





Plugged in, Tuned Out – Student Engagement Patterns in Texas Public Schools During COVID-19 Show Need for Statewide Broadband Access

By Christina Quintanilla-Muñoz, May 19, 2021

The digital divide is one of the most pervasive equity issues plaguing students in Texas. It impacts rural and urban school districts alike. Latino students are significantly less likely to have access to the basic Internet. The same disparities are prevalent for Black students or low-income students who report having less access to computers, basic Internet, and broadband access (TSTA, 2020).

In many parts of the state, diminished student engagement was a direct result of limited Internet access during the transition to remote learning. IDRA's new analysis found that school districts with the highest rates of student engagement tend to be urban/suburban, while districts with the highest rates of "unengaged" students tend to educate greater proportions of Latino students.

Schools Lost Touch with 10% of Students During the Pandemic

TEA reported that more than 600,000 Texas public school students – over one in 10 students – did not complete assignments or respond to teacher outreach in spring 2020. Schools lost touch with Black students and Latino students at over twice the rate of white students. (TEA, 2020)

Students' engagement with their schoolwork during the pandemic has been difficult to track because classroom instruction is delivered in-person and online. To facilitate data collection, in May 2020, the Texas Education Agency (TEA) began to require that schools submit crisis code indicators on student engagement in spring coursework for the 2019-20 and 2020-21 school years.

The Public Education Information Management System (PEIMS) crisis codes characterize student engagement as completion of assignments, responsiveness to teacher and school outreach, and participation in virtual classrooms by logging on (TEA, June 2020). TEA's definition of student engagement for this purpose is narrow and places the onus on students rather than measure a school's role in engaging students in the classroom.

The IDRA Quality Schools Action Framework, on the other hand, identifies student engagement as an indicator of a quality school based on the following definition: "School environment and activities that value students and incorporate them in the learning process and other social activities within the school" (Robledo Montecel & Goodman, 2010). A quality school, including high academic achievement, thus depends on schools' engagement of students.

According to the PEIMS code, students completing assignments in one or more core content areas are counted as "engaged" if they are responding to teacher or school administration outreach. Students who respond to teacher and school administration outreach but do not complete assignments are coded as "unengaged." Schools report student engagement across instructional venues: on-campus learning and remote learning, both synchronous and asynchronous methods.

Reports showed that almost 89% of students were considered fully engaged during the COVID-19 school closures (March through May 2020). Schools flagged having no contact or having lost contact with 1.78% students during the same period. (TEA, 2021)

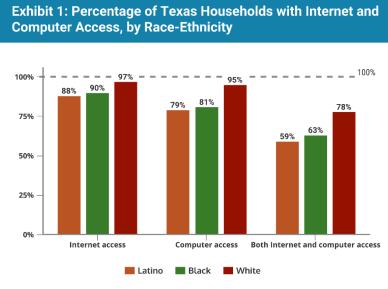
Remote Learning Exposed Inequitable Access to Computers, Internet and Technical Support

The COVID-19 pandemic exacerbated festering inequities within the K-12 public education system. Schools had to make significant adjustments to the ways they teach and support students in response to changing health guidelines. These adjustments included halting traditional in-person instruction to facilitate learning in

a virtual remote capacity.

Virtual remote learning in K-12 education has never been as widespread as during the pandemic. The shift to remote learning demonstrated even deeper rifts among the deeply-rooted educational inequities in school funding, technological resources and connectivity, and the ways schools engage families, especially in districts serving large populations of students of color, emergent bilingual (English learner) students, and students from households with low-incomes (Marshall & Muñoz, 2021).

Inequities included limited access to technological devices, such as computers



Data Source: TSTA. (August 2020). Closing the Digital Divide for Students in Texas. Texas State Teachers Association

and tablets, for teachers and students. Students of color are significantly less likely to have access to broadband and Internet-connected devices compared to their white peers (TSTA, 2020).

Schools also provided insufficient digital literacy education to support families who were unequipped to engage with new online class resources. And there was not enough technical support for historically underserved student populations, such as emergent bilingual students, students with disabilities, and students experiencing homelessness (Herold, 2020; Edley & Echaveste, 2020). Disparities posed by the digital

divide had dire consequences on the quality of education students received and the way they could engage in their learning.

Defining Quality Connectivity

Broadband Internet connectivity refers to the bandwidth data transmissions transported through physical mediums. Generally, *broadband access* means having a fast, reliable and efficient Internet connection. *Bandwidth* is the download rate of the Internet service or the fastest rate that information data (also known as "bits") can be downloaded to the device that is connected to the Internet (Daily Wireless, 2020). The greater the bandwidth, the faster the data can be downloaded to the device. (See Appendix A for definitions.)

One major aspect of digital equity is making sure connectivity is functional. Knowing the various connection speeds available and their capacities is critical to setting standards that are appropriate and sufficient to engage in activities necessary for learning.

Devices alone do not solve the digital divide. While many school districts distributed devices and hotspots to students pretty quickly to reduce instruction interruptions, hotspot speeds do not have the bandwidth needed to provide enough Internet access to all students within a household. For instance, hotspots only have enough capacity for one student to be in a Zoom classroom at a time.

IDRA Analysis of the Digital Divide's Impact on Student Engagement

To explore how the digital divide impacted student engagement during the pandemic, IDRA examined the relationship between student engagement patterns in spring 2020 and access to broadband Internet services prior to the pandemic across Texas school districts (see Appendix B). We studied the following research questions:

- 1. What is the pandemic's impact on Texas public school enrollment?
- 2. What is the relationship between district size and student engagement patterns across Texas school districts during the 2019-20 school year?
- 3. What is the relationship between broadband Internet access and student engagement patterns?

IDRA studied data on student engagement patterns from the spring 2019-20 school year paired with an analysis of Texas students' broadband access from the American Community Survey estimates of the presence and type of Internet subscriptions in households within Texas school districts (U.S. Census Bureau, 2020).

Student Enrollment Dropped by Over 156,000 Students

In October 2020, TEA conducted an "intermediary data collection" to examine public school enrollment trends by grade level. TEA compared this data with September 2020 intermediary data and October 2019 official PEIMS Fall (snapshot) data. TEA reported that almost 2.5 million (46%) of the 5.3 million Texas public school students were engaging in remote learning as of October 2020, with the largest percentage being high school students (TEA, 2021).

TEA also reported a 3% decline, a little more than 156,000 students, in overall enrollment in Texas public schools. About 54% of the decline was represented by a lack of enrollment in optional early education, prekindergarten and kindergarten programs, while enrollment in grades 1-12 decreased by 1% (TEA, 2021).

Large Urban Districts Had Lower Student Engagement

The digital divide is not limited to rural communities. While rural communities certainly experience poor broadband infrastructure, urban students (particularly urban students of color) bear the brunt of this systemic issue. The infrastructure in urban geographic areas may be established, but access is still an issue. For example, even with a hotspot issued to a student residing in an area with adequate infrastructure, that student may not have access to a robust network to connect online.

Three-fourths of the 20 million U.S. households who still lack home broadband or mobile data connections live in urbanized areas, and they are very likely low-income (NDIA, 2019). Sizable gaps in broadband access occur in major urban school districts in Texas. Students who reside in urban communities, such as Dallas, Houston and San Antonio, lack access to high quality Internet.

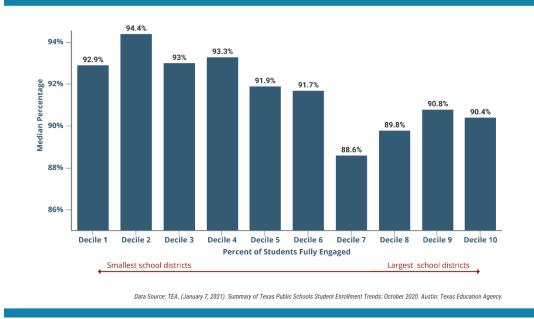
To determine how student engagement patterns differed across school district sizes, IDRA grouped school districts into deciles (10 equal groups) by enrollment in 2019-20 to examine engagement patterns within more homogenous groups. Decile 1 is comprised of the smallest districts while Decile 10 is comprised of the largest districts, by enrollment size.

Each decile corresponds with National Center for Education Statistics (NCES) geographic indicators. NCES classifies districts into four basic types: city, suburban, town and rural. The categories are based on population size and proximity to urban areas.

- "City" districts are located inside an urban area (defined by having more than 50,000 residents) and inside a principal city (or largest city in a metro area),
- "Suburban" districts are located outside a principal city and inside an urban area,
- "Town" districts are located inside any urban cluster (defined by having 2,500 and 50,000 residents) that is 10 to 35 miles from an urban area, and
- "Rural" districts are located 5 to 25 miles from an urban area and 2.5 to 10 miles from an urban cluster (NCES, 2020).

Exhibit 2 illustrates the rate of fully engaged students and rate of household broadband Internet access across school district enrollment size, grouped by decile. Large urban districts demonstrated the lowest rates of fully engaged students yet the highest rates of household broadband Internet access. Smaller rural and town districts demonstrated the highest rates of fully engaged districts yet the lowest rates of household broadband Internet access. Internet access.

Exhibit 2: Percent of Fully Engaged Students in Spring 2020, by School District Decile



These trends indicate that districts with greater access to broadband Internet services prior to the pandemic did not experience higher rates of full student engagement in spring 2020 at the beginning of the COVID-19 pandemic. To better understand these results, IDRA further explored the relationship between these two variables.

Broadband Internet Access was a Significant Predictor of Full Student Engagement for Large Urban Districts

Our analysis did not show a statistically significant relationship between broadband Internet access prior to the pandemic and "fully engaged" student patterns for all districts (see Exhibit 3; see also Appendix B).

However, Quartiles 3 and 4 showed a significant positive relationship between the rate of broadband Internet access and the rate of fully engaged students (see Appendix C).

About 93% of districts in Quartile 3 are classified "rural" or "town" (see Exhibit 4) compared to 41% of districts in Quartile 4 (see Exhibit 5). Rates of broadband Internet access are directly associated with student engagement patterns in spring 2020 for medium to large districts characterized as "rural/town" and "urban."

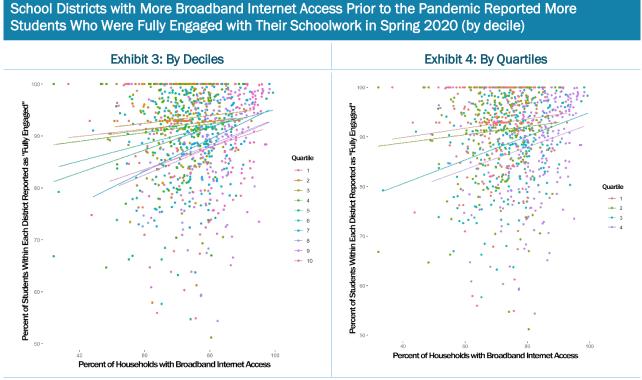
Our analysis indicates that access to broadband of any type was a significant predictor of full student engagement within school districts in Quartile 3 (B = 0.285, β = 0.269, t(243) = 4.352, p < .05).

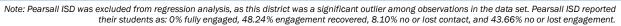
Every percentage point increase in access to broadband of any type predicts an increase of 0.285 percentage points in full student engagement within school districts.

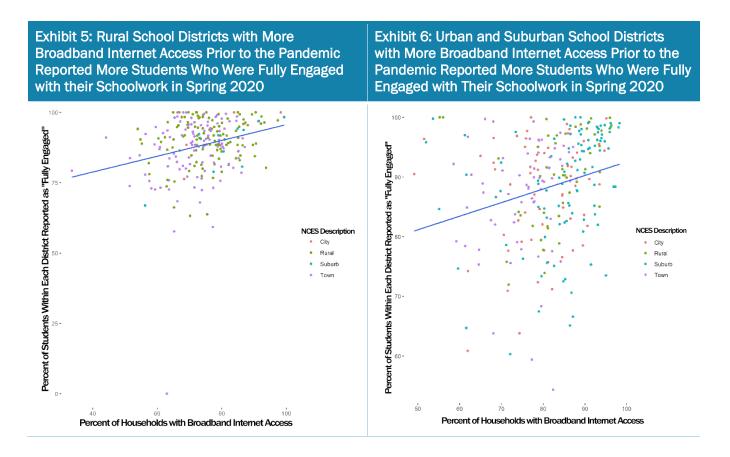
Additionally, access to broadband of any type was a significant predictor of full student engagement within Quartile 4 school districts (B = 0.230, β = 0.250, t(266) = 4.207, p < .05). For every percentage point increase in access, the district should have an increase of 0.23 percentage points in full student engagement.

Exhibit 3 illustrates the relationship between broadband Internet access prior to the pandemic and the "fully engaged" student engagement pattern for all districts. It displays trend lines across school district deciles.

Exhibit 4 illustrates the same relationship as Exhibit 2 but *across school district quartiles*. Grouping school districts by quartiles enabled us to compare groups of school districts that align more closely with enrollment size standards outlined for small and midsize district allotment in HB 3 (86R).







Our analysis found that for large urban school districts, there was a significant positive relationship between a household's broadband Internet access prior to the year of the pandemic and student engagement patterns.

School districts with the highest rates of students counted as "unengaged" tend to have greater proportions of Black students and/or Latino students. Rural districts had disproportionately high rates of "no or lost" student contact (see Appendix B).

With students of color significantly less likely to have access to broadband and/or Internet-connected devices, we can postulate from this study's evidence that these students were more likely unable to engage via online learning during the pandemic.

Additionally, our findings suggest that household access to broadband Internet within both large urban districts and smaller rural and town districts prior to the pandemic was directly related to full student engagement at the start of the pandemic. This means that students from households with limited access to broadband Internet prior to the pandemic experienced a greater challenge in staying connected to their learning during the transition to an online format. Low levels of engagement in large urban districts with greater access to broadband Internet indicates that connectivity is not the sole culprit of engagement issues experienced by many school districts. Issues of affordability of such services and gaps in user-knowledge may offer more insight to trends revealed through this analysis.

IDRA Policy Recommendations

State policymakers must equitably address dire education concerns exacerbated by the COVID-19 pandemic, such as the impact of the digital divide on student engagement. IDRA outlines recommendations for ensuring state policy decisions include strategies to secure equitable access to broadband infrastructure and reliable connectivity for students in Texas urban and rural districts.

Adopt a state broadband plan that addresses equity concerns in schools

The state's creation of the Governor's Broadband Development Council in 2019 was an important first step in addressing gaps within broadband connectivity and infrastructure. During the 87th regular Texas legislative session in 2021, Governor Greg Abbott and Lieutenant Governor Dan Patrick flagged broadband access as an "emergency priority." State leaders must now create a statewide broadband plan for rural and urban communities while addressing immediate and long-term K-12 and college education needs to close the digital divide for students, particularly for the most underserved populations: students with disabilities, emergent bilingual students, students from households with low incomes, and students of color.

This session, the flagship broadband bill House Bill 5 (by Rep. Trent Ashby, et al.) would establish a state broadband office, institute a federal grant program for allocated broadband funds, and create a state mapping system to identify key areas of the state that lack access to broadband service. With House and Senate conferees appointed, House Bill 5 awaits a schedule date to appear in conference committee. The conference committee will work to resolve differences in each chambers' version of the bill.

IDRA supports adding a seat on the Governor's Broadband Development Council for a representative from an urban school district. Urban representation on the council will help to ensure the over 25 million students and families (U.S. Census, 2019) who reside in these districts are included in broadband development and connectivity dialogue and plans.

IDRA also supports keeping provisions that increase financial support and training resources for digital literacy programs and keeping specific language that assesses which school districts lack connectivity.

Another bill this session that addresses digital divide concerns is House Bill 3591 (by Rep. Jacey Jetton and Rep. Ryan Guillen), which creates a grant program for the Texas Commissioner of Education to distribute to qualifying school districts for digital technology and Internet connectivity needs (see Marshall, March 2021b).

Collect data equitably to accurately assess the digital divide

Texas needs accurate data collected equitably to track the digital divide. The Governor's Broadband Development Council must go beyond relying on census block data to determine connectivity issues for households across Texas. The Federal Communications Commission (FCC) counts broadband data by census block. This methodology grossly undercounts communities of color and households with limited incomes. Census blocks are map regions that the government uses for reporting population. A census block can represent anything from one city block to hundreds of square miles in rural areas. This means that one person can count as an entire census block.

IDRA recommends the council integrate data collection methods that capture more precise granular-level data to identify the correct number of households who lack broadband Internet access and connectivity.

Increase financial support and training resources for digital literacy programs

Financial support for digital literacy would facilitate students and families having the knowledge to use computer devices, particularly to support virtual and remote learning. Digital literacy is an integral component of digital-based learning and ensures students have the knowledge to safely and effectively use computer devices, navigate online programs, and access safe, credible sources of information on the Internet as part of their digital learning experience.

House Bill 129 (by Rep. Mary González) would add a one-credit class to school curriculum focused on digital citizenship. It would include media literacy, digital ethics, etiquette, safety, and identification of hate speech, racism and discrimination. We recommend the state make funds available to school districts to provide digital literacy training to students, teachers and families (See Marshall, March 2021a; May 2021).

Institute student and family engagement plans across all school districts

Texas policymakers should invest in sustainable, long-term student and family engagement programs that foster authentic communication between schools and families, to create accessible pathways for engagement, encourage healthy relationships with students and their learning, and to rebuild positive relationships with students and families and families with their schools.

The state should support the revamping of student and family engagement plans so they serve to strengthen relationships between campus leadership, educators, teachers, students and families; and reinforce positive family attitudes about education and school-family engagement. The state should help ensure school districts' student and family engagement plans have the capacity to support distance learning, including virtual, online and remote options; support digital communications, including devices, connectivity and user-knowledge that promotes digital literacy; and target resources to state geographic areas and households with limited and no access to broadband Internet. Rep. James Talarico authored House Bill 4391 with IDRA input to ensure student and family voices are prioritized in these efforts.

The digital divide is a long-standing equity crisis in Texas. The mass pivot to virtual learning in spring 2020 intensified the impacts of the divide as many Texas families lack sufficient broadband connectivity in their homes to support remote online learning. Texas lawmakers must take steps this session to address viable and effective solutions toward bridging the digital divide and closing academic gaps for communities and families of color.

Solutions for solving the digital divide must include not only expanding access to statewide broadband infrastructure but repairing connectivity issues, bridging affordability gaps, and increasing digital literacy skills to ensure students and community members can effectively navigate the growing digital landscape.

References

Ali, T., Chandra, S., Cherukumilli, S., Fazlullah, A., Hill, H., McAlpine, N., McBride, L., Vaduganathan, N., Weiss, D., Wu, M. (2021). Looking Back. Looking Forward: What it Will Take to Permanently Close the K-12 Digital Divide. San Francisco: Common Sense Media. Edley, E., & Echaveste, M. (June 25, 2020). Now is the right moment to measure educational disparities. EdSource. Connected Nation Texas. (January 2020). Planning: The Broadband Landscape in the State of Texas. Connected Nation. Governor's Broadband Development Council. (November 2020). 2020 Texas Report. Office of the Governor. Herold, B. (April 10, 2020). The Disparities in Remote Learning Under Coronavirus (in Charts). Education Week. Marshall, T. (February 2021). Texas Needs an Equitable State Broadband Plan to Serve Students and Families. IDRA Newsletter. Marshall, T., & Muñoz, C. (April 20, 2021). Digital Destination - Texas Needs Broadband Connectivity for All Students & Families, IDRA Issue Brief. San Antonio: Intercultural Development Research Association. Marshall, T. (March 16, 2021). Digital Health and Wellness Are Essential to a Digital Citizenship Curriculum, IDRA comments for House Bill 129 presented to the Texas House Public Education Committee. San Antonio: Intercultural Development Research Association. Marshall, T. (March 30, 2021). Texas Needs to Prioritize Rural and Urban School Districts through a Community Approach for Internet Connectivity. IDRA Testimony on House Bill 3591 submitted to the House Public Education Committee. San Antonio: Intercultural Development Research Association. Marshall, T. (May 13, 2021). Digital Health and Wellness are Essential to a Digital Citizenship Curriculum, IDRA statement in support of House Bill 129 presented to the Texas Senate Education Committee, San Antonio: Intercultural Development Research Association. Muñoz, C. (March 2021). Digital Divide Directly Impacted Student-School Engagement During COVID-19. IDRA Newsletter. Pensworth, L. (March 7, 2020). What is Mbps? Daily Wireless. Robledo Montecel, M., & Goodman, C. (2010). Courage to Connect: A Quality Schools Action Framework. San Antonio: Intercultural Development Research Association. Ramón, A. (March 2021). Student Researchers Collect Insights from Peers about the Pandemic's Effects on Schooling. IDRA Newsletter. TEA. (2020). SY 2020-2021 COVID-19 Crisis Code Reporting Guidance, web page. Austin: Texas Education Agency. TEA. (January 7, 2021). Summary of Texas Public Schools Student Enrollment Trends: October 2020. Austin: Texas Education Agency.

TEA. (June 4, 2020). <u>COVID-19 Reporting Guidance: Crisis Codes</u>. Austin: Texas Education Agency.

TEA. (August 22, 2019). House Bill (HB 3) Implementation: Small and Mid-sized District Allotment. Austin: Texas Education Agency.

- Texas Economic Development. (2021). Governor's Broadband Council. Office of the Governor.
- TSTA. (August 2020). Closing the Digital Divide for Students in Texas. Texas State Teachers Association.

U.S. Census Bureau. (December 10, 2020). American Community Survey 2015-2019 5-Year Data Release. U.S. Department of Commerce.

Christina Quintanilla-Muñoz is an IDRA Education Policy Fellow. For more on the Fellows see: https://www.idra.org/idra-fellows

The Intercultural Development Research Association is an independent, non-profit organization. Our mission is to achieve equal educational opportunity for every child through strong public schools that prepare all students to access and succeed in college. IDRA strengthens and transforms public education by providing dynamic training; useful research, evaluation, and frameworks for action; timely policy analyses; and innovative materials and programs.

Appendix A: Broadband-Related Definitions

Bandwidth: The total download rate of Internet service, i.e., the fastest individuals can download information (data) to their computers or Internet-connected devices.

Broadband access: An individual's ability to connect physically to broadband Internet. It is defined by the Federal Communications Commission as 25 Megabits per second (Mbps) download speed and 3 Mbps upload speed (25/3 Mbps) (Connected Nation Texas, 2020).

Digital citizenship: The responsible use of technology by anyone who uses computers, the Internet, and digital devices to engage with society on any level (Zook, 2019). It typically refers to those who use the Internet regularly and are part of one or more online communities.

Digital divide: The barrier some face due to their lack of access to Internet service, devices or the literacy to use those services and devices.

Digital equity: All individuals and communities have the information technology capacity they need to participate fully in society, democracy and the economy.

Digital inclusion: How communities increase digital equity involving "the activities necessary to ensure all individuals and communities, including the most disadvantaged, have access to and use of information and communication technologies" (National Digital Inclusion Alliance, 2021). Sample activities include helping people learn basic computer skills in small groups or one-on-one, helping them find affordable Internet services and devices, and providing technical and social support as they gain confidence and find uses for their newfound skills.

Digital literacy: The ability to navigate various digital platforms and understand, assess and communicate through them (Common Sense Media, 2021).

Mbps: "Megabits per second." Mbps refers to download and upload speeds and represents the speed an Internet plan is offering. The higher the number, the faster the possible speed.

MBps: "Megabytes per second." A megabyte is equal to 8 bits (like in Mbps above). The term *megabytes* refers to the size of a file an individual downloads or the amount of data transferred to the computer or device over the Internet.

References

Common Sense Media. (2021). <u>News and Media Literacy – What is digital literacy?</u>, webpage. San Francisco: Common Sense Media. Connected Nation Texas. (January 2020). <u>Planning: The Broadband Landscape in the State of Texas</u>. Connected Nation. FCC. (February 5, 2020). <u>Broadband Speed Guide</u>, website. Washington, D.C.: Federal Communications Commission. NDIA. (2021). Definitions, web page. Columbus, Ohio: National Digital Inclusion Alliance. <u>https://www.digitalinclusion.org/definitions</u> Marshall, T., & Muñoz, C. (February 2021). <u>Texas Needs Broadband Connectivity for All Students & Families</u>. IDRA Newsletter. NDIA. (2021). <u>Digital Navigator Model</u>. Columbus, Ohio: National Digital Inclusion Alliance. Zook, C. (December 10, 2019). <u>What is digital citizenship and how do you teach it?</u> Lancaster, Penn.: Applied Educational Systems.

Basic Internet Speed Guidelines for Common Activities				
Activity	Bare Minimum Download Speed			
Streaming online radio	<0.5 Mbps			
Browsing email and social media	1 Mbps			
Streaming standard- definition video	3-4 Mbps			
Playing online multiplayer games	4 Mbps			
Stream high- definition video	5-8 Mbps			
Making video calls	6 Mbps			
Streaming 4K video	15-25 Mbps			
Federal Communications Commission, 2020				

Appendix B: Data and Methods

Phase 1: Cleaning and restructuring TEA student engagement and ACS Internet access data

IDRA cleaned the raw, preliminary 2019-20 TEA student engagement data in the R statistical program and merged them by district number (unique district identification) to 2019-20 TEA enrollment data—2019-20 enrollment rates by race/ethnicity. Additionally, the 12 National Center Education Statistics (NCES) classifications were collapsed into four basic types for the purposes of this analysis: city (urban), suburban, town, and rural. The variables examined are displayed in Table 1.

Table 1: Variables Examined from TEA Student Engagement Data				
Variable	Levels			
District number				
District name				
Engagement pattern (as characterized by PEIMS Crisis Codes, 2019-20)	Fully Engaged Engagement Recovered No or Lost Engagement No or Lost Contact			
Rate of engagement by district race/ethnicity	Asian Black/African American Hispanic/Latino American Indian/Alaska Native Native Hawaiian/other Pacific Islander Two or more races White			

Next, IDRA cleaned ACS Internet access data and configured proportions of estimate totals for variables outlined in Table 2 below. IDRA also configured margins of error for each estimate proportion. IDRA merged ACS Internet access data and TEA student engagement data by district number.

Table 2: Variables Examined from ACS Internet Access Data				
Variable				
Estimate of households with Internet subscription				
Estimate of households with dial-up only				
Estimate of households with cellular data plan only				
Estimate of households with broadband: cable, fiber, optic only				
Estimate of households with satellite Internet service only				
Estimate of households with Internet access, without subscription				
Estimate with no Internet access				

Phase 2: Conducting Data Analysis

For the purposes of this analysis, IDRA examined non-charter public schools only. Overall, IDRA categorized 985 school districts into four quartiles based on the school district enrollment count using PEIMS 2019-20 school enrollment data (see Table 3).

We treated any data that reflected a range value for engagement pattern due to FERPA data masking guidelines (e.g., <90% fully engaged students, <10% students with no or lost contact) as "missing." We substituted "missing" values with

imputed values such that the masked data point was replaced by the median level of that variable. We completed this process within each quartile. Districts with imputed data are flagged for reference in R markup language.

Table 3: Classifications of School District Quartiles							
Quartile	N	Range of enrollment count	Median enrollment count	Percent of districts classified by NCES as "rural" or "town"			
1	229	14-366	200	99.6%			
2	236	368-941	590	99.2%			
3	245	942-2,879	1,526	92.7%			
4	268	2,898-210,061	7,797	41.0%			

We further examined whether school district student engagement patterns could be predicted by rates of household access to broadband of any type within each school district. IDRA conducted a least squares regression on "Fully Engaged" student engagement district patterns by district broadband access in R software at an alpha level of 0.05 for each quartile. We configured unstandardized and standardized estimates in the analysis.

Table 4: Districts with 100% "fu	Ily engaged" students		
Academy for Academic Excellence	Fayetteville ISD	Littlefield ISD	Rotan ISD
Alamo Heights ISD	Ft. Davis ISD	Lone Oak ISD	Sabine Pass ISD
Ambassadors Preparatory Academy	Ft. Sam Houston	Lone Star Language Academy	Saltillo ISD
Amherst ISD	George Gervin Academy	Longview ISD	San Vicente ISD
Avalon ISD	Glasscock County ISD	Lovelady ISD	Sands CISD
Benjamin ISD	Grapeland ISD	Malta ISD	Santa Maria ISD
Bland ISD	Hamlin Collegiate ISD	Marathon ISD	School of Science and Technology
Blanket ISD	Hartley ISD	Maud ISD	Sierra Blanca ISD
Campbell ISD	Hedley ISD	McKinney ISD	Spring Creek ISD
Cayuga ISD	High Island ISD	Meadowland Charter District	St. Anthony Catholic School
Chilton ISD	Huckabay ISD	Meridian ISD	Step Charter School
Cityscape Schools	Hughes Springs ISD	Morgan ISD	Sulphur Bluff ISD
Collinsville ISD	Iredell ISD	Muenster ISD	Sundown ISD
Compass Academy Charter School	Jacksboro ISD	Nazareth ISD	The Lawson Academy
Cotton Center ISD	Jayton-Girard ISD	Nordheim ISD	Tom Bean ISD
Cross Plains ISD	Katherine Anne Porter School	North Texas Collegiate Academy	Trinity Charter School
Divide ISD	Kennard ISD	Paint Creek ISD	Trivium Academy
Draw Academy	Ki Charter Academy	Paint Rock ISD	UTPB Stem Academy
Ector ISD	Klondike ISD	Panther Creek CISD	Vysehrad ISD
Era ISD	Knox City-O'Brien CISD	Penelope ISD	Walnut Bend ISD
Etoile Academy Charter School	Kopperl ISD	Petersburg ISD	Westphalia ISD
Eula ISD	Lake Granbury Academy Charter School	Pioneer Technology and Arts Academy	Whiteface CISD
Evadale ISD	Leonard ISD	Pleasant Grove ISD	Whitewright ISD
Evant ISD	Lindsay ISD	Ramirez CSD	Windthorst ISD
Fannindel ISD	Lingleville ISD	Richards ISD	

Appendix C: Results

Quartiles 3 and 4 demonstrated a significant positive relationship between rates of broadband Internet access of any type and rates of fully engaged students, r = 0.27, t(243) = 4.35, p < .05 and r = 0.25, t(266) = 4.21, p < .05, respectively. Tables 5-14 display student engagement patterns by quartile including traditional school districts and charters.

Table 5: Relationship Between Broadband Internet Access and "Fully Engaged" Student Engagement Pattern						
Quartile	Degrees of Freedom	t	p value	Pearson's r		
1	227	1.49	0.07	0.10		
2	234	1.45	0.07	0.09		
3	243	4.35***	<.001***	0.27		
4	266	4.21***	<.001***	0.25		
Note: $x_0 < 05$ $x_{00} < 01$ $x_{00} < 001$						

Note: *p < .05, **p < .01, ***p < .001

Table 6: Least Squares Regression for "Fully Engaged" Student Engagement Patterns on Broadband Internet Access					
Quartile	Quartile R p value R ²				
3	18.94***	<.001***	0.073		
4 17.7*** <.001*** 0.062					
Note: *p < .05, **p < .01, ***p < .001					

Table 7: Districts with the next top 5 highest rates (below 100%) of "fully engaged" students

District	End of Year Enrollment	Percent of "Fully Engaged" Students	Public School (Y/N)	NCES Classification
Prosper ISD	17,683	99.92%	Y	Rural-fringe
Leadership Prep School	1,348	99.84%	N	Suburb-large
Comal ISD	26,264	99.83%	Y	Rural-fringe
Keller ISD	36,854	99.82%	Y	City-large
Pharr-San Juan-Alamo ISD	34,351	99.78%	Y	Suburb-large

Table 8: Districts in Q1 with the top 5 highest rates of "no or lost engagement" students

District	End-of-Year Enrollment	Percent of "No or Lost Engagement" of Students	Public School (Y/N)	NCES Classification
Terlingua CSD	128	32.20%	Y	Rural
Garner ISD	221	28.23%	Y	Rural
Loraine ISD	174	23.87%	Y	Rural
Northside ISD	233	22.94%	Y	Rural
Leverett's Chapel ISD	252	22.5%	Y	Rural

Table 9: Districts in Q2 with the top 5 highest rates of "no or lost engagement" students

District	End-of-Year Enrollment	Percent of "No or Lost Engagement" of Students	Public School (Y/N)	NCES Classification
Brackett ISD	611	31.63%	Y	Town
Seagraves ISD	589	25.88%	Y	Rural
Blum ISD	392	23.30%	Y	Rural
Yantis ISD	409	22.97%	Y	Rural
Culberson County-Allamoore ISD	417	22.66%	Y	Rural

Table 10: Districts in Q3 with the top 5 highest rates of "no or lost engagement" students

District	End-of-Year Enrollment	Percent of "No or Lost Engagement" of Students	Public School (Y/N)	NCES Classification
Pearsall ISD	2,292	43.66%	Y	Town
Whitesboro ISD	1,746	36.14%	Y	Town
Vernon ISD	2,070	31.65%	Y	Town
Rusk ISD	2,171	29.48%	Y	Rural
Crane ISD	1,226	27.29%	Y	Rural

Table 11: Districts in Q4 with the top 5 highest rates of "no or lost engagement" students					
District	End-of-Year Enrollment	Percent of "No or Lost Engagement" of Students	Public School (Y/N)	NCES Classification	
Columbia-Brazoria ISD	3,212	37.07%	Y	Town	
New Caney ISD	17,138	28.31%	Y	Suburban	
Plainview ISD	5,518	28.18%	Y	Town	
Jacksonville ISD	5,185	26.87%	Y	Town	
Sulphur Springs ISD	4,679	26.2%	Y	Town	

Table 12: Districts in Q1 with the top 5 highest rates of "no or lost contact" with students					
District	End-of-Year Enrollment	Percent of "No or Lost Contact" of Students	Public School (Y/N)	NCES Classification	
Matagorda ISD	121	16.22%	Y	Rural	
Texline ISD	206	9.52%	Y	Rural	
Leverett's Chapel ISD	252	8.33%	Y	Rural	
Boys Ranch ISD	355	5.10%	Y	Rural	
Marfa ISD	356	4.92%	Y	Rural	

Table 13: Districts in Q2 with the top 5 highest rates of "no or lost contact" with students

District	End-of-Year Enrollment	Percent of "No or Lost Contact" of Students	Public School (Y/N)	NCES Classification
Brookeland ISD	419	28.61%	Y	Rural
Alto ISD	670	14.95%	Y	Rural
Hearne ISD	834	9.61%	Y	Town
Bloomington ISD	944	8.42%	Y	Rural
Bovina ISD	490	6.44%	Y	Rural

Table 14: Districts in Q3 with the top 5 highest rates of "no or lost contact" with students

District	End-of-Year Enrollment	Percent of "No or Lost Contact" of Students	Public School (Y/N)	NCES Classification
Bullard ISD	2,808	15.38%	Y	Rural
Monahans-Wickett-Pyote ISD	2,605	8.84%	Y	Town
Pearsall ISD	2,292	8.10%	Y	Town
Vernon ISD	2,070	7.68%	Y	Town
Tornillo ISD	1,047	7.29%	Y	Rural

Table 15: Districts in Q4 with the top 5 highest rates of "no or lost contact" with students

District	End-of-Year Enrollment	Percent of "No or Lost Contact" of Students	Public School (Y/N)	NCES Classification
Plainview ISD	5,518	9.33%	Y	Town
Manor ISD	10,334	8.47%	Y	Rural
Beeville ISD	2,465	8.20%	Y	Town
Northside ISD	113,572	7.79%	Y	Urban
Columbia-Brazoria ISD	3,212	7.65%	Y	Town