Technology Implications for Missouri Public Schools in the Era of COVID-19

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As a result of the COVID-19 pandemic, many schools were forced to pivot to fully online instruction and learning. As a result, adequate and reliable internet access became an even larger priority than in years past. Historically, Missouri has lagged national trends and recommendations on adequate internet speeds. In response, Governor Mike Parson allotted $50 million in Coronavirus Aid, Relief, and Economic Security Act (CARES Act) funding to improve and expand broadband internet access, with $10 million directed to augment K-12 distance learning.[1] These investments have improved available bandwidth in the state, but it remains unclear if these changes will be sustained after the expiration of CARES Act stimulus funding. In this policy brief, we consider the gap in technology access for Missouri's school districts brought to light by the recent coronavirus pandemic. We further describe how trends in Missouri's internet access lag those of our neighboring states and the nation, specifically regions with similar rural populations, and why rectifying these gaps is vital to meet students' educational needs.

Introduction

Over the last twenty years, technology has become increasingly critical to daily life. Cell phones are standard communication tools and the internet has become an indispensable daily resource. Schools have recognized the need to cultivate technology skills in their students to sustain their learning and competitiveness in future job markets. The COVID-19 pandemic has amplified technology's role in schools, especially given that technology may enhance learning, provide access to limitless information, and facilitate student creativity and collaboration. However, many of technology's benefits are useful only if students have sufficient and reliable internet access and speed. The COVID-19 pandemic has illuminated gaps in internet access across states, while simultaneously shining a light on the lack of home internet access crucial for distance learning.

To keep up with today's digital technology, schools must continually increase internet bandwidth, the amount of data transferred from one point to another measured in bits per second. Greater bandwidth means faster and more efficient internet access. High bandwidth is especially important today given the increased demand for consistent internet access in schools as they use video conferencing and other technological resources to enhance learning. As a result, state governments have made improving internet access and broadband infrastructure a policy and budgetary priority.[2] Still, states like Missouri have yet to achieve minimum recommended speeds for internet access in all schools while geographic gaps in equal internet access persist as well.

FCC Recommendations for Education

Prior to 2018, the Federal Communications Commission (FCC) recommended a minimum standard bandwidth of 100 kilobits per second (Kbps) per student for schools to best facilitate online learning.[3] Two-thirds of the nation's districts that had previously achieved this threshold have made additional upgrades to improve their classroom bandwidth capabilities.[4] In 2018, the FCC increased its recommended adequate bandwidth level to one megabit per second (Mbps) per student.[5] Because the average Missouri public school district serves about 1,600

Special points of interest:

- In 2018, the Federal Communications Commission (FCC) increased the recommended per student bandwidth from 100 Kbps to 1 Mbps

- Over half of Missouri's traditional public school districts fail to meet the minimum recommended broadband speed

- One in five Missouri students does not have home internet access, severely hampering distance and virtual education options

- In response to the pandemic and shutdown, Gov. Parson allotted $50 million of the state's COVID-19 relief funds to improving broadband

students, adequate connectivity in Missouri schools would need to be at or above 1,600 Mbps.[6]

Many states have prioritized improving internet connectivity to facilitate its effective use in schools. For example, after designating connectivity a key statewide initiative, one hundred percent of Arkansas' K-12 districts were connected to broadband through the Arkansas Public School Computer Network in July of 2017.[7] Today, 99% of Arkansas school districts meet the minimum recommended bandwidth, trailing only Hawaii and South Dakota.[8] By comparison, only 43% of Missouri's school districts meet the minimum one Mbps per student FCC recommendation.[9]

Before the COVID-19 shutdown, 17 of Missouri's 516 traditional public school districts failed to meet the prior FCC minimum standard of 100 Kbps.[10] At the time of publication, only four of the state's districts still failed to meet the 100 Kbps standard; 277 of the state's districts have failed to meet the new one Mbps per student guideline.[11] Further, while 97% of the state's students attend schools that meet the minimum standard, only 20% are sustaining the one Mbps level, compared with 24% nationally.[12] Among Missouri districts meeting the minimum 100 Kbps standard, the median register of bandwidth is 615 Kbps per student, versus a 676 Kbps national average.[13] Arkansas' median register of bandwidth is 1,553 Kbps per student.[14]

While Missouri's school internet infrastructure remains lacking, a collaboration between the Missouri Department of Elementary and Secondary Education, the Governor's Office, and the Education Superhighway is working to rectify this. This collaboration intends to leverage state matching funds to expand fiber infrastructure, give schools sufficient bandwidth, establish robust Wi-Fi connections in all classrooms, and improve affordability using E-rate funds.[15] This partnership has been mostly successful, as evidenced by the increased percentage of schools with fiber connections over the last four years.

Technology & COVID-19

The advent of the COVID-19 pandemic and subsequent shutdown has introduced a new dimension to the digital divide, as schools must consider ways to increase internet access and enhance online learning. Not only are schools

Table 1 : National School District Technology Initiatives Amid the Pandemic[20]

School District	Initiative	Funding Source
Albuquerque (NM) Public Schools	Purchased hotspots for families in need	Operating funds
Arlington (TX) Independent School District	Providing temporary plans to promote internet access	Partnership with private companies
Baltimore (MD) Public Schools	Guest and student wireless high-speed broadband networks expanded to reach 200 facilities including libraries, public schools and community centers	Baltimore City Government
Buffalo (NY) Public Schools	2,000 MiFi mobile hotspots available at four community schools	Operating funds
Cobb County (GA) School District	Digital Campaign to purchase 600 hot spot devices	Cobb Schools Foundation
Detroit (MI) Public Schools	Subsidized LTE data through Connected Futures Project	DTE Energy Foundation, Quicken Loans Community Fund, and the Silkman Foundation.
Fairfax County (VA) Public Schools	Content and classes broadcast over cable channels	
Miami Dade (FL) Public Schools	Distributed 11,000 phones through the 1 Million Project for use as hotspots	1 Million Project Foundation
Shelby County (TN) Public Schools	Providing low-cost devices	Tennessee DE working w/Dell, Microsoft & SHI

Source: Center on Reinventing Public Education

concerned with their own bandwidth capabilities, but they also must consider the broadband capabilities available to their students at home. As the role of technology in schools has grown, so too has a concern over the "homework gap," defined as school-age children lacking the internet access needed to complete schoolwork at home, in part due to underconnectivity in many communities.[16] These concerns have only increased following the COVID-19 pandemic, as 58% of eighth graders responding to a Pew Research Center poll say they rely on the internet for their homework almost every day.[17]

Most districts have supported a variety of remedies for the lack of student connectivity, which has altered the course of student learning. To make access more equitable, many internet service providers offered 60

days of free internet to new customers, low-cost internet, or increased data usage at no cost. These efforts, for example, have enabled individuals to use their cell phones as Wi-Fi hotspots.[18]

Some districts have devised unique ideas to increase access. For example, the Cy-Fair (Texas) Independent School District (ISD) approved up to $44 million to supply Chromebooks and hotspots for its 117,000 students to support home learning, funded through a bond package approved by voters in 2019.[19] The San Antonio ISD is leveraging existing fiber-optic network infrastructure to connect 20,000 students' homes to their schools' wireless networks.[20] Tables 1 and 2 outline some additional notable connectivity initiatives from districts across Missouri and the nation.

Table 2 : Missouri School District Technology Initiatives Amid the Pandemic		
School District	Initiative	Funding Source
Columbia Public Schools[22]	Wi-Fi can be used outside CPS buildings until 10:00pm; Socket: free internet for 90 days; Charter/Spectrum: 60 days free internet; Mediacom: offering low cost internet; 400 hotspots.	District funds
Jefferson City Public Schools[23]	Wi-Fi can be accessed outside school buildings	N/A
Kansas City 33 Public Schools[24]	Mobile hotspots	Issued by district
Parkway C-2 School District[25]	Wireless hotspots provided through requests; Charter/Spectrum 60 days free internet; low cost internet through everyoneon.org	District funds
Poplar Bluff School District[26]	Extended Wi-Fi to parking lots around town; low cost internet or removing data caps through ATT, Sparklight, and Verizon	N/A
Saint Louis Public Schools[27]	60 days free internet from Charter/Spectrum or ATT.	N/A
Springfield Public Schools[28]	Purchased an additional 2,000 Wi-Fi hotspots bringing the total number to 2,800	$373,146 out of technology budget
Sources: Information drawn directly from school district websites		

## Access Issues in Rural Missouri

Districts that implemented online learning have found that students without robust internet access miss critical instruction time, as well as the opportunity to collaborate with peers, retrieve enrichment resources, and utilize educational tools.[29] Unfortunately, approximately one fifth of Missouri students lack home internet access.[30] As the map below illustrates, home Internet access varies substantially by geography. Across the most rural school districts in Missouri, it is not uncommon for over a quarter of households to lack Internet access. It is also important to note inequitable access in more populated areas. Roughly one quarter of households in the St. Louis City and Kansas City Public School districts do not have internet access. By contrast, less than 10% of households lack internet access in the majority of districts in their respective surrounding suburbs.

Lack of access in rural school districts is not uncommon across the country, but some states have made greater strides than others. Another state with a substantial number of rural districts is Arizona, where only 13% of the state's households lack internet access.[31]

Rural broadband access is especially important in Missouri. The state's connectivity issues have persisted for nearly 25 years, an issue which may be ameliorated through policy changes. The passage of House Bill 620 by the Missouri General Assembly in 1997 restricted "any entity" from providing broadband services to residents.[32] Challenges to this statute have been unsuccessful and its regulations continue to hamper connectivity expansion. Although Missouri has experienced a 79% decline in broadband prices since 2015, cost remains a formidable deterrent for many.[33] Rural residents often are charged more for internet access due to population sparsity, which often leads to increased service costs.[34]

Currently, Missouri ranks 42nd in the nation for broadband connectivity, leading Governor Parson to expand the state's focus on broadband access by allocating $5 million to the Rural Broadband Development Fund and by creating a Broadband Development Office.[35] While these steps likely will improve Missouri residents' internet access, many issues remain. Much of Missouri consists of farmland, characterized by large agricultural zones and

Figure 1: Percent of Households Without Internet Access by Missouri School District
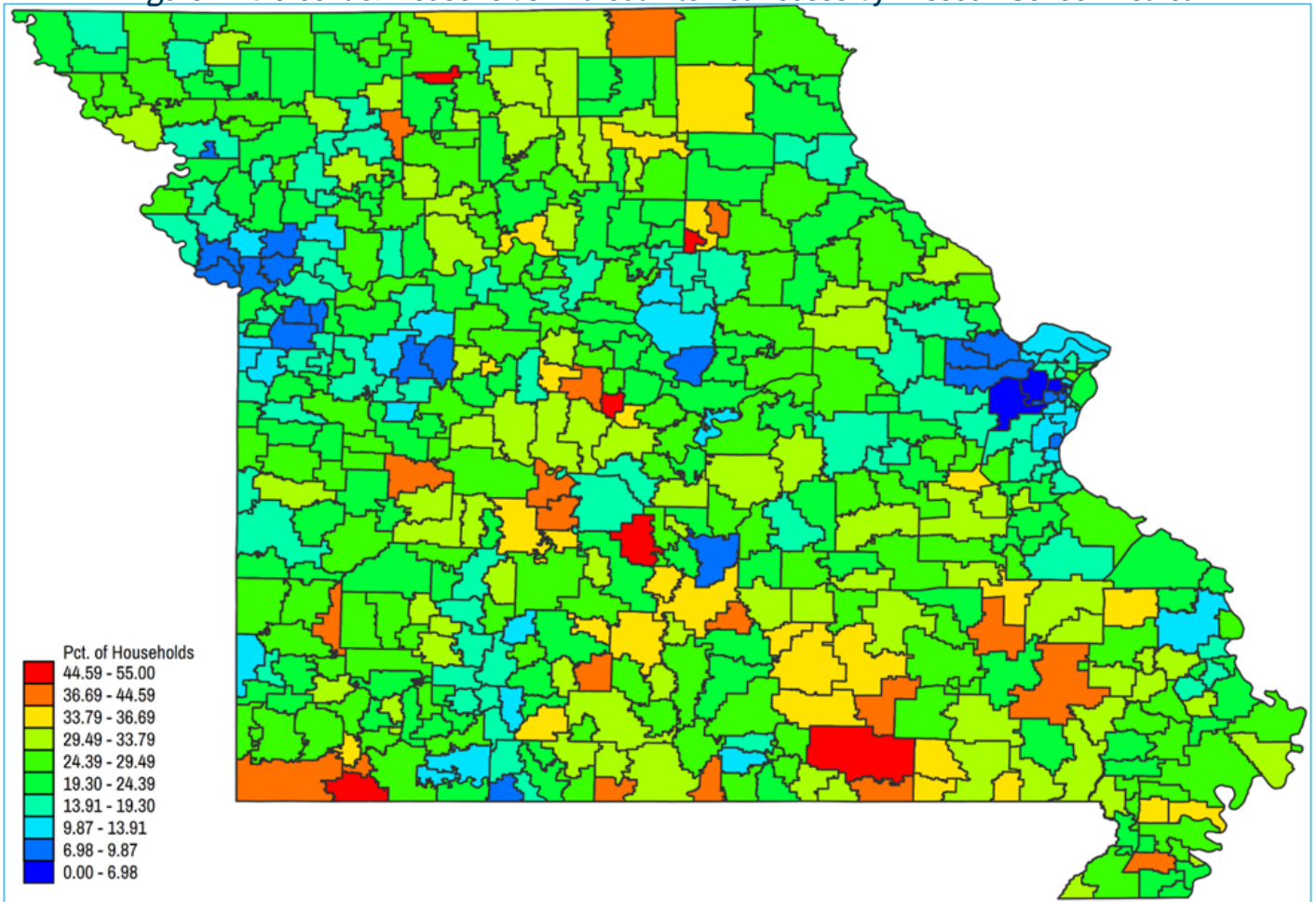
other low-density land-use. Because of this, telecom companies have a low return on investment in these areas, making fixed broadband the only option for residents in these areas.[36] Municipal and state governments cannot support local communities by offering or leasing broadband services, leaving electric cooperatives to pick up the slack. Recognizing the dire need for access in more remote areas, the Missouri State Assembly amended state laws to encourage rural electric coops to establish broadband networks. Still, these initiatives are primarily limited to cities and towns surrounding lesser-served areas.[37]

In recent years, the focus on technology integration has been placed primarily on resource acquisition. Teacher attitudes, however, can have just as profound an impact on the successful implementation of technology-focused learning strategies. While research has found that inconsistent computer and internet access makes it extremely difficult to integrate technology into existing lesson plans, deficient professional development and training was the most commonly cited reason for lack of technology

implementation.[38] Administrators can advocate for the latest equipment in connectivity and promote cutting-edge online resources, but impediments to digital education still exist. Thought must also be given to the amount of time required for implementation, the level of teacher competence with the device or program, and the amount of input afforded to teachers during the selection of resources.[39]

Conclusions & Implications

Despite Missouri's weak broadband infrastructure, reasons for optimism remain. In response to the pandemic, some internet providers have offered discounts and free access to qualifying families, helping some obtain online access.[40] However, many of these programs are temporary and more advocacy may be needed to make these changes permanent. Recently, the FCC launched the $20 billion Rural Digital Opportunity Fund to assist with connectivity.[41] Six Missouri Broadband Providers received $103 million in support from the USDA Pilot Reconnect Program, including several utility districts.[42]

In the Summer of 2020, Governor Parson announced that $50 million in CARES Act funding would be allocated to establish a reimbursement fund for broadband providers that assist students or vulnerable populations, and to LEAs that try to increase student connectivity.[43] However, connectivity shortfalls remain prevalent across the state and will not abate when the pandemic ends and students are able to safely return to in-person schooling. The fact remains that Missouri has legislative and structural issues that have hampered broadband infrastructure expansion, rendering the state among the lowest rated in the nation for connectivity. Finding solutions without an additional infusion of federal stimulus aid is not impossible, as other predominantly rural states like Arkansas and Arizona have demonstrated prior to the pandemic. It remains unclear if the measures facilitated by CARES Act funding will serve as the foundation for permanent change or if Missouri's technological infrastructure improvements will regress when stimulus funding is exhausted.

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