

Broadband Connectivity at Schools in New Mexico

Prospects for Distance Learning 2020-2021



Broadband is a transmission technique

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1Mbps = 1 Million

Public School Capital Outlay Act

Education Technology Infrastructure and Education Technology Infrastructure Deficiency Corrections Initiative

- Section 2. Paragraph M: “Up to ten million dollars (\$10,000,000) of the fund may be expended each year for an education technology infrastructure deficiency corrections initiative pursuant to Section 4 of this 2014 act; provided that funding allocated pursuant to this section shall be expended within three years of its allocation.”

Education Technology Infrastructure Legislation

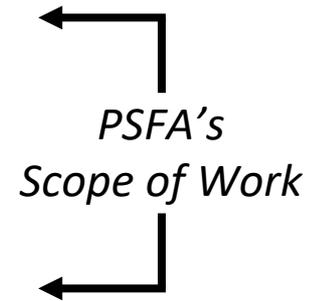
SB 159 (2014) - Education Technology Infrastructure:

- Section 3.B.2 (c): “In an emergency in which the health or safety of students or school personnel is at immediate risk, the council may award grant assistance for a project using criteria other than the statewide adequacy standards.”
- Section 3.B.3 (d): “Any other financing concept that may maximize the dollar effect of the state grant assistance.”

Broadband and Ed Technology Components

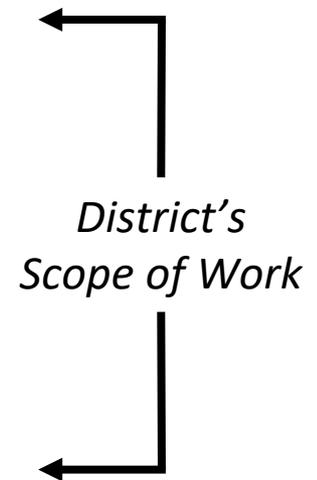
School-based Capital Project Infrastructure

- Category 1 projects: Fiber-optic cable.
- Category 2 projects: Network equipment.



Student Connectivity and Network Operations

- Service agreements for the school sites.
- Purchase of user devices.
- Vouchers for service at homes.
- Service and support for software/hardware.
- Network security and content filtering.

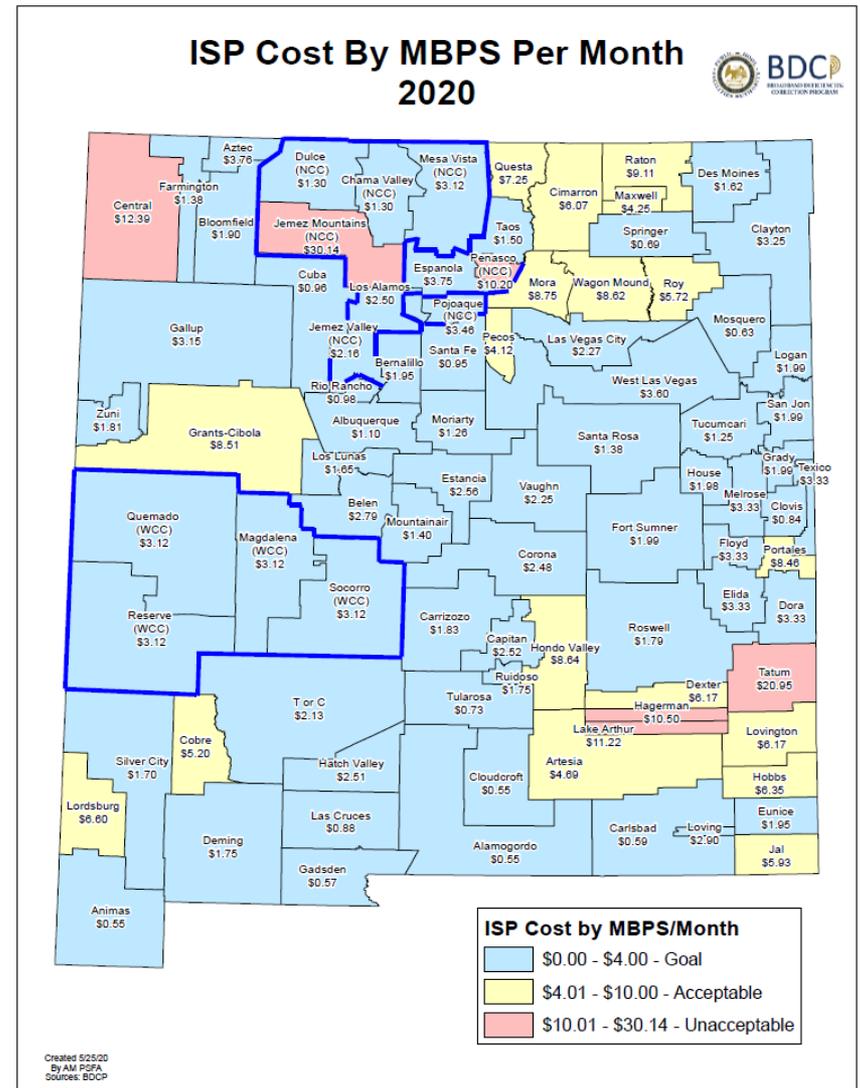
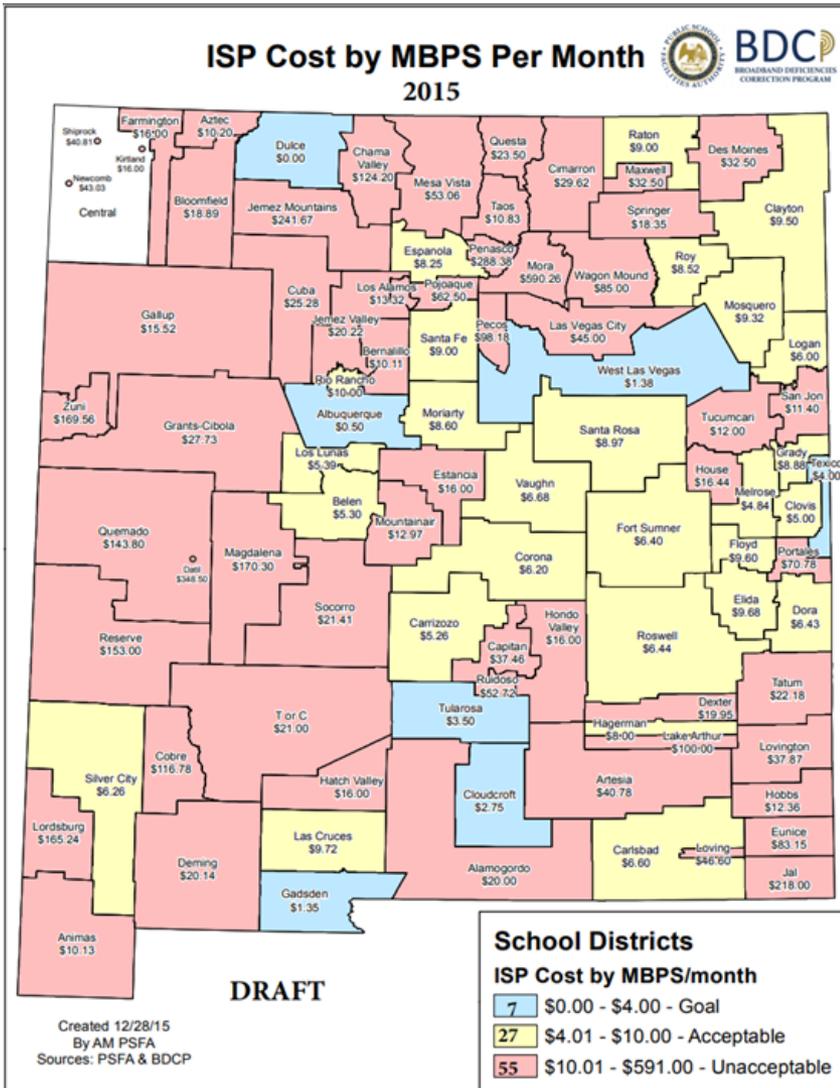


How PSFA/Districts Connected Schools

PSFA has made progress getting schools connected to high speed fiber optic internet utilizing the following mechanisms:

1. Contracted service with an E-rate consultant to help districts apply for federal funding.
 - This federal funding was vital to get all schools connected to high speed internet within 5 years.
2. PSCOC funding, ~\$3 M per year, has leveraged federal funding \$9/\$1
3. Small team of 3-4 project developers/managers at PSFA has provided direct support to school districts, to help them understand how to request federal funding and what the options are for network configuration in their district or regionally.

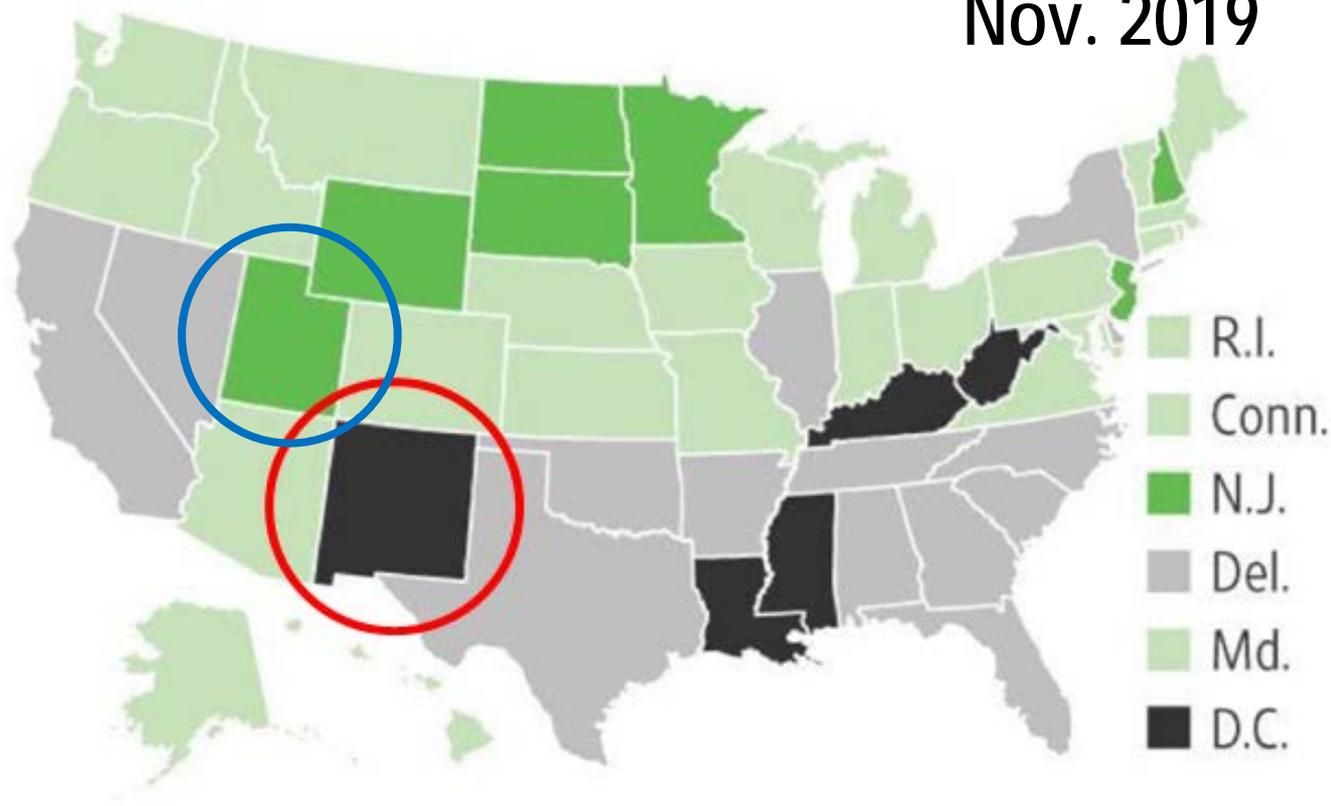
Progress Since 2015



Percentage of Students without Broadband



NM - 49th: LFC
Broadband Report
Nov. 2019



Upcoming Challenges

1. Renewing school networks
 - Need to continue to upgrade and optimize school network infrastructure and develop shared infrastructure.
2. Sharing digital resources
 - Need to consolidate network infrastructure and human expertise to manage networks at centralized locations rather than at each individual district.
3. Reducing digital opportunity gap
 - Ensure that students have uniform access to internet resources at school and at home, with an expanded definition of school networks to reach beyond the school site to students' homes.

Renewing and Improving School Networks

- Most network equipment (Category 2 projects) needs to be replaced every 5 years.
- PSFA can continue to help districts keep up with this replacement cycle with planning and funding, focused on continued improvement and optimization, rather than simple replacement.
- Regional consortia involving multiple school districts, tribal entities, rural public libraries, and other participants are successfully accomplishing key objectives:
 - Lowering internet access costs at a regional level.
 - Building more regional capacity for new high speed internet connections in the future, including homes.
 - Centralizing network management and security, based on available, qualified personnel and funding.

Benefits of Regional Consortia

Regional collaboration that connects schools and libraries together:

- To increase buying power and create economies of scale.
- Eliminate duplications, sharing procurement, contracting and E-rate applications.
- Improved operational implementation:
 - Network security, monitoring, and filtering.
 - Integration of technology into the classroom and curriculum.
- Efficient network configuration to serve the district.
- Share specialized technology resources.
- Build a foundation for sharing applications and educational content (Learning Management System (LMS), digital books and content).
- Increase the broadband capacity in the region for all users, including residences.

Benefits of a Comprehensive Approach

Utah Education Network Summary

- Non-profit overseen by a board, established in 1989.
- Connects **16,000** K12, Libraries, Higher Ed (& telehealth) locations to a robust network, developed in partnership with private telco providers.
- Coordinates and maximizes E-rate and other federal funding.
- Ensures highly skilled tasks (network engineering & security, monitoring, etc) are covered for all members.
- Provides high quality applications and content, professional development programs... for all members.
- Brings high capacity connectivity in several regions of the state.
- **Purchases ~30% less Internet Access compared to all New Mexico districts combined, while serving all Utah K12, libraries, Higher Ed, rural clinics and the entire state of Utah government.**

Digital Opportunity Gap

Problem:

- Approximately 76,000 students in NM (23%) do not have internet at home (PSFA/PED survey March-April 2020), which is necessary to participate in at-home online learning.

Solution:

- Work with each district to identify the need, create a plan to address the need, and begin executing the plan.

Challenges:

- High level of effort to coordinate and manage, to make any measurable progress.
- Will require funding.
- Will take several years to make sustainable improvements state-wide.
- Need to prioritize districts to focus efforts.

Requirements:

- Support (authorization and funding support from Council to PSFA).
- Changes in PSCOA.

Connectivity Barriers

Two categories of students without internet access at home*:

1. Homes that could be connected with a voucher for service.
 - Wired (cable or DSL) connectivity available, but with service that is too expensive.
 - Wireless (LTE cell-data from Verizon, T-Mobile, etc) connectivity available, but with service that is too expensive.
2. Homes located in remote areas without any adequate options for internet access.

* Statewide survey needed to determine an estimated number of students in each of these categories.

Connectivity Goals

Internet service speed:

- 30 MB = Adequate residential service for homework, videoconferencing.
- 100 MB = Target residential service speed.

Examples of internet service offerings **below adequate speed**:

- Satellite (multiple problems but available everywhere).
- DSL (sometimes too slow).
- Wireless Internet Service Provider (WISP) (sometimes too slow).
- Wireless cell phone service (sometimes too slow).

Examples of internet service offerings **at adequate speed**:

- DSL (speed varies widely, often not adequate).
- WISP (speed depends on location of home related to tower).
- Wireless cell phone service (LTE with strong signal is required).

Examples of internet service offerings **at target speed**:

- Cable internet (e.g. Comcast) -- almost always adequate, limited to high population areas
- Fiber-optic -- always the best choice, currently in very limited locations (Kit Carson, Plateau, Continental Divide (Grants, etc), La Jicarita (Mora) - some parts of all their service areas)

Estimates for Vouchers

Assumptions:

- 38,000 students could be connected, if a voucher for service is provided (50% of the estimated 76,000 students without service at home).
- \$150 installation cost.

Low estimate: **\$18.24 M per year recurring**

35,000 (Locations) x \$40/Mo x 12 Months = **\$18.24 M** / year recurring.

35,000 (Locations) x \$150 = **\$5.7 M** non-recurring installation cost.

High estimate: **\$72.96 M per year recurring**

35,000 (Locations) x \$160/Mo x 12 Months = **\$72.96 M** / year recurring.

35,000 (Locations) x \$150 = **\$5.7 M** non-recurring installation cost.

*Can go up to \$500 / Month for Satellite (unlimited data).

Short-Term Strategies for Improving Internet Access

Strategies that could be funded by PSCOC:

- Coordination to help districts identify effective connectivity solutions.
- Continue to improve school site WiFi strength and capacity for after-hours, parking lot connectivity.
- Purchase and install equipment to support school bus WiFi connectivity.
- Purchase devices and home-based connectivity equipment for students.
 - PSFA expects high-demand for this type of capital purchase through the \$18.867 M appropriation for impact aid districts.
 - PSCOF funding participation in this type of capital purchase could be allowed, with changes to the Educational Technology Initiative.

Strategies that cannot be funded by PSCOC:

- Help districts contract with Wireless Internet Service Providers for district-wide WiFi systems.
- Provide vouchers for residential internet service to students where possible.

Long-Term Strategies for Improving Internet Access

Strategies that could be funded by PSCOC:

- PSCOC support to regional consortia for fiber installation projects, centralized network equipment, and shared internet access service agreements.
- Regional installation of high-speed internet fiber optic cable to service multiple remote school sites, libraries, tribal facilities, and other entities is improving access to wired connectivity for all users in these regions, including residential service.
- PSCOC support for the development of a statewide educational network, to include continued fiber-optic construction and regional hubs for network equipment and services (service agreements, network configuration, security, and content filtering).
- PSCOC commitment to construction of a statewide education network that:
 - Provides centralized network infrastructure for smaller school districts.
 - Improves market options for wired connectivity in all areas.
 - Offers shared agreements that can be used by groups of small districts for service connections and network support (expertise to configure hardware, manage security, filter content, etc)

Implementation Plan

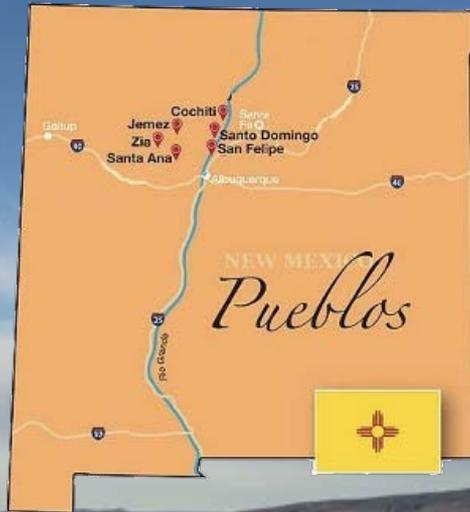
- 1. PSFA can advise applicants for Capital Projects in Impact Aid Districts Appropriation to identify effective, relevant and feasible short-term expenditures to improve student connectivity on and off school sites.**
- 2. PSFA staff and/or consultants begin working with individual districts, and coordinating regionally to:**
 - a. Document the need in each district.
 - How many students can be connected now with a voucher vs how many need a long-term network improvement in their area?
 - b. Form a plan with each district to define relevant short-term and long-term strategies to begin building a statewide education network.
 - c. Begin executing the plans, starting with the districts with the greatest need.
- 3. Implement long-term strategies to achieve long-term goals:**
 - a. Close the homework gap, with home-based connections as an extension of school networks, including connectivity equipment and service to accompany student devices.
 - b. Ensure 100 MB per home to 100% of student residences in NM.
 - c. Completion of a statewide K-12 education network.
 - d. PSFA needs a staffed and funded partner at the state level to develop and manage projects beyond school sites for tribal, city, county, and other entities.

State of Internet Service on Tribal Lands



- **People:** 41% of people living on tribal lands lack access to broadband, with the deficit jumping to 68% for those living in rural areas. (FCC, 2016)
- **Homes:** 65% of Home Internet rely on cell phones. (ASU, 2019)
- **Schools:** Bureau of Indian Education schools can pay significantly more than non-BIE schools in the same locations.
Ch'ooshgai Community School \$20,750/mo. vs. NM PED School District \$6,005/mo.
- **Tribes:** In 2020, some tribal governments in New Mexico still connect with T1s (1.5 Mbps), or about 10% of a single LTE cell phone
 - Largely an issue of incumbent providers not building out on tribal land
- **The Digital Divide is now the Digital Chasm**

Building on Previous Tribal Efforts



Middle Rio Grande Pueblo Tribal Consortium
Jemez-Zia Pueblo Tribal Consortium

2015 Pueblo Beginnings



- Schools & Libraries: Very slow and expensive connections
- Tribal Libraries as critical community computing centers
- Only ½ Tribes had IT Departments
- Few Tribal libraries applying for E-Rate discounts



T1/Satellite

*San Felipe Library
Santo Domingo Library
T'siya Elementary School
Jemez Day School
Jemez Walatowa High School*



DSL

*Jemez Tribal Library
Zia Tribal Library (Ethernet)
San Diego Riverside*



LTE

MY iPHONE

Cochiti Tribal Library



Microwave

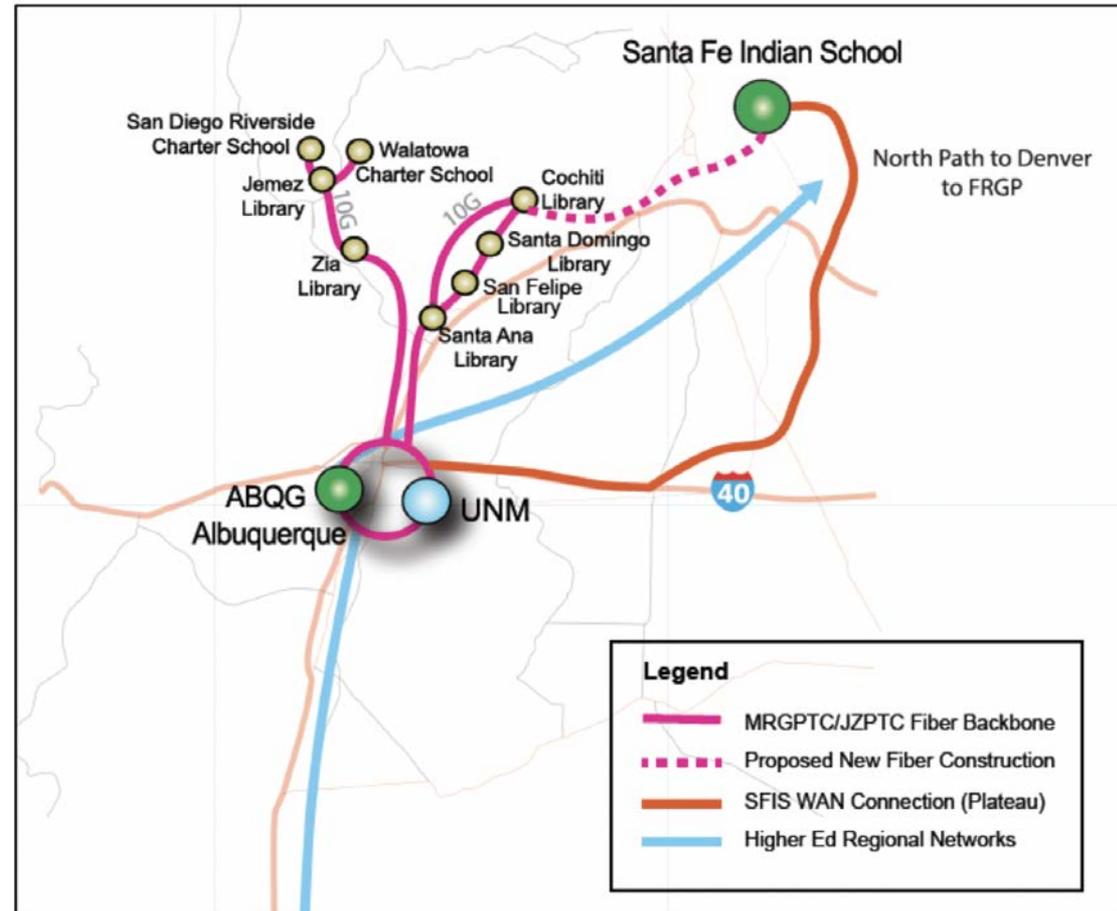
Shared w/Tribal Government

Santa Ana Tribal Library

Project Approach



- Consortium- includes all school & libraries in a geographic area
- Aggregates Demand
- Economies of Scale
- Network Design: Aims for ABQG at 505 Marquette
- The ask: 95% E-rate Discount on \$8 million projects



2019 Project Outcomes



- With E-Rate: 30 Cents/Mbps
- Over 3000% faster/Up to 96% Cheaper
- Scalable: Can grow as needed
- Benefits of ABQG: Peering and Caching, Internet2
- Increased collaboration between schools and libraries
- *Next Steps: Call for NM Education Network 23 States have K-20 Education Networks but not NM*
- *Next Steps: New Tribal Investments to connect to Tribal Homes*



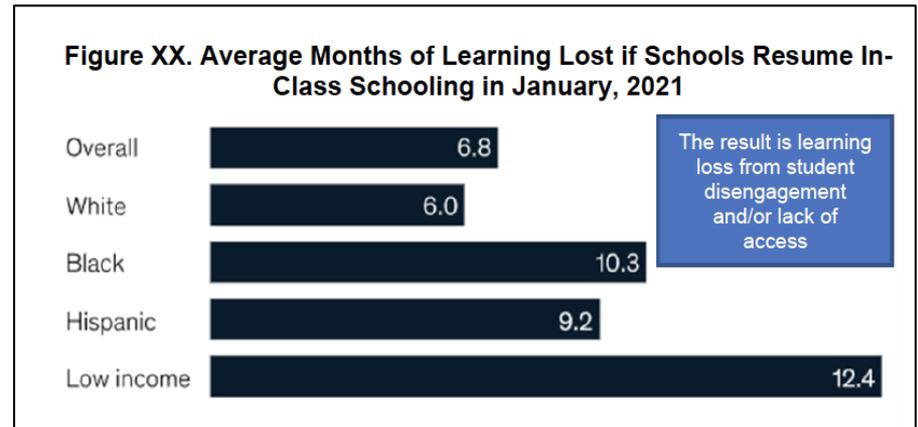
But that was before COVID-19.



- COVID-19 revealed the existing fault lines and put a face to the discrimination against students that aren't connected.
 - Lack of connectivity in homes is biggest student challenge
 - School-issued Chromebooks don't help w/o Internet
- LFC Report, "Learning Loss Due to COVID-19 Pandemic" (6/10/20)

Low income schools, students suffer most

- Internet factor
- Low-income schools underperform without established technology-rich teaching pedagogy and experience mobile technology



2020 COVID-19 Tribal Responses



Response	Timeframe	Technology	Pros	Cons
Immediate Rapid Response	SY19-20 School Closures	<ul style="list-style-type: none"> Cellular Hotspots Devices 	<ul style="list-style-type: none"> Immediate connectivity Cheap devices CARES eligible 	<ul style="list-style-type: none"> Cellular Hotspots: Expensive band-aids Short-term contracts Dependent on cell signal Chromebooks dependent on the Internet for best use
Mid-Term	SY 20-21 Doing better in the Fall	<ul style="list-style-type: none"> Hotspots/ Devices Cont'd Community Wi-Fi 	<ul style="list-style-type: none"> Wi-Fi: Affordable Wi-Fi: Easy installs Serves many students 	<ul style="list-style-type: none"> Parking lot Wi-Fi: Hot/cold vehicles Lack of transportation Not great space to study
Long-Term	Fall Onward	<ul style="list-style-type: none"> Emergency Tribal Network Residential Internet Access 	<ul style="list-style-type: none"> Permanent Infrastructure Leverages existing fiber backbones Leverages the FCC Tribal Priority Window 	<ul style="list-style-type: none"> Requires CARES, or other funding Not all tribes have fiber backhaul



COVID-19 Notwithstanding – On-going Needs

- Homework Gap Goal: In-Home Internet Access
- Professional Development to develop a Technology-Rich teaching pedagogy
- Addressing connectivity for all tribal schools, including the least connected BIE-operated schools
- Creating a NM State Education Network