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BROADBAND AND STUDENT PERFORMANCE GAPS

A Checklist for K12 Schools Considering Online Teaching in Response to COVID-19

http://broadbandgap.net | https://doi.org/10.25335/BZGY-3V91

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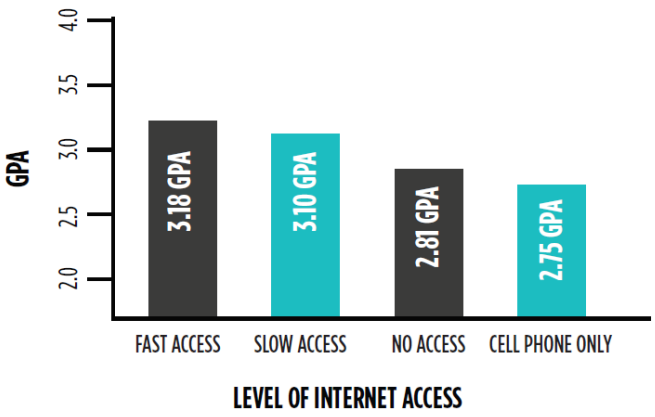
Takeaways

- As schools across the country seek to move education online in response to COVID-19, it is important that they do it in ways that do not exacerbate digital inequalities and further disadvantage vulnerable populations.
- Recent research shows that, even during normal teaching conditions, students without high-speed Internet access at home have lower grades, lower digital skills, and are less likely to plan to attend a college or university.
- It also shows that students who depend on a cell phone alone for Internet access from home and for access to learning materials do as poorly or worse than students with no Internet.
- Existing digital inequalities cannot be eliminated in the short response time necessitated by COVID-19. However, schools have options to minimize disadvantages for students without fast broadband access at home.
- Post-COVID-19, sustained multi-stakeholder efforts, involving the private, public, and non-profit sectors and supporting local, state, and federal programs, are needed to overcome digital inequalities.
- Longer-term, forward-looking approaches will also need to enhance the resilience of individuals, organizations, and institutions to increase the ability of society and of the educational system to respond to future disruptions.

Key Findings of the Broadband Gap and Student Performance Study

A recent study by the Quello Center at Michigan State University in collaboration with Merit Network and several Michigan intermediate school districts examined in detail the effects of variations in broadband connectivity on learning outcomes. Led by Professor Keith Hampton with Dr. Laleah Fernandez, Craig T. Robertson, and Dr. Johannes M. Bauer, the project surveyed 3,258 students in grades 8-11 in three largely rural Michigan intermediate school districts.

The team collected data through in-class, pen-and-paper surveys in 173 classrooms in 21 schools across Michigan, looked at student PSAT and SAT scores, and home Internet speed tests. The survey covered a broad range of measures, including students' online activities, homework completion, subject grades, digital skills, media use, to their goals, experiences and attitudes, and career interests. All data was fully de-identified.



The data reveals that the most rural and socioeconomically disadvantaged students are least likely to have broadband Internet access at home. Only 47 percent of students who live in rural areas have high-speed Internet access, compared to 77 percent of those in suburban areas. Of those who do not have home access, 36 percent live in a home with no computer and 58 percent live on a farm or other rural setting.

Students without high-speed Internet access at home have lower grades, lower digital skills, and are less likely to plan to attend a college or university. On the other hand, students with Internet access have substantially higher digital skills, and these skills are a strong predictor of performance on pen-and-paper standardized tests, such as the SAT, PSAT 10 and PSAT 8/9. Specifically, the study finds:

- The "homework gap" is only one small indicator of the differences in student performance related to inequalities in home Internet access.
- Students with high-speed home Internet access do more educational activities online when away from school.
- The gap in digital skills between students with no home access or cell phone only and those with fast or slow home Internet access is equivalent to the gap in digital skills between 8th and 11th grade students.
- Students with high-speed, home Internet access have higher overall grade point averages (half a letter grade higher, the difference between a B and a B- average).
- Digital skills predict higher scores on pen-and-paper versions of standardized tests, such as the SAT and PSAT.
- Students who do not have high-speed Internet access at home are less likely to plan to attend college or university.
- Students with higher digital skills are more likely to plan to enter a career in a STEM- or STEAM-related profession.
- Poor broadband connectivity impedes the ability of individuals and communities to thrive in the digital economy.

The full report and more information are available at broadbandgap.net and https://doi.org/10.25335/BZGY-3V91. See also the additional guidelines for school districts to consider: See also the guidelines for school districts to consider at https://comartsci.msu.edu/about/newsroom/news/urgent-need-move-schools-online-four-things-your-school-district-needs-know.

Short Term Responses to the COVID-19 (SARS-Cov-2) School Closures

School districts face difficult choices. Large scale shifts in public education to an online curriculum must consider inequalities in broadband access, devices and skills, as well as parental and caretaker involvement. However, these inequalities cannot be overcome immediately. Unless schools decide against online teaching altogether because of these concerns (a strategy that has disadvantages for connected students), they need to find responses that minimize potential disadvantages for vulnerable populations. Key considerations are (1) offering of measures to improve the capacity of teachers, parents and learners to adapt to online learning, (2) appropriate design and use of distance learning, and (3) short-term measures to improve access to broadband.

(1) Measures to improve the capacity of teachers, parents and learners. Assisting the teaching and learning communities to effectively use distance education is critical, despite daunting time and resource constraints.

- Schools should survey parents about the Internet access and devices they have at home. Best practices include using a standard set of questions via email and follow-up phone and collect information about type of connectivity, available access devices, online use practices, and resource needs.
- Schools will need to adapt their learning expectations and test schedules. Students differ widely in their digital skills. Students without home access and those who rely on a cell phone only will have less prior experience with online learning and will need considerable additional support.
- Schools and districts should provide professional development training to teachers to increase digital skills and to develop best practices for online pedagogy. The sharing of teaching and other online resources should be allowed and encouraged.
- Before moving testing online, teachers and schools need to be aware that students who have not had home Internet access or exposure to many devices at home will struggle with digital skills.
- Schools and districts should implement strategies to ensure that distance learning strategies fully support all students, including those with special needs.

(2) Combining online and other forms of distance learning. A hybrid approach could mitigate broadband access gaps, but it places new demands on schools, teachers, parents and caretakers.

- Hybrid approaches could use online learning for students who are connected and traditional forms of distance education, such as mailed hardcopies of learning materials for those who are not. Schools would have to develop detailed lesson plans to continue in this mode.

- With some lead time, schools could collaborate with radio and television stations to broadcast lectures, and with cable networks to retransmit them (e.g., see https://www.kcet.org/at-home-learning).
- To households with computers that are not connected and cannot be connected in the short run, digital copies of lectures could be distributed, including recordings of social media and other online streams.
- Schools would need to offer call-in office hours to support parents and learners. Other complementary services could be offered once the closures are lifted.

(3) Measures to improve broadband access. These initiatives can reduce the cost of broadband, alleviate device and data usage limitations, and facilitate expanding broadband to customers that can be connected easily.

- Nearly 200 service providers have agreed not to disconnect any residential or small business customers due to their inability to pay bills, to waive any late fees, and to keep WiFi hotspots open (see FCC Keep America Connected Pledge).
- Mobile network operators have increased data caps for existing customers and fixed network operators such as Comcast have volunteered to make their low-cost offerings available to additional low-income customers.
- In addition, mobile network operators should monitor and increase capacity and coverage to support increased data demands from hotspots, especially in rural areas that may have fewer cell cities with more limited capacity.
- On March 18, 2020, the FCC waived the gift rules for E-Rate participants to obtain free devices and broadband connections in support of remote learning (see https://www.fcc.gov/document/fcc-acts-support-telehealth-remote-learning-during-coronavirus).
- On March 23, 2020, the FCC allowed schools and libraries to keep their E-Rate funded WiFi access points turned on and make them available to the general public while on school or library property (see https://www.fcc.gov/document/community-use-e-rate-supported-wi-fi-permitted-during-closures).
- The Federal Communications Commission (FCC) has been petitioned by the Schools, Health & Libraries Broadband (SHLB) Coalition and others to authorize funding from the Universal Service Fund for hotspot lending programs through schools, libraries and other anchor institutions.
- Where possible, schools should be allowed to use Educational Broadband Service (EBS) spectrum and possibly other currently unused bands to further alleviate access bottlenecks.
- The next few weeks and months are an opportunity to experiment with different technical and pedagogical solutions. It will be important to monitor positive and negative experiences to improve future responses.

The Need for Sustained Action to Reduce Digital Inequalities

Overcoming the existing digital inequalities and their repercussions for learning outcomes will require sustained measures to close the gaps in access to broadband connectivity and devices. Currently FCC documents define broadband as a connection supporting 25 mbps download speed and 3 mpbs upload speed. As digital technology advances, new forms of learning, such as immersion into virtual worlds, will arise that may need higher bandwidth support. Any long-term connectivity policies therefore will have to include provisions for the continuous revision of the programs to avoid new digital inequalities.

Long term connectivity planning will also require sustained complementary efforts to address gaps in digital skills, and the knowledge of parents on how to best use digital technology to support learning. Many of these challenges interact with sociodemographic factors and other types of inequality. Furthermore, schools may need to review and overhaul their use of instructional technology. These measures require coordination among local, state, and federal government agencies and with stakeholders in the private and non-profit sectors.

- Technological advances have reduced some of the cost of connectivity during the past decades and it can be expected that this development will continue. New low orbiting satellites, in some locations terrestrial 5G wireless, fixed wireless, and new wide area WiFi will all contribute to mitigating the present broadband access divides.
- However, it is unlikely that technological and advances and entrepreneurship will create enough momentum to fully eliminate the existing inequalities. To that end, universal service initiatives, such as the E-Rate program and the Lifeline program, will need to be updated.
- In addition, new funding programs will be needed. The Rural Digital Opportunity Fund of $20.4 billion in combination with additional broadband funding in the stimulus bills can significantly reduce broadband connectivity gaps and generate a high social return.

- The most flexible and scalable, but currently also the most expensive, broadband technology is fiber optical networking. Careful planning and coordination could save a significant share of deployment costs. Dig once models deploy conduits and ducts in parallel to road or other infrastructure projects, greatly reducing the cost of fiber rollout.
- The broader range of connectivity options allows each community to develop a least-cost connectivity plan by putting together the most efficient combination of networking technologies. This will often be a hybrid solution, using a mix of fixed and wireless technology.
- In some locations, investment in a public access broadband network or a public private partnership may be a viable option. Several successful models demonstrate the effectiveness of this approach (see the examples in Broadband for America's Future and in Michigan Moonshot Broadband Framework), although not all experiments did well.
- Existing local, state, and federal laws need to be reviewed to remove obstacles to entrepreneurship, public-private partnerships, and public solutions. In addition, service providers need to review operating procedures for provisions that are barriers to connectivity.
- Because access inequalities interact with income inequalities, complementary measures to increase affordability, such subsidies to individuals, may be needed. Much will depend on the business model and technology deployment and the resulting price points. Stimulating retail and wholesale competition will also help reduce prices per unit of information.
- Several initiatives have sought to work with communities to develop a deeper appreciation of the importance of broadband and digital connectivity. Schools and other community institutions will need to develop programs to work with parents, grandparents, and other caregivers to broaden digital literacy among these populations.

Forward-looking Strategies to Increase Resilience

The current COVID-19 (SARS-Cov-2) pandemic and the challenges of shaping appropriate responses brought vulnerabilities of the K12 education system into sharp focus. Resilience is the capacity of a system to recover quickly from difficulties and unexpected events and the ability of a system to deliver despite continuing adverse events. Organizations, technologies and social systems can be designed with resilience in mind. Thus far, resilient approaches to education have been implemented in crises regions, mostly in low-income countries, but they offer lessons for high-income countries also. Forward-looking education policy will be well advised to consider resilient design. Measures to be considered include:

- Structuring and preparing the K12 system so that it can deliver education effectively online and in other (technology-mediated) modes, should online education become disrupted.
- In addition to addressing the existing digital inequalities, such a model would require systematic teacher and parent training and adaptations to the curriculum.
- Increasing the level of resilience will also require including material on potential sources of risks, effects of unanticipated developments, systems thinking, and possible responses in the curriculum.
- Finally, increasing the ability to mobilize spare resources quickly will be critical, including emergency funding facilities and individuals who are trained to assist in providing educational support in emergency situations.

Additional resources

Hampton, K. N., Fernandez, L., Robertson, C. T., & Bauer, J. M. Broadband and Student Performance Gaps. James H. and Mary B. Quello Center, Michigan State University. https://doi.org/10.25335/BZGY-3V91
Michigan Moonshot, https://www.merit.edu/services/moonshot/.
Michigan Moonshot Broadband Framework: https://www.merit.edu/framework/

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