MARCH 2015

TECHNOLOGY AND RURAL EDUCATION

Bryan C. Hassel and Stephanie Dean, Public Impact

roci

J.A. AND KATHRYN ALBERTSON FOUNDATION

BELLWETHER EDUCATION PARTNERS
IDEAS | PEOPLE | RESULTS

• TABLE OF CONTENTS •

• ACKNOWLEDGEMENTS •

The Rural Opportunities Consortium of Idaho (ROCI) was launched by the J.A. and Kathryn Albertson Foundation of Boise, Idaho during the summer of 2013. Since then, Bellwether Education Partners and a task force of experts led by Dr. Paul T. Hill have been working to foster a better understanding of the issues that affect rural education, inform policy discussions, and bring attention to the unique needs and circumstances of rural school children. A series of reports, published over the next year, will examine issues including migration, technology, human capital, economic development, postsecondary enrollment and persistence, and more. Papers will be posted online at www.rociidaho.com/research-publications.

ABOUT THE AUTHORS

Bryan C. Hassel is co-director of Public Impact. He is a recognized expert on education technology, charter schools, education entrepreneurship, and teacher and leader policy. Dr. Hassel received his Ph.D. in public policy from Harvard University and his master's degree in politics from Oxford University, which he attended as a Rhodes Scholar. He earned his B.A. at the University of North Carolina at Chapel Hill, which he attended as a Morehead Scholar. He is a senior research affiliate with the Center on Reinventing Public Education and a nonresident senior fellow with Education Sector. Dr. Hassel is the author of several studies on uses of education technology including "A Better Blend: A Vision for Boosting Student Outcomes with Digital Learning" and "Teachers in the Age of Digital Instruction."

Stephanie Dean is vice president of teaching and learning policy at Public Impact. Her work focuses on identifying and cultivating state policy conditions that help schools extend the reach of excellent teachers. Before joining Public Impact, she led The Hunt Institute's research

and policy analysis team, identifying and analyzing key education policy issues to inform state leaders. Much of her work there focused on state content standards and assessment systems. Ms. Dean has served as a grant manager of education programs for United Way California Capital Region and helped coordinate the Success By 6® early childhood initiative in Portland, Oregon. She taught fourth grade in the Mississippi Delta as a Teach For America corps member and earned her master's degree in public policy from Duke University. For more info about Public Impact see publicimpact.com.

Emily Ayscue Hassel led the development of many of the ideas in this paper regarding extending the reach of excellent teachers to more students. Thanks to Elaine Hargrave for research assistance and to the Rural Opportunities Consortium of Idaho and the Bellwether team for helpful feedback.

ABOUT ROCI • RURAL OPPORTUNITIES CONSORTIUM OF IDAHO

ROCI brings together some of the nation's best thinkers to conduct research on the challenges of rural education and identify innovations, programs, and models to address them. This effort informs a national body of work on rural education and explores implications for increasing the educational attainment and economic competitiveness of Idahoans and Americans.

ABOUT JKAF • J.A. AND KATHRYN ALBERTSON FOUNDATION

The J.A. and Kathryn Albertson Foundation is a Boise-based, private family foundation committed to the vision of limitless learning for all Idahoans. Since 1997, the J.A. and Kathryn Albertson Foundation has invested almost $700 million in Idaho. The J.A. and Kathryn Albertson Foundation honors the legacy of Joe and Kathryn Albertson, founders of Albertsons grocery store, however it is not affiliated with Albertsons LLC. Grant-making is by invitation only. For more information, visit jkaf.org.

ABOUT BELLWETHER EDUCATION PARTNERS

Bellwether Education Partners is a nonprofit dedicated to helping education organizations—in the public, private, and nonprofit sectors—become more effective in their work and achieve dramatic results, especially for high-need students. To do this, Bellwether provides a unique combination of exceptional thinking, talent, and hands-on strategic support.

• INTRODUCTION •

Rural schools are often a centerpiece of the community—a structure that connects generations, a teaching staff that communicates local values, and a forum where community pride takes shape in school events and the cheering on of sports teams. It's important to consider this rural context—deep pride in both place and people—before turning to a discussion of technology use within rural schools. The strong connection that rural residents feel for their locale can generate dedicated educators who devote an entire career to a single school. Many of these educators are eager to find ways to use technology in their classrooms while maintaining efforts to engage students in learning activities rooted in their local context. Such community-based or place-based strategies have been found to have benefits for student social and academic engagement.[1] It will be important for local districts and policy leaders to find ways to capitalize on the benefits technology has to offer while preserving local connections.

That said, technology holds great promise for rural education. It can give students access to great teachers. It can enable them to tap into resources they would never find in a school's media center. It can help them personalize their learning to meet their own unique needs; use that learning to create presentations, websites, and movies; and open doors to forge networks with other students across the world. And it can free local teachers' time, enabling a school's great teachers to reach more students and help other teachers succeed. It is possible that technology can do all of these things, but there are not yet success stories that have been taken to scale. This is a time for creative thinking, the courage to try new things, and close study to identify strategies that work.

Running a fast broadband connection to every school and outfitting classrooms with laptops and iPads will not automatically accelerate learning in rural schools.

Though much remains to be learned about using technology to enhance educational access and delivery, this paper proposes a set of approaches for using technology to transform rural education. It describes unproven solutions worth exploring while keeping the attendant challenges in mind. Examples found within Idaho are featured, but the challenges and ideas are applicable in rural settings across the nation. None are meant to be taken as quick fixes or silver bullets; running a fast broadband connection to every school and outfitting classrooms with laptops and iPads will not automatically accelerate learning in rural schools. Such strategies could help educators overcome some of the challenges faced in rural environments, but would need to be thoughtfully integrated into the school system.

• SIMILAR CHALLENGES TO OTHER AREAS, UNIQUE TWISTS •

Rural schools face challenges that fall into similar categories as those found in suburban or urban schools: ensuring that all students are taught by excellent teachers, meeting diverse learning needs, and helping students overcome social and academic obstacles. First and foremost in any academic setting is the challenge of ensuring that each student has consistent access to excellent instruction, year after year. It is clear that high-quality teachers are a student's primary ticket to academic success, the single most important school-based factor affecting student achievement. These teachers, making up the top 25 percent of the profession, already achieve a level of results that could enable all of our children to meet and exceed standards, and to graduate from high school ready for college and careers.[2] Any strategy for using technology to improve rural education needs to focus on increasing the number of rural students who have access to excellent teachers.

First and foremost in any academic setting is the challenge of ensuring that each student has consistent access to excellent instruction, year after year.

Teachers hold a place of high regard within local communities. And many people born in a rural setting find teaching to be one of the few career options that will allow them to remain in the place they love. In a forthcoming paper for the Rural Opportunities Consortium of Idaho, Daniel Player explains that, in most cases, rural principals appear to have no greater difficulty filling teacher vacancies than their counterparts in urban areas (teachers of English-language learners being the sole exception).[3] However,

rural principals typically have a smaller pool of candidates to choose from,[4] generally displaying lower academic aptitude than candidates in urban areas.[5] This hiring scenario has important implications for principals who must build instructional programs to meet diverse student needs. It makes it much less likely that students in rural areas will have access to excellent educators and a full slate of course options.

Efforts to attract teachers to rural areas tend to face an uphill battle, difficulties which Player also notes in his paper.[6] Though many rural communities offer stronger connections between teachers, students, parents, and the community,[7] they lack other amenities that might attract young teachers, such as access to entertainment venues and cultural diversity.[8] Cost of living is usually lower than suburban or urban areas,[9] but small and shrinking tax bases make it difficult for rural areas to compete with the salaries offered elsewhere. Limited employment options may be problematic for non-educator spouses. Such challenges increase the imperative that rural schools make careful and efficient use of their strongest teachers.

Population density presents logistical challenges as well. In some rural school districts, the student population is scattered across a massive number of square miles. Students in these districts will end up spending an inordinate amount of time on buses traveling to faraway school buildings. Extensive transportation budgets are also tough on school districts that face limited funds. Resources that could otherwise be used for instructional activities are eaten up by efforts to fuel, maintain, and drive buses across vast distances.

When rural students aren't consolidated into larger school populations, the resulting small number of students who make up any particular grade or grouping can limit course offerings. Teacher shortages combined with an already small student body make it very unlikely that a district will be able to offer access to every math, science, Advanced Placement, and elective course that an individual student needs to advance along his or her learning trajectory.

Rural teachers and school administrators can put technology to use as they work to overcome these obstacles. Technology also offers school districts, teachers, and students resources and information they might otherwise find impossible to access. But it is not as easy as rolling a cart of digital devices into a school and watching the magic unfold. Let's first consider the potential of technology to free rural students from geographic limitations that impede them from achieving their educational potential. We'll then turn to a series of challenges that must be overcome to make technology a true force for high-quality rural education, and offer a set of recommendations for moving forward.

• ENVISIONING THE POTENTIAL OF TECHNOLOGY FOR RURAL EDUCATION •

To tap the full potential of technology, students, communities, educators, and policymakers will need to re-envision the traditional paradigm: education delivered within classrooms of 20-30 students, led by a single teacher hired to work in that particular room at that particular time.

Technology could be used to address the above-noted challenges faced by rural school districts. In fact, most rural schools—including districts in Idaho participating in the Idaho Leads Project, the Idaho PTECH Network, Khan Academy in Idaho, and other efforts—are already forging ahead with integrating technology into their work in many ways.[10]

But to tap the full potential of technology, students, communities, educators, and policymakers will need to re-envision the traditional paradigm: education delivered within classrooms of 20-30 students, led by a single teacher hired to work in that particular room at that particular time. Schools will need to set aside assumptions about how students are organized into classrooms, where and when education takes place for students, who a student's teachers are and where they are located, and even which characteristics qualify a setting to be a "school." Envelope-pushing leaders can consider several ideas about what rural education could look like if we broke the mold.

Two types of technology are relevant here.[11] The first is **communication technology** that makes it possible to connect people across vast geographic distances. In the past, a great algebra teacher only reached the students in her classroom. Thanks to the advent of live streaming and two-way video conferencing, a great teacher can now reach students

anywhere. For group projects, students once had to sit around a table to work together. Technology now exists that allows them to work with peers in any location. Of course, live, in-person interaction is still the ideal scenario in many cases. But often the choice isn't between remote and live, it's between remote and nothing. For example, 2011–12 data from the National Center for Education Statistics show that just 55 percent of rural students had access to Advanced Placement courses within their schools.[12]

Using communication technology, online learning experiences can now supplement the in-person learning experience, helping rural districts meet diverse student needs in the face of teacher shortages. State-sponsored virtual schools such as the Idaho Digital Learning Academy offer students a wide array of online courses, increasing student access to Advanced Placement and honors-level courses, foreign languages, and less common electives that allow students to explore unique interests. Virtual courses are also commonly used for credit recovery, giving students who have failed a course the chance to make up those credits and stay on track to graduate. Online courses, led by a remote instructor via the Internet, can either be synchronous (students and instructors interact in real time) or asynchronous (students complete work and participate in discussions on their own schedule). If these classes were staffed exclusively with top-notch teachers, even students in the most remote locations could gain access to great teachers.

Digital learning resources are the other type of technology to consider. In addition to a burgeoning trove of online information that can be accessed by teachers and students, educational software has enormous potential to give each student a rich personalized learning experience. Available resources have come a long way from early iterations that provided no more than an online version of the textbook. Recent software development efforts have created interactive learning activities that enable students to progress at their own pace as they master a set of materials.

Digital learning resources have come a long way from early iterations that provided no more than an online version of the textbook.

A statewide initiative in Idaho, for example, serves up Khan Academy's web-based system of instructional videos and practice exercises, all aligned to a learning map across a range of subjects. Applications such as Khan produce data and analytics that help teachers (and students themselves) decipher each student's strengths and weaknesses and formulate next-step lesson plans for individual, group, and whole-class instruction. Other tools have emerged that allow all students to receive their own personalized lesson plans each day, using algorithms to crunch data on student activity and progress and to queue up the next

experience for an individual student's "playlist." The field of software options is nascent and growing, and quality varies. Websites such as EdSurge are popping up to collect reviews based on educator feedback, helping their peers to select software by subject, grade level, curriculum type (such as supplemental or core curriculum), technical requirements, and a variety of other factors pertaining to cost and intended use.[13]

In addition to the potential to personalize learning, digital resources present opportunities for administrative efficiency. Automation can be used to handle activities such as attendance taking, lunch orders, and data entry from student assessments.[14] Such shifts might seem minor, but for teachers who must cover lots of instructional ground within a limited number of minutes, automation offers valuable time savings. Digital resources can also eliminate the regular purchase of textbooks from the budget equation, as electronic materials stay up-to-date without the need to purchase new editions of bulky and expensive hard-copy books.

Digital resources can ensure that the most effective teachers are able to reach more students. Paraprofessionals can supervise students while they spend an age-appropriate portion of their day working digitally. During this time, excellent teachers are freed to instruct additional students or to analyze student work and plan collaboratively with their peers. Such "time-technology swaps" establish a valuable mentor role for teachers and increase the number of adults who are tuned in to each student's academic growth and social development. Using technology in a time-technology swap would allow rural schools to rely on a smaller number of more selectively hired teachers to instruct their students. This type of staffing shift would need to be phased in as natural turnover occurs, which, as Dan Player's report suggests, might be slower in some rural communities compared to higher turnover settings in urban areas.[15, 16]

Digital learning can also extend the time and place in which students have access to learning. Consider the long bus ride that many rural students find bookending their school days. These hours do not need to be spent cut off from the online learning environment. Communication technology makes it possible to create Wi-Fi hotspots within school buses, allowing students to continue their learning on wireless devices.

Finally, digital learning can also extend the time and place in which students have access to learning. Consider the long bus ride that many rural students find bookending their school days. These

hours do not need to be spent cut off from the online learning environment. Communication technology makes it possible to create Wi-Fi hotspots within school buses, allowing students to continue their learning on wireless devices. Of course, it's likely that students will use the Wi-Fi access for non-academic activities a portion of the time, and the rugged geography of some rural areas makes such networking impossible. Despite these factors, many school districts across the country are finding school bus Wi-Fi to be a useful investment.[17]

RE-ENVISIONING SCHOOL

These two modes of technology—communication and digital learning resources—become even more powerful when combined. Together these strategies could improve rural students' access to course offerings and excellent instruction, help overcome the pressure on school districts to fill teacher shortages, give on-site teachers even more time to improve their practice, and offer excellent on-site teachers the opportunity to reach more students.

Imagine a school that lacks a physics teacher and is blessed with an English language arts teacher whose students consistently make greater-than-average academic growth. Consider the benefit to student learning if:

- Students take an online course from an excellent physics teacher who lives where she wants to live and teaches "classes" of students from various other locations. On site, the students are overseen by paraprofessional staff. Students have access to excellent instruction, and the district is able to offer physics without hiring a less-equipped teacher from a small or nonexistent candidate pool.
- Students attend on-site classes with the English language arts teacher every other day and engage in supplemental digital learning activities and projects every other day. Digital learning time is overseen by paraprofessionals, and the excellent teacher is able to reach more students. If well scheduled, the teacher can reach 50 percent more students while gaining several hours per week of planning time.[18]

It's possible to conceive of an entirely new concept of the physical school's role—potentially revolutionizing rural education.

It's possible to also conceive of an entirely new concept of the physical school's role—potentially revolutionizing rural education. Imagine if the school building

were the place where the total package of a student's education came together but was not constrained by local availability of the teaching force. Imagine if rural schools relied in part on teachers who excel at delivering remote instruction—living wherever they choose. That change would give rural students access to unlimited course offerings and the best instruction. Excellent rural educators could use remote instruction to extend their reach to a greater number of students. The school building would become a place where students access the infrastructure and support for learning, such as:

- Learning workspaces and access to technology from which they could tap into digital learning resources and their remote teachers
- Supportive teachers or paraprofessionals who excel in classroom management and social-emotional development
- Peer engagement through social, athletic, and enrichment activities
- Non-academic services such as meals, college and career counseling, and health and social services

This approach could capitalize on a powerful combination of excellent instruction and wraparound services for rural children and youth. This is not to say that excellent educators are not also individuals who can support whole-child development. But the art and science of providing personalized instruction to meet individual student needs is incredibly challenging analytical work. When faced with small and nonexistent candidate pools, rural school districts will often find themselves settling for a poor fit or a vacancy. At the same time, excellent teachers in rural areas might find their reach to be limited to a small number of students. This new vision of a rural school could focus instructional dynamos on the academic development of more students combined with the best in-person youth development supports available to ensure student success.

Taking the idea of a re-envisioned school building one step further, school buildings need not be the only point of delivery for instruction and support services. In areas where students are dispersed into many small communities, it might not be sensible to bus them all to a big, centrally located school every weekday. It could be cost effective to establish smaller community-based hubs staffed by personnel, mostly paraprofessional educators and youth development professionals, who know the students well and can serve as mentors and counselors. Students at these sites could connect to great academic instructors remotely and benefit from the in-person, intensive support of individuals who are masters at helping students navigate the terrain to success as young adults. They could attend real "school" one or two days a week, greatly reducing

their commute times. A hybrid model of online education paired with in-person supports in satellite school centers could, once established, be a cost-effective model to give students the best of both worlds.

It is important to note that nothing in these visions of technology-enhanced education contradicts the value of place- and community-based education that has been found instrumental in rural settings. Technology allows teachers who are most adept at integrating a place-based approach to extend their reach to students in surrounding areas. Some states, including Idaho, have established two-way video conferencing capabilities in their schools, allowing teachers in neighboring and nearby districts to bring place-based instruction—via an alternate form of "face-to-face" communication—to students who would not otherwise have had access to those teachers.

As with any form of education, the value of technology in rural education hinges on the quality of both the online and in-person aspects.

As with any form of education, the value of technology in rural education hinges on the quality of both the online and in-person aspects. It is commendable to try new strategies to uncover solutions to challenges in rural education, but careful attention is necessary to ensure that student needs are being met.

Not surprisingly, quality varies among education programs that make use of technology. A 2004 meta-analysis of distance education concluded that such programs can have the same effect on measures of student academic achievement as traditional instruction.[19] Many, however, do not. Recent studies have shown some programs to yield flat or even dismal results. For example, in 2010–11, just 27.4 percent of students attending full-time virtual schools operated by private education management organizations met adequate yearly progress (AYP), compared to an estimated 52 percent in public schools nationwide.[20] Yet some courses delivered virtually have achieved better-than-average results. Over a two-year period, the average Arkansas Virtual Academy student increased about 9.6 percentile points in math and 3.6 percentile points in literacy, compared to 1.6 and 1.2 percentile points for matched peers.[21]

Student access to effective online and blended learning also depends on access to quality devices. Not surprisingly, disparities fall along economic lines. Teachers of the lowest-income students are more than twice as likely as teachers of the highest-income students (56 percent versus 21 percent) to cite lack of access to digital technologies as a "major

Student access to effective online and blended learning also depends on access to quality devices. Not surprisingly, disparities fall along economic lines.

challenge."[22] Preliminary data from the Idaho Leads Project suggest that access is an issue for teachers across the state, with fewer than half of teachers surveyed noting they are able to obtain computers when they need them. Just 28 percent of teachers report having desktops, tablets, or mobile devices that they would characterize as excellent.[23]

Despite these hardware obstacles, students and teachers are putting technology to use in their everyday experiences. In Idaho, 61 percent of students find it easy to collaborate using online documents, and more than half of students surveyed are at ease obtaining information via web-based platforms. Most teachers are feeling encouraged to use technology for teaching and learning, and a large majority (88 percent) want to learn more about making effective use of technology in the classroom.[24]

• CHALLENGES TO OVERCOME, POSSIBLE SOLUTIONS •

Technology has found its way into rural schools on a variety of paths, such as grants from local businesses, innovative educators seeking new ways to engage students, students toting their own smartphones and devices, and the leadership of dedicated administrators. These efforts, often relying on the ideas and will of a single individual or a small team of visionaries, have paved the way for technology to become a more embedded element of rural education. As other educators, administrators, and students witness the success and failure of these pioneers, their curiosity might be piqued, they might observe with disinterest, or they might worry about the change that seems to follow in the wake of any form of technological change. The potential of early endeavors can only be realized when a more systemic effort is undertaken to integrate technology into rural education. To do so, a series of challenges must first be addressed to remove barriers and increase access.

These barriers and issues fall into three categories. First, rural schools and communities need a much **more robust technology infrastructure**, both hardware and software, in order to fully capitalize on the promise of technology. Second, policymakers need to build **effective quality assurance mechanisms** to ensure that technology use in rural schools moves beyond "shiny objects" and actually enhances the quality of instruction and learning. Third, rural schools and students need **much greater flexibility** on a range of issues in order to tap into the full potential of the digital age.

MORE ROBUST TECHNOLOGY INFRASTRUCTURE

Expand broadband access

Access to high-speed Internet brings the potential for cost-effective improvements in healthcare, education, business, and public services. Two recent federal studies estimated that across America, 26 million people do not have access to high-speed Internet. More than 70 percent of those are in rural areas.[25] However, analysis by the National Telecommunications and Information Administration (NTIA) and the Economics and Statistics Administration (ESA) found a more nuanced picture of broadband availability than a simple rural/urban divide. "Exurbs"—which are located within the boundaries of a metropolitan statistical area, have a population density of up to 37 residents per square mile, and are defined as rural—are often lumped together with very rural areas residing outside of metropolitan areas and having a population density of up to 11 residents per square mile. Equal shares of the US population reside in these two types of rural areas—slightly less than 10 percent each. But broadband access is not equivalent between the two. In 2013, 76 percent of "exurban" residents had basic broadband service compared to just 65 percent of residents in very rural areas.[26]

The speed and bandwidth of broadband connections is an essential factor in whether students can access educational opportunities that involve live streaming video, virtual science labs, or other activities that demand greater bandwidth.

It's also not enough to make sure broadband connections exist. The speed and bandwidth of those connections is an essential factor in whether students can access educational opportunities that involve live streaming video, virtual science labs, or other activities that demand greater bandwidth. Connections are deemed "high-speed" at 3 Mbps, yet the State Educational Technology Directors Association (SETDA) recommends that schools have a least 100 Mbps per 1,000 students/staff members. As found by a recent national survey, two-thirds of schools across the country are operating at speeds lower than 25 Mbps.[27] And the targeted ideal connection speed is only moving further away, as SETDA estimates speeds of 1 Gbps will be needed by the 2017–18 school year.[28]

The public is quite attuned to this need. In a recent survey of voters, 83 percent support putting high-speed Internet access in all American public schools within the next five years. Those surveyed were also clear on the ways broadband access could improve

educational opportunities for students, with 88 percent agreeing that high-speed Internet provides access to new learning resources, online educational tools, instruction in foreign languages, college prep tools, and distance learning programs.[29] Strategic actions are needed to channel limited resources in a manner that ensures rural classrooms are technically equipped to access any online educational resources they wish to use.

Evaluate bandwidth use and unmet demand to ensure that broadband expansion meets immediate needs

The federal E-Rate program has been instrumental in providing discounts of up to 90 percent for telecommunication services to schools, but demand has exceeded program funding by about two to one. The Department of Education has found the average school to have Internet connectivity equivalent to the average American home, but serving 200 times as many users. Fewer than 20 percent of educators nationally have an Internet connection that meets their teaching needs.[30] As noted in Johnson, Mitchel, and Rotherham's analysis of federal education policy, the Obama administration's new ConnectED initiative aims to provide 99 percent of schools with access to high-speed broadband Internet within five years.[31]

Educators in very rural areas who struggle with some of the lowest connection speeds are among those most eager to adopt online learning.

The broadband situation was found to be particularly dire in Idaho, which in 2011 was reported to have the slowest Internet connection speeds in the nation.[32] Though the state ranked just 19th in the number of people who had some form of an Internet connection,[33] the speeds available made simple online tasks take roughly four times longer than in other parts of the country. Broadband connections were least likely to be available in rural north Idaho, which is characterized by rugged, mountainous terrain.

To control costs and fund broadband expansion in the most efficient manner possible, states and districts need a clear understanding of actual broadband supply and demand. In Idaho, the Idaho Education Network (IEN) was created to provide broadband Internet access and interactive video to schools statewide. IEN analyzes supply and demand to target expansion efforts to schools and districts that have the greatest need and are most likely to put the additional bandwidth to immediate use. IEN has found that educators in very rural areas who struggle with some of the lowest connection speeds are among those most eager to adopt online learning.[34]

Ensure that school districts have the capacity to maximize their current bandwidth

The connection speed for a school is not indicative of the daily experience of teachers and students who interface with various online learning experiences. If the school network is not appropriately designed and maintained, teachers and students will be held up by connection disruptions and cumbersome lag time. In Idaho, fewer than half of teachers recently surveyed via the Idaho Leads Project characterize the quality of Internet at their school as "excellent or above average."[35] Small school districts are much less likely to have a dedicated information technology (IT) position—just 42 percent of districts with fewer than 2,500 students, compared to 70 percent of districts with 2,500 to 9,999 students and 82 percent of districts with at least 10,000 students.[36] Lack of attention to the on-site setup and upkeep of technology is likely a significant reason that 22 percent of rural schools are found to have "fair" or "poor" technology infrastructure.[37] Rural districts may not be able to fund a dedicated IT position to ensure on-site network efficiency, but could possibly share IT support among neighboring districts. As Johnson, Mitchel, and Rotherham found in their survey of rural superintendents in Idaho, 94 percent indicated they were interested in or are already sharing administrative, financial, or instructional services.[38]

The connection speed for a school is not indicative of the daily experience of teachers and students who interface with various online learning experiences. If the school network is not appropriately designed and maintained, teachers and students will be held up by connection disruptions and cumbersome lag time.

Bring broadband to students outside the schoolhouse

Many visions of digital learning in rural environments involve students accessing online learning resources outside of the school setting, whether at home, in learning hubs based in community centers or churches, or on Wi-Fi-enabled school buses. To make these ideas come to life, broadband access needs to be seamless across settings for students. In Idaho, three different organizations exist to bring broadband to K-12, higher education, and communities and local businesses. Working separately, these organizations tap funding streams dedicated to their respective segments of education and the community. But they will need to work as partners to coordinate those efforts; a strategic vision would provide a helpful framework for their long-term planning.

The Pew Research Center has found that mobile connectivity has risen dramatically in recent years. From 2011 to 2013, smartphone ownership increased from 35 percent to 56 percent of American adults. But just 40 percent of rural adults owned a smartphone in 2013. In 2010, just three percent of American adults owned a tablet computer—but by 2014, 42 percent owned such devices.[39] Rural resident ownership of tablet computers is closer to the national figure at 38 percent.[40] These data suggest that mobile connectivity is becoming more widespread in rural areas. Though uptake is lagging slightly behind non-rural areas, it appears to be increasing steadily and is worthy of inclusion in efforts to increase student access to broadband.

Increase school access to excellent digital software

Within rural schools, teachers and administrators are gaining access to a variety of digital devices, online programs, and video conferencing technology. But the availability of digital learning resources is uneven and does not guarantee they will be used, or used effectively, in the classroom. In spring 2013, researchers from Northwest Nazarene University found that teachers in rural Idaho who tried to implement blended learning for at least one semester perceived it to have benefits for student learning. But the majority of the 627 teachers surveyed hadn't used blended learning in their classrooms at all, noting they lack the time, technology, training, and administrative support to do so. Many educators feel overwhelmed by the array of digital offerings.[41] Districts, states, and outside organizations can help by aggregating digital resources into platforms that make it easier for teachers and students to find applications that meet their needs, align with state standards, and are otherwise useful and appropriate.

It is important to keep in mind that teachers who excel at in-person, face-to-face instruction will not automatically be able to translate their experience and skill to digital settings. Teachers, no matter their level of effectiveness, will need to develop new skills and adapt their instructional style if they are to transition successfully to blended learning techniques and online instruction.

Blended learning and remote instruction can help excellent teachers reach more students. It is important to keep in mind that teachers who excel at in-person, face-to-face instruction will not automatically be able to translate their experience and skill to digital settings. Teachers, no matter their level of effectiveness, will need to develop new skills and adapt their instructional style if they are to transition successfully to blended learning techniques and online instruction. Several steps can be taken to help build the pool of excellent blended learning and online instruction available to rural students.

EFFECTIVE QUALITY ASSURANCE MECHANISMS

Set clear standards and measures for online and blended instruction

The International Association for K-12 Online Learning (iNACOL) has established national standards that describe what online teachers need to know and be able to do.[42] The organization is scheduled to release competencies for blended teaching this summer.[43] It is up to states and districts to put these guidelines into effect, which means developing rubrics for evaluating teacher and program effectiveness. Idaho has developed its own Idaho Standards for Online Teachers, which were approved by the State Board of Education and adopted in 2010 by the Idaho legislature. Teachers who demonstrate proficiency through online teaching, course completion, and documentation of experience can receive an Online Teacher Endorsement. However, the endorsement is not required to teach online in the state of Idaho.[44]

iNACOL has also established standards that articulate characteristics of high-quality online courses, yet standards are unlikely to get much attention without accountability measures. Just as it is essential for states and districts to ensure that brick-and-mortar educational programs and teachers yield satisfactory student growth, online course providers and remote teachers also need to be accountable for student outcomes. The Idaho Digital Learning Academy has implemented a quality control system that is reminiscent of teacher evaluation in more traditional school settings, with online principals conducting weekly virtual "walkthroughs" of courses to monitor the quality of content and delivery. This forms the foundation of what could become a full-blown system for monitoring and improving online education.[45]

Offer training and professional development

Many rural districts will not have the capacity to train educators in the effective delivery of blended and online instruction, but some state-funded online providers are also stepping in offer this support to districts. In Idaho, the Idaho Digital Learning Academy and Idaho Education Network both provide professional development for educators across the state. For example, IDLA's blended learning consortium, revamped in 2009 to focus more explicitly on strategies to personalize instruction with blended learning, now serves 35 of Idaho's 116 school districts.

Build an elite corps of remote teachers

Through live but remote instruction, technology can bring great teaching to rural schools that otherwise struggle with teacher shortages.[46] If the online teaching corps has the same distribution of effectiveness as the in-person teaching force, however, students will not benefit much from access to remote teaching. Public or philanthropic funds could catalyze the creation of an elite corps of proven excellent teachers who would then be made available to students across a state or a multi-state area. This would require certification and licensure issues to be addressed for out-of-state teachers who have shown themselves worthy of entering the elite pool of online instructors.

MUCH GREATER FLEXIBILITY

Allow schools to rethink school staffing and time to improve rural students' access to excellent instruction[47]

As noted above, schools can use digital learning in part to free up great teachers' time to teach other students. In a typical high school schedule, for example, a school's best math teacher might teach four to five classes per day. If those classes alternated days between the teacher and a digital lab where students could work on self-paced learning, it would free between 10 and 12 periods for the teacher every week. She could teach two additional classes, while having time left over for additional planning. Or, a teacher with leadership skills could use the freed time to become a "multi-classroom leader," overseeing a team of teachers and paraprofessionals to take responsibility for a larger number of students.

In a typical high school schedule, for example, a school's best math teacher might teach four to five classes per day. If those classes alternated days between the teacher and a digital lab where students could work on self-paced learning, it would free between 10 and 12 periods for the teacher every week. She could teach two additional classes, while having time left over for additional planning.

In addition, teachers are not actively engaged in instruction 100 percent of the time. A portion of every teacher's school day is spent on other activities, such as overseeing students as they engage in independent practice or group projects, handling administrative tasks, and supervising the lunch room or bus line. This means the valuable instructional skill of the best teachers in a school, district, and state are underutilized for a large part of each school day. This is true in non-rural schools, but is perhaps an

even greater issue in rural schools that need members of their staff to play a variety of roles in addition to their primary function. Rethinking roles and schedules could enable great teachers to spend more time on instruction or on leading their peers, placing more students under their responsibility.

These changes could help students gain access to great teaching. But they could also make the teaching career more attractive in rural schools. As great teachers took on more students, they could earn more within existing school budgets, and have a way to advance in their careers while continuing to teach. These benefits might, in turn, attract more high-caliber candidates into rural teaching, and retain more of the most effective educators over time. Schools could offer what Public Impact has termed an "Opportunity Culture," in which excellent teachers extend their reach to more students directly and by helping their peers succeed.

Maximize flexibility to group students as needed

Digital learning time, facilitated by a paraprofessional, frees up excellent teachers to instruct more students.[48] Yet well-intentioned state policies such as class size and line of sight restrictions—policies that dictate the number of students who are in a classroom or are within sight of a certified teacher—make it challenging for local schools to group students in ways that incorporate digital learning time into the day.

Some rural schools also face challenges regarding physical space available for groups of students. In some cases, the digital learning lab is classroom space that is made available to each otherwise non-digital class in the school building at regular intervals. With greater flexibility to form large groups of students to work on skills practice and project work, more students could be supervised in a digital learning lab setting during portions of the day. This could mean rethinking the digital lab space, from a standard wired classroom to a larger space that can accommodate students from multiple classrooms at a single time.

Support districts seeking to exchange online instruction

Sperry and Hill's paper on political considerations describes a district that was unwilling to give up its own chemistry teacher to a teacher-sharing arrangement with a neighboring district.[49] Though some rural education leaders are hesitant to give up the tradition of a teacher in an on-site classroom, others are eager to access live, remote instruction for their students. The IEN provides infrastructure for remote teachers to instruct students across the state using real-time, two-way video conferencing. IEN offers a mechanism for districts to share the best of their local teaching, including place-based instruction that could hold relevance for students in neighboring and regionally similar settings. Informal district partnerships have emerged to share instruction across

this network, such as the 3-Rivers Consortium. This partnership of six school districts, based on a trade-like economy in which each participating district agrees to offer at least one course, has allowed students to access instruction in Spanish and calculus, plus special-interest courses such as military history. Participating districts have noted scheduling challenges, as their grading periods, holiday and spring breaks, and even deadlines for establishing class rosters are not aligned.[50] A centralized exchange website could be established to help districts across the state align key dates within the school year, broadcast the courses they are able to offer remotely, and request courses based on their own district needs.

Funding restrictions

Digital and online learning have the potential to help local districts achieve cost efficiencies while improving student access to wider course selection and learning activities. Yet local budgets and state funding structures can make it difficult for district leaders and educators to fund digital strategies.

Local budgets and state funding structures can make it difficult for district leaders and educators to fund digital strategies.

Many districts could fund a "digital conversion" by reallocating funds that are currently being used for non-essential staff positions, textbooks, and other purposes. Leaders such as Superintendent Mark Edwards of Mooresville Graded School District in North Carolina have shown that it is possible to implement a district-wide shift to technology-based classrooms within current budgets. Mooresville is widely touted as ranking 100th in the state for per pupil spending but third in the state for student outcomes.[51] Edwards says that the key to his district's success was a focus on the culture shift that needs to accompany a "digital conversion," rather than the purchase of expensive technology and programs. Part of this culture shift included reallocation of funds from 65 jobs, putting pressure on the district to ensure that technology was truly used to deliver education in a more efficient and effective manner.

States can support this type of local innovation by allowing districts greater control over how they use state funds. One of the biggest constraints on districts in states such as Idaho is funding tied to specific position types or other input categories. As noted in Marguerite Roza's report on the relationship between spending and outcomes in rural districts, there is currently a poor relationship between spending and student outcomes in rural districts.[52] Yet some rural districts exhibit very high return on investment, suggesting that their rural counterparts might be able to apply similar strategies within their own context.

Local districts need to determine the best use of funds for infrastructure, professional development, and staffing. If a district is able to offer students a better instructional program using online resources or a new combination of teachers and class sizes, it should not lose access to state funds that are locked into non-strategic categories. For instance, in the 2013–14 school year, 40 districts in Idaho aimed to save costs by shifting to a four-day school week.[53] Since Idaho law reimburses districts for up to 85 percent of their transportation costs, most of the transportation costs saved were not available for districts to reallocate. Local innovation is facilitated when a district has the ability to shift funds for textbooks, materials, or teaching positions to lease or purchase laptops, establish a more powerful data system to personalize instruction, or provide much needed training to staff as they implement blended learning techniques, within the limits of its overall budget.

Local districts need to determine the best use of funds for infrastructure, professional development, and staffing. If a district is able to offer students a better instructional program using online resources or a new combination of teachers and class sizes, it should not lose access to state funds that are locked into non-strategic categories.

• ROLES FOR POLICY AND PHILANTHROPIC LEADERS •

Educators and district leaders in rural areas could act on—and are already acting on—many of the ideas floated in this analysis. Keeping in mind that these efforts are often nascent and not yet proven by research, there are several actions state policymakers and philanthropic leaders can take to ensure that the full potential of technology is harnessed for rural education, in terms of both quality and scale. This concluding section summarizes some of the critical steps each of these actors could take.

MAKE POLICY TO PROMOTE QUALITY-FOCUSED RURAL-ED TECH

The opportunity for policymakers runs parallel to the three sets of challenges outlined in the previous section. Among the most important policy roles are:

- ***Ensuring widespread broadband access.*** Although states such as Idaho have made great progress on this front, it should remain a priority for leaders in all states, especially those with substantial populations of rural students, to continue improving access and speed and to spread it even beyond the walls of the schoolhouse. While families and communities with means will have ever-expanding and improving access without policy intervention, a critical role for state leaders is to avoid the "digital divide" that could result if disadvantaged students and communities lag behind.

- ***Insisting on quality.*** The proliferation of devices and software will not, by itself, lead to improvements in the quality of schooling. In fact, the track record of technology as a transformative force in public education is poor.[54] State leaders are in a unique position to drive the resulting activity toward achievement of goals for students' academic success. The most important state policy role is maintaining high standards for student learning, along with an accountability system that rewards schools for achieving high levels of student growth and acts swiftly to induce changes when a school or districts' students are stagnating. But this system needs to evolve for the digital age. For example, on-demand assessments should increasingly replace tests that occur only at the end of the school year, to enable students and schools to vary the timing and pace of student work based on their needs.[55]
- ***Removing barriers.*** State policy generally does not stand in the way of schools' using technology as an add-on to the existing delivery model—for example, placing computers at the back of the classroom and enabling students to use them during class time. But many of the ideas sketched above require more fundamental changes in staffing patterns; student assignments to classrooms; and how schools spend money on personnel, facilities, and technology. Depending on the state policy context, many of the shifts may be difficult or impossible to make within the constraints the state places on school spending, teacher compensation, class sizes, seat time, paraprofessional roles, and other matters.[56] Clearing these barriers should be a top priority for state policymakers, either through overall relaxation of constraints or through waivers and exemptions in response to district-submitted flexibility plans.

INVESTMENTS IN INNOVATION, QUALITY, AND SCALE

Infusing rural education with more technology should not, in theory, raise the overall operating costs of rural schooling in the long run. School districts may spend more on hardware and software, but they also should be able to realize commensurate changes in facilities costs, staffing costs, and other expenses to proceed in a cost-neutral fashion.

Public and private investments can play a critical role in helping rural education cover start-up and transition costs that a shift to fundamentally new models would surely entail. Here, we sketch two examples:

- ***Launching an elite remote teaching corps.*** Above, we outlined the idea of an elite remote teaching corps: a carefully selected cadre of teachers, perhaps from multiple states, who can be made available to teach students wherever they live using ever-improving two-way communication technology. If such a corps existed, it could likely subsist on payments made by districts, who could employ the remote corps when they were unable to find top-notch in-person teachers in (for example) advanced subjects, or subjects in which they have only a few students seeking to enroll. But launching an elite remote teaching corps would require significant investments for activities such as identifying the highest-priority needs; designing a selection process; carrying out an initial recruitment process; making initial investments in infrastructure (e.g., a facility in Boise where many remote teachers might work); and developing a "business model" that works for both the corps and its "customers." A substantial multi-year investment could then yield dividends for years to come, as many more students statewide would have access to great teaching and teachers would have a career path that enabled them to serve students everywhere.
- ***Making the shift to new models.*** Similarly, districts seeking to transform their local delivery models in the ways described above should be able to run those models in the long term using existing dollars. But making the transition would pose costs. Districts and schools would need to engage in substantial upfront planning to design new models that would be sustainable and educationally vibrant over time, planning that would require increasing internal staff and/or the use of consultants so that existing district and school staff could continuing "flying the plane" during redesign. A competitive "request for proposals" could induce districts to propose bold plans and then receive funding to engage in redesign work, with the promise of financial sustainability after a start-up period.

These are just two examples of ways policymakers and philanthropists could make strategic investments with long-term "payoff." Combined with smart policy, along with the innovation already underway and flourishing in many rural classrooms, these investments could pave the way for a new future for rural students and their communities.

• ENDNOTES •

1 For examples, see program evaluations conducted by the Place-Based Education Collaborative, http://www.peecworks.org/index.

2 Emily Ayscue Hassel and Bryan C. Hassel, *An Opportunity Culture for All: Making Teaching a Highly Paid, High-Impact Profession* (Chapel Hill, NC: Public Impact, 2013), http://opportunityculture.org/wp-content/uploads/2013/09/An_Opportunity_Culture_for_All-Public_Impact.pdf.

3 Daniel Player. "The Supply and Demand for Rural Teachers." (forthcoming).

4 David H. Monk, "Recruiting and Retaining High-Quality Teachers in Rural Areas," *Excellence in the Classroom* 17, no. 1 (2007): 155–174.

5 Jacob Fowles, J. S. Butler, Joshua M. Cowen, Megan E. Streams, Eugenia F. Toma, "Public Employee Quality in a Geographic Context: A Study of Rural Teachers," *The American Review of Public Administration* (2013).

6 See "The Supply and Demand for Rural Teachers.

7 Patricia A. Bauch, "School-Community Partnerships in Rural Schools: Leadership, Renewal, and a Sense of Place," *Peabody Journal of Education* 76, no. 2 (2001): 204–221.

8 Luke Currie Miller, PhD, "Valuing Place: Understanding the Role of Community Amenities in Rural Teacher Labor Markets" (PhD diss., Stanford University, 2008), retrieved from http://gradworks.umi.com/33/32/3332886.html.

9 Gundars Rudzitis, "Amenities Increasingly Draw People to the Rural West," *Rural Development Perspectives* 14, no. 2 (1999): 9–13.

10 For information about the Idaho Leads Project, see http://education.boisestate.edu/idaholeads/. For the PTECH Network, see http://www.jkaf.org/initiatives/education-choice/grants-available-for-creation-of-innovative-p-tech-schools/. And for Khan Academy in Idaho, see http://www.khanidaho.org/.

11 For a more complete discussion of how technology can give more students access to excellent teachers, see B.C. Hassel and E.A. Hassel, "Teachers in the Age of Digital Instruction," *Education Reform in the Digital Era* (Fordham Institute, 2012), http://edexcellence.net/publications/education-reform-for-the-digital-era.html.

12 National Center for Education Statistics, *Schools and Staffing Survey, 2011–2012* (US Department of Education, 2013), http://nces.ed.gov/surveys/sass/tables/sass1112_2013312_s12n_007.asp.

13 The EdSurge Edtech Index, retrieved from https://www.edsurge.com/products/.

14 Heather Staker et al., *The Rise of K–12 Blended Learning* (San Mateo, CA: Innosight Institute, 2011): 6, retrieved from http://www.innosightinstitute.org/innosight/wp-content/uploads/2011/01/The-Rise-of-K-12-Blended-Learning.pdf.

15 See "The Supply and Demand for Rural Teachers."

16 For more on this topic, see A Better Blend (Public Impact, 2013).

17 For example, see articles on wireless-equipped bus fleets in Becker, MN, and Eastern Carver County, MN. Kevin Allenspach, "Students in Becker, Minn., Access Internet on the Bus," *Government Technology*, January 27, 2014, http://www.govtech.com/education/Students-in-Becker-Minn-Access-Internet-on-Bus.html. Kelly Smith, "Eastern Carver School District Gets Wi-Fi on School Buses," *Star Tribune*, March 10, 2013, http://www.startribune.com/local/west/196791221.html.

18 For more details on this concept, see "Schedule Example: 1/2 Time in Digital Learning per Subject—Secondary Rotations" (Public Impact, 2012), http://opportunityculture.org/wp-content/uploads/2012/05/Half_Time_Digital_Secondary_Rotation-Public_Impact.pdf.

19 Cathy Cavanaugh et al., "The Effects of Distance Education on K-12 Student Outcomes: A Meta-Analysis (Naperville, IL, Learning Point Associates/North Central Regional Educational Laboratory, 2004).

20 Gary Miron and Jessica L. Urschel, "Understanding and improving full-time virtual schools" (National Education Policy Center, 2012), http://nepc.colorado.edu/files/nepc-rb-k12-miron.pdf.

21 University of Arkansas, "Internal Evaluation of the Arkansas Virtual Academy School" (2012), http://www.edweek.org/media/uofarkansasstudy.pdf.

22 Kristen Purcell et al., "How Teachers are Using Technology at Home and in Their Classrooms," Pew Research Center's Internet & American Life Project (2013), http://www.pewinternet.org/2013/02/28/how-teachers-are-using-technology-at-home-and-in-their-classrooms/.

23 Preliminary data obtained from Idaho Leads Project on April 24, 2014. Data derived from Clarity technology audit powered by BrightBytes Consulting.

24 Ibid.

25 Diette Courrégé Casey, "Growing Bandwidth Demands Create Challenge for Rural Schools," *Rural Education* (blog), Education Week, October 19, 2012, http://blogs.edweek.org/edweek/rural_education/2012/10/growing_bandwith_demands_creates_challenge_for_rural_schools.html.

26 David Beede and Anne Neville, "Broadband Availability: Beyond the Rural/Urban Divide" (National Telecommunications and Information Administration and the US Department of Commerce's Economics and Statistics Administration, 2013), http://www.ntia.doc.gov/files/ntia/publications/broadband_availability_rural_urban_june_2011_final.pdf.

27 Karen Cator, "Broadband Availability to U.S. Schools and Colleges," *Home Room* (blog), Institute of Education Sciences, US Department of Education, 2013(?), http://www.ed.gov/blog/2011/03/broadband-availability-to-u-s-schools-and-colleges/.

28 Christine Fox et al., "The Broadband Imperative: Recommendations to Address K-12 Education Infrastructure Needs" (Washington, DC: State Educational Technology Directors Association, 2012), http://www.setda.org/wp-content/uploads/2013/09/The_Broadband_Imperative.pdf.

29 Joel Benenson and Amy Levin, "Summary of Broadband Access Survey" (Benenson Strategy Group, 2014), survey commissioned by the Leading Education by Advancing Digital Commission, http://leadcommission.org/sites/default/files/3045%20Common%20Sense%20Media%20Broadband%20Access%20Memo%20FIN.pdf.

30 The White House, "ConnectED: President Obama's Plan for Connecting All Schools to the Digital Age" (2014), http://www.whitehouse.gov/sites/default/files/docs/connected_fact_sheet.pdf.

31 Lars D. Johnson, Ashley LiBetti Mitchel, and Andrew J. Rotherham, "Federal Education Policy in Rural America," (2015) http://www.rociidaho.org/wp-content/uploads/2015/01/ROCI_2014FedEdPolicy_FINAL_0115.pdf

32 Katherine Q. Seelye, "For Idaho and the Internet, Life in the Slow Lane," *New York Times*, September 13, 2011, http://www.nytimes.com/2011/09/14/us/downloads-are-slowest-in-idaho-study-finds.html.

33 *Governing Magazine*, "Internet Connectivity, Usage Statistics for States," July 2013, http://www.governing.com/gov-data/internet-usage-by-state.html.

34 Interview with Julie Bell, Communications Director for the Idaho Education Network, February 18, 2014.

35 Preliminary data obtained from Idaho Leads Project on April 24, 2014. Data derived from Clarity technology audit powered by BrightBytes Consulting.

36 Lucinda Gray and Laurie Lewis, *Educational Technology in Public School Districts: Fall 2008* (NCES 2010-003, 2009), National Center for Education Statistics, Institute of Education Sciences, US Department of Education, http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2010003.

37 Debbie Alexander and Laurie Lewis, *Condition of America's Public School Facilities: 2012–13* (NCES 2014-022), US Department of Education, Washington, DC: National Center for Education Statistics, http://nces.ed.gov/pubs2014/2014022.pdf.

38 See "Federal Education Policy in Rural America."

39 Pew Research Internet Project, "Broadband and smartphone adoption demographics," August 27, 2013, http://www.pewinternet.org/2013/08/27/broadband-and-smartphone-adoption-demographics/.

40 Author analysis of data available from Pew Research Internet Project, January 2014 E-reading and Gadget Omnibus Survey, http://www.pewinternet.org/datasets/january-2014-e-reading-and-gadgets-omnibus/.

41 Eric Werth, Lori Werth, and Eric Kellerer, *Transforming K-12 Rural Education through Blended Learning: Barriers and Promising Practices* (iNACOL, October 2013), http://www.inacol.org/cms/wp-content/uploads/2013/10/iNACOL-Transforming-K-12-Rural-Education-through-Blended-Learning.pdf.

42 iNACOL, *National Standards for Quality Online Teaching, Version 2* (October 2011), http://www.inacol.org/cms/wp-content/uploads/2013/02/iNACOL_TeachingStandardsv2.pdf.

43 See *Education Week*, January 29, 2014.

44 See Idaho page, Keeping Pace with K–12 Digital Learning, http://www.kpk12.com/states/idaho/.

45 For more on accountability in the digital age, see iNACOL, *Measuring Quality from Input to Outcomes*, http://www.inacol.org/cms/wp-content/uploads/2012/11/iNACOL_Quality_Metrics.pdf; Public Impact, *Virtual Schools: Assessing Progress and Accountability* (Washington, DC: National Charter School Resource Center, 2014).

46 See *A Better Blend*.

47 For more on the concepts in this section, see Hassel and Hassel, An Opportunity Culture for All, 2014.

48 See A Better Blend.

49 Samuel R. Sperry and Paul T. Hill, "The Politics of K-12 Education in Small Rural School Districts: The Case of Idaho," (2015) http://www.rociidaho.org/wp-content/uploads/2015/01/ROCI_2014_K-12Politics_FINAL.pdf

50 3-Rivers interview

51 Alan Schwarz, "Mooresville's Shining Example (It's Not Just About the Laptops)" *New York Times*, February 12, 2012, http://www.nytimes.com/2012/02/13/education/mooresville-school-district-a-laptop-success-story.html.

52 Marguerite Roza, "Innovations Amid Financial Scarcity: The Opportunity in Rural Schools," (2015) http://www.rociidaho.org/wp-content/uploads/2015/02/ROCI_2015_InnovationAmidScarcity_Final.pdf

53 Rural Education, "Review of a 4-Day School Week," Idaho State Department of Education (Date unknown), https://www.sde.idaho.gov/site/ruraleducation/.

54 Larry Cuban, *Oversold and Underused: Computers in the Classroom* (Cambridge, MA: Harvard University Press, May 30, 2003).

55 See iNACOL, *Measuring Quality from Input to Outcomes*; Public Impact, *Virtual Schools: Assessing Progress and Accountability*.

56 See *A Better Blend* for more detail on the likely policy constraints facing technology-enabled school modes.