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The Digital Divide and COVID-19

Teachers' Perceptions of Inequities in Students' Internet Access and Participation in Remote Learning

I n the wake of the coronavirus disease 2019 (COVID-19) pandemic, researchers estimate that the teachers of roughly 50 million K–12 public school students have had to transition to remote instruction.[1] Emerging research about the impact of the pandemic on schooling consistently reveals that school closures have presented significant hurdles to effective instruction, particularly for children and youth in low-income families and other typically underserved student groups. Surveys from spring 2020 revealed that during school closures, schools and teachers faced challenges related to student engagement and students' lack of internet access. Moreover, these challenges were more prominent in high-poverty schools than low-poverty schools.[2] Disparities in internet access for households with higher levels of poverty and in rural areas were documented before the pandemic began.[3] Access to the internet remains a serious concern for teachers' capacity to deliver high-quality remote instruction during the 2020–2021 school year.

This Data Note investigates the relationship between teachers' reports of their students' internet access and teachers' interaction with students and families during pandemic-related school closures. We used state and nationally representative survey data from nearly 6,000 teachers for these analyses.[4] We explored the following research questions using these data:

1. To what extent did teachers report that limited technology access was a barrier to providing instruction during school closures?
2. How do teacher reports of their students' internet access vary by school demographic factors (e.g., school urbanicity, poverty level, and state)?
3. How do teacher reports of their students' internet access relate to their reports of students' work completion and their ability to communicate with families?

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[1] Chandra et al., 2020.
[2] Hamilton, Kaufman, and Diliberti, 2020; Kraft and Simon, 2020.
[3] Chandra et al., 2020; KewalRamani et al., 2018.
[4] At the time of the survey, 99.7 percent of teachers indicated that their schools had physically closed, with three-quarters of teachers reporting that their schools had closed by March 16, 2020.

These data are drawn from the American Instructional Resources Survey (AIRS),[5] which was fielded in May and June 2020 to a nationally representative sample of teachers and school leaders who are part of the RAND Corporation American Educator Panels and to state-representative samples of teachers in 12 states. The 2020 AIRS included questions to teachers regarding their instruction during school closures as a result of the COVID-19 pandemic in spring 2020. We analyzed teachers' survey responses by several school-level variables, including school urbanicity, school racial/ethnic composition, school poverty level (based on student eligibility for free or reduced-price lunch [FRPL]), and state. (For definitions of the subgroups used in our analyses, see the "How This Analysis Was Conducted" section at the end of this Data Note.) This Data Note is intended to present a small and focused set of key findings and omits some potentially valuable findings from the full set of survey questions asked and subgroup differences detected.[6]

Teachers Perceived That Challenges with Students' Access to Internet and Technology Were Deeply Intertwined with Concerns About Communication with Families, Student Participation, and Delivering Quality Instruction in a Remote Context

Teachers were given the opportunity to answer the open-ended question, "In your opinion, what is the biggest challenge for teaching and learning related to COVID-19?" Teachers' short responses often described a combination of challenges, suggesting that these challenges are deeply intertwined. We identified the following four major themes from teachers' responses, with the first theme representing the most commonly reported challenge:[7]

- Approximately 43 percent of teachers reported concerns related to **communication with students and student participation**, including difficulty reaching all students, concerns about students' work completion, and challenges with holding students accountable for schoolwork.
- Approximately 31 percent of teachers reported concerns with **providing instruction within the context of remote learning**, including concerns about how to teach new content, provide feedback, engage in asynchronous instruction, monitor students' progress, and gauge understanding.
- Approximately 27 percent of teachers reported challenges relating to **students' families**, such as teachers' ability to reach and support families, challenges that students might be facing in their home lives, concerns around family capacity to support students' remote learning given other responsibilities, and concerns around families' capacity to have their basic needs met during the pandemic.
- Approximately 20 percent of teachers reported challenges related to **technology**, including students' lack of access to the internet, lack of access to devices, and students' or families' challenges with using technology.

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[5] More information about the AIRS can be found at RAND Corporation, undated b.

[6] A full set of survey results and technical documentation is provided in Doan et al., 2020; the data will be available to download from the AEP data portal by the end of August 2020 to enable others to conduct analyses (see RAND Corporation, undated a).

[7] Other challenges that were less common included concerns for students' social and emotional well-being; about a lack of preparation for pandemic-related school closures; and about equity, particularly for English language learners, students from high-poverty and rural schools, and students with disabilities. Teachers' responses were coded to more than one challenge if applicable.

According to one teacher, "The biggest challenge was not having all students engaged in learning. I had nine out of 22 students not participate due to language barriers, no access to working devices, tech issues, and no WiFi access."

Teachers Working in High-Poverty Schools Were Significantly More Likely to Report That Their Students Lacked Access to the Internet and Devices at Home

Teachers saw challenges related to technology—especially internet access—as mediating students' engagement in learning and teachers' communication with students and families. Nationally, only half of teachers estimated that "all or nearly all" of their students had access to the internet at home, with 29 and 14 percent of teachers indicating that "approximately 75 percent" and "approximately 50 percent" of their students had internet access, respectively.[8] These responses indicate that teachers believe that students' home internet access is prevalent but far from ubiquitous. Throughout this Data Note, we focus specifically on whether teachers indicated that "all or nearly all" of their students had home internet access. Although this masks variation in partial student home internet access, we believe that this focus on full home internet access provides the most relevant indicator for whether teachers can fully commit to online-based remote instruction.

Teachers' estimates of their students' access to internet at home varied considerably by their school demographic characteristics. Teachers in schools located in towns and rural areas, schools serving higher percentages of students of color,

and high-poverty schools (i.e., those serving higher percentages of students eligible for FRPL) were significantly less likely to report that all or nearly all of their students had access to the internet at home (see Figure 1). The differences in internet access were starkest by school poverty level. Only 30 percent of teachers in schools in the highest category of school poverty (76–100 percent of students eligible for FRPL) reported all or nearly all of their students had access to the internet, which was 53 percentage points lower than reports of teachers in the lowest-poverty category (0–25 percent FRPL eligible).[9]

Nearly all of the respondents reported that their schools offered some support to students to access technology, and among those, 78 percent indicated that their school provided students with devices. Seventy-three percent of schools offered information to families on how to acquire internet access, but only 45 percent of schools provided students with internet hot spots. Given how many teachers reported that their students lacked internet access, information alone likely was not enough to overcome the gap in internet access. Teachers' responses to the open-ended survey item suggest that even with such supports, household access to internet and technology might be less than ideal for engaging in remote instruction. For example, internet connections can be slow or unreliable, and families with more than one child might need additional devices.
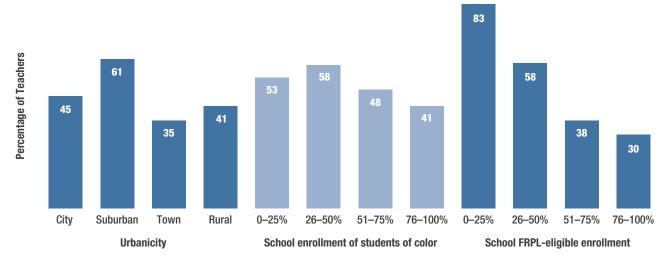
[8] Teachers were asked to respond by selecting one of the following discrete categories: "none or almost none," "approximately 25 percent," "approximately 50 percent," "approximately 75 percent," "nearly all or all," and "I don't know." Teachers responding "I don't know" for a given item are treated as having a missing response.

[9] See the "How This Analysis Was Conducted" section at the end of this Data Note for more information about defining school poverty levels.

FIGURE 1

Teachers in Higher-Poverty Schools Were More Likely to Indicate That Their Students Did Not Have Access to the Internet at Home

Percentages of Teachers Estimating That All or Nearly All of Their Students Had Access to the Internet at Home, by School Subgroup

NOTES: Within subgroup type, the following pairwise comparisons are significantly different at the $p < 0.05$ level: (1) urbanicity: all suburban comparisons and town versus city; (2) school enrollment of students of color: 0–25 percent versus 76–100 percent, 26–50 percent versus 51–75 percent, 26–50 percent versus 76–100 percent, and 51–75 percent versus 76–100 percent; and (3) school FRPL-eligible enrollment: all comparisons. School urbanicity, enrollment of students of color, and FRPL-eligible student enrollment data were obtained from the 2018–2019 National Center for Education Statistics Common Core of Data (CCD).

Gaps in Internet Access Among Students in Higher-Poverty Versus Lower-Poverty Schools—as Reported by Their Teachers—Varied Greatly by State

Comparing teachers' perceptions of their students' internet access across states suggests that state contexts might shape internet access for students whose families live in poverty. Across the 12 states in which the American Teacher Panel has a representative sample, the percentage of teachers reporting that all or nearly all of their students had access to the internet at home varied greatly by state (see Figure 2). The highest percentage of teachers reporting such access came from Rhode Island (79 percent), followed by New York (70 percent), and the lowest percentage of

teachers reporting such access came from Mississippi (21 percent) and Louisiana (24 percent).

The size of the gap between high- and low-poverty schools in teachers' reports that all or nearly all of their students had access to the internet at home varied greatly by state, as illustrated in Figure 2. The red and blue dashes represent the averages for high- and low-poverty schools in each state, and the black dots represent the state averages. On average, teachers in high-poverty schools in New York were more likely to report that all of their students had home internet access than all teachers' averaged reports in Delaware, New Mexico, Tennessee, Louisiana, and Mississippi. Importantly, these states are among the most rural in the nation, with more than 30 percent of schools in each state (except Delaware) classified as rural by the National Center for Education Statistics; only 16 percent of
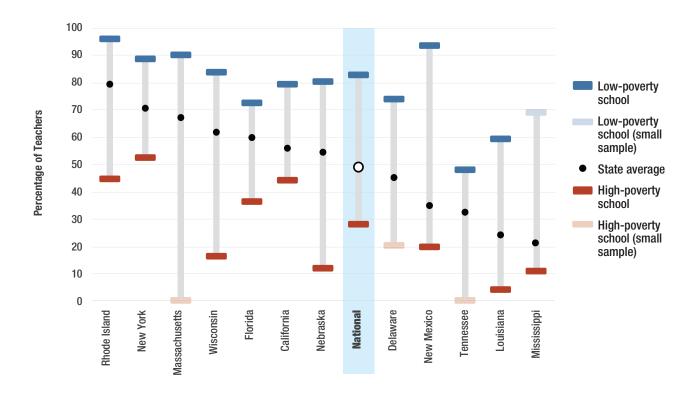
FIGURE 2

Students' Access to the Internet at Home Varied Widely by State Context

Percentages of Teachers' Reporting That All or Nearly All of Their Students Had Access to the Internet at Home, with Means for High- and Low-Poverty Schools in Oversampled States

schools in New York are rural. These data suggest not only that poverty is a huge predictor of home internet access but also that—according to teachers' reports—students in high-poverty homes were much more likely to have access to the internet in some states compared with others. Differences in state demographics, including poverty levels and urbanicity, likely influence variability across states (at least in part).

Teachers' Reports of Home Internet Access Were a Key Predictor of the Share of Students Completing Work and of Family Communication

When teachers deliver remote instruction, their capacity to communicate with students and their families is shaped by home internet access. The survey asked teachers to estimate the proportion of their students who had been completing assignments and the proportion of families that had communicated with them in any way regarding their child's work or learning since COVID-19 school closures began. About 20 percent of teachers estimated that all or nearly all of their students were completing

assignments and that they had contact with all or nearly all of their students' families. The majority of teachers (60 percent) estimated that about half or three-quarters of their students were completing assignments. On the other hand, almost 40 percent of teachers reported communicating with only one-quarter of families or less.

Teachers whose students had more-prevalent access to the internet at home were more likely to have higher proportions of students completing assignments and to be in communication with a higher proportion of students' families (see Figure 3). Our data suggest that access to the internet is an important factor for contact with students and families, irrespective of other characteristics of the student population within a school.[10]

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[10] These relationships remain significant when accounting for school urbanicity, percentages of students of color and FRPL-eligible students, school grade level, and state fixed effects.
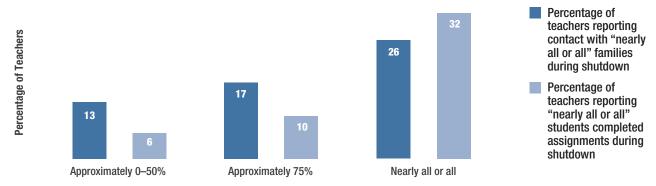
Implications

These results suggest some implications for educators and policymakers as they plan for the 2020–2021 school year.

Policymakers should aim to bring internet access and devices to every household for the coming school year. Only about half of teachers estimated that all or nearly all of their students had internet access at home, and this estimated lack of access was far higher for students in high-poverty schools and varied widely by state. When students are without internet access and/or technology devices, teachers are severely limited in their capacity to reach them, let alone effectively instruct them. Students in high-poverty schools faced disparities in access to educational resources before the pandemic, which are almost certain to be widened by learning losses because of the digital divide. State and local

FIGURE 3

Teachers Were More Likely to Report That Their Students Were Completing Assignments if Their Students Had Access to Internet at Home

Percentage of Teachers Reporting Contact with All or Nearly All Families and Percentage Reporting All or Nearly All of Their Students Were Completing Assignments, by Teachers' Estimates of the Percentage of Students with Home Internet Access

NOTES: This figure shows the survey-weighted percentage of teachers indicating that (1) "nearly all or all" of their students' families have communicated with them regarding student work or student learning, shown in light blue, and (2) "nearly all or all" of their students completed assignments during the time school has been closed, shown in dark blue. These estimates are conditional on the percentage of students that they estimate have home access to the internet. Teachers were asked to estimate the proportion of students for all three items (family contact, student assignments, student internet access) by selecting among the following categories: "none or almost none," "approximately 25 percent," "approximately 50 percent," "approximately 75 percent," "nearly all or all," and "I don't know." "None or almost none," "approximately 25 percent," and "approximately 50 percent" were combined to form the "approximately 0–50 percent" category. For a given item, all pairwise comparisons with "nearly all or all" are statistically significant at the $p < 0.05$ level; differences between "approximately 0–50 percent" and "approximately 75 percent" were not statistically significant.

education agencies have employed various strategies to try to expand access to the internet and technology for all families, including working to better identify students who lack internet access or devices to mobilize support or funding and creating community or mobile hot spots where those without internet access can convene,[11] educating families about opportunities for free or discounted WiFi and technologies, and incentivizing internet providers to help families in need.[12] Many district, state, and federal strategies will need to address the infrastructure and systemic issues that prevent students from accessing the internet.

Some states must act urgently to improve internet access for students in the highest-poverty schools. In eight of the 12 states examined, at most, 20 percent of teachers from the highest-poverty schools reported that all or nearly all of their students had access to the internet at home. This suggests that students in high-poverty schools in these states might have larger learning losses than students in low-poverty schools, which would exacerbate existing inequities. A recent review of state reopening plans for 2020–2021 found that most states required that districts assess students' access to the internet and devices and act on those findings, but far fewer states took concrete actions to address disparities in students' internet access.[13] In this review, the Center on Reinventing Public Education found that with concrete actions—such as Connecticut's strategy of launching a statewide task force to assess district needs for devices and coordinate the delivery of devices—some states were able to mobilize resources and bring technologies to districts with the highest needs. Such action in other states might require state departments of education to work with other state agencies with which they do not typically interact (e.g., community, economic development, and infrastructure agencies). Collaborations among these agencies could influence not only education outcomes but also economic development and other state goals for years to come. States could also consider developing partnerships with providers and offering incentives for helping communities in need.

Teachers will need support and innovative ideas for navigating remote instruction without universal internet access or devices for their students—particularly those in rural, high-poverty schools. Many teachers, especially those in high-poverty schools, will have to face the coming school year with at least some plans for remote instruction but without internet access for all of their students. These teachers must navigate how they will deliver remote instruction, engage students, and communicate with families without the internet. For all teachers whose schools will be doing at least some remote instruction, challenges with internet and technologies will persist regardless of students' access. Internet outages, slow service, and broken devices are all issues that might derail teachers' remote instruction. For these reasons, teachers must establish solid lines of communication with families that do not depend on internet access, set clear expectations around completing work, and employ systems to check in when work is not completed. In addition, states and districts should seek innovative options to help teachers provide good instruction even when internet access is not possible. For example, such strategies as regular text messages to parents or students with reminders about things to do, daily emails, or weekly phone calls with individual students would likely be more helpful than sending weekly packets without reminders.

Limitations

In this Data Note, we provide some guidance on the extent to which internet access presents a barrier to remote learning across school demographics and state contexts. However, it is important to note several limitations. First, our analysis relies on teachers' reports of student internet access and work completion, which are likely more prone to measurement error than the use of administrative data. That said, teachers likely have a better window into student access to the internet than ever before, given

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[11] Samuels, 2020.

[12] Lieberman, 2020.

[13] Jochim, Hassel, and Clifford, 2020 .

their attempts to provide remote instruction during spring 2020 school closures. Second, although we report mostly on relationships between two quantities (e.g., student home internet access versus student work completion), it is important to note that these relationships are likely confounded by other school and community contextual factors. We test the robustness of our relational results by controlling for school urbanicity and student composition, but other factors, such as differences in school or district remote-learning policies, are unaccounted for, emphasizing that the results we present should be interpreted as purely associational. Finally, survey data provide only a rough picture of the nuanced challenges to remote learning caused by COVID-19 school closures. Policymakers should review other sources of data, including qualitative data, and learn from the perspectives of other stakeholders, including school leaders, parents, and students, to get a more comprehensive sense of challenges to teaching and learning during the pandemic.

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How This Analysis Was Conducted

In this Data Note, we use responses from 5,978 teachers to the 2020 AIRS to examine challenges and barriers to remote instruction during the COVID-19 pandemic. Specifically, we focus our analysis on the following items from the 2020 AIRS:

1. "Please estimate the proportion of your students who have access to the internet at home."
2. "Please estimate the proportion of your students who are completing assignments you have provided during the time your school has been closed."
3. "Please estimate the proportion of students' families who have communicated with you in any way during the time school has been closed regarding the work students are doing at home and/or ask questions about how to support their children's learning."
4. "In your opinion, what is the biggest challenge for teaching and learning related to COVID-19?"

For the first three items, teachers were asked to respond by selecting one of the following discrete categories: "none or almost none," "approximately 25 percent," "approximately 50 percent," "approximately 75 percent," "nearly all or all," or "I don't know." Teachers responding "I don't know" for a given item are treated as having a missing response. Teachers provided open-ended responses to the fourth item.

Throughout this Date Note, we report samplewide and subgroup-specific means and proportions of variables of interest, weighted using a set of nationally representative weights described in further detail in the American Instructional Resources Survey (AIRS) Technical Documentation (RR-A134-4, www.rand.org/t/RRA134-4). To compare responses for teachers in schools with different demographic profiles, we matched AIRS responses to school-level data from the 2018–2019 CCD to examine differences across school enrollment of FRPL-eligible students, school enrollment of students of color, and school urbanicity (city, suburban, town, rural).

In Figure 3, we present simple means of the binary indicators for student work completion and family contact conditional on each category of student internet access. We found that the relationships between student internet access, student work completion, and student family contact (1) were robust to defining the binary indicator for the student work and family contact items to also include responses of "approximately 75 percent;" (2) were robust to controlling for school FRPL enrollment, school enrollment of students of color, school urbanicity, school level, and state fixed effects; and (3) were robust to a multinomial logit model that modeled the relationships between the uncollapsed categories of each item.

To answer research question 1, we used a word search technique to qualitatively code 5,651 teacher responses to the open-ended question about their biggest challenge for teaching and learning during the COVID-19 pandemic. We first reviewed approximately 200 responses to generate initial coding categories and potential keywords. We then tested the validity of the keywords by performing keyword searches and reviewing at least ten responses per keyword. We then refined the list of keywords for each coding category until we were able to obtain at least 80-percent accuracy. Two researchers then performed intercoder reliability checks by conducting additional keyword searches on one another's work to confirm at least 80-percent accuracy. After finalizing the list of keywords for each coding category, teachers' open-ended responses were coded in Stata by searching for these keywords to ensure that (1) each response was counted toward a specific code only one time, regardless of how many keywords for that code were present and (2) each response could be counted toward more than one code if relevant. To calculate the percentages of teachers whose responses fell into each coding category, we divided the number of teacher responses found for the relevant keyword searches by the total number of open-ended responses.

About the AEP Data Note Series

The AEP Data Note series is intended to provide brief analyses of teacher and school leader survey results of immediate interest to policymakers, practitioners, and researchers. If you would like to know more about the dataset, please see the American Instructional Resources Survey (AIRS) Technical Documentation (RR-A134-4, www.rand.org/t/RRA134-4) for more information on survey recruitment, administration, and sample weighting. If you are interested in using AEP data for your own analysis or reading other AEP-related publications, please email aep@rand.org or visit www.rand.org/aep.

About This Report

The American Educator Panels (AEP) are nationally representative samples of teachers and school leaders across the country.

We are extremely grateful to the U.S. public school teachers and leaders who have agreed to participate in the panels. Their time and willingness to share their experiences are invaluable for this effort and for helping us understand more about how to better support their hard work in schools. We also thank our reviewers, Fatih Unlu, Andrew McEachin, and Betheny Gross, for helpful feedback that improved this report.

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