital-tools.

[24] Nearly 40 percent of Americans living in rural communities lack access to broadband internet that meets the FCC's minimum speed requirements, compared to just 4 percent in urban areas. See D. M. West and J. Karsten, "Rural and Urban America Divided by Broadband Access," *Techtank* (blog), Brookings Institution, July 18, 2016, https://www.brookings.edu/blog/techtank/2016/07/18/rural-and-urban-america-divided-by-broadband-access/. Of the 3,700 schools lacking access to fiber-optic connections, 79 percent are rural schools. See EducationSuperHighway, *2016 State of the States* (San Francisco, CA: Author, 2016), https://s3-us-west-1.amazonaws.com/esh-sots--pdfs/2016_national_report_K12_broadband.pdf.

[25] B. Herold, "Big Progress, Hurdles on School Internet Connectivity, Analysis Finds," *Digital Education* (blog), *Education Week*, November 19, 2015, http://blogs.edweek.org/edweek/DigitalEducation/2015/11/progress_hurdles_school_connectivity_erate.html.