Unequal Access, Unequal Outcomes: Examining the Digital Divide's Effect on Rural Student Success

CST 462S: Meta Race Gender & Class Digital World

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Introduction

The digital divide is the gap created by unequal access to internet technology, which disproportionately affects the disadvantaged and students in rural and remote areas. While many learners have access to the hardware and software needed for academic success, the divide remains present across different communities in the United States. The coronavirus disease (COVID-19) pandemic led to prolonged school closures nationwide and further exasperated this issue. Students in rural areas, often unable to afford or access the internet and devices, faced significant challenges in fully engaging with online learning. Efforts have been made to bridge this gap, such as lending laptops or providing government subsidies for broadband service. However, these solutions fall short as rural areas still struggle with reliable connectivity, leaving students at a disadvantage compared to their peers who have uninterrupted access.

Online assignments, resources, and submission requirements can hinder rural students' ability to keep up with their urban peers, limiting their learning opportunities. This continues past schooling and into adulthood. As technology becomes even more integral to the workforce, the lack of digital literacy deepens inequalities for learners without adequate access. Many high-paying jobs require knowing how to use hardware and software effectively, making it challenging for people without the appropriate skills to pursue lucrative careers or complete educational requirements. Without exposure to those skills and opportunities they open the doors to, students from underserved areas face cycles of poverty that become difficult to escape. Such negative long-term consequences call for a change. Addressing the digital divide requires analyzing key factors such as internet connectivity and device access in rural schools. Ensuring equitable access to technology is essential to providing all students with the skills necessary to

succeed in an increasingly digital world. Improved connectivity and device availability could empower rural students to develop the technological competencies necessary for both academic and career advancement.

Literature Review

Research into educational trends in the United States offers valuable insights into the digital divide, especially in the context of the COVID-19 pandemic and technology's growing role in education. This review focuses on how these factors affect rural students who often face limited access to the necessary digital resources.

Graves (2021) addresses the ongoing challenges of limited technology access in rural and remote U.S. areas, noting its impact on educational outcomes. Weak or nonexistent broadband connections prevent many learners from fully engaging in online learning — a gap that widened during the COVID-19 pandemic. When in-person classroom attendance was not an option anymore, many had to upgrade their hardware and software to continue productive educational efforts from home. While the change might have been easy for some, rural and low-income communities struggled the most, given that the main platforms for learning were done through desktops, laptops, mobile hardware devices, and Google Suite for software (Stewart, 2021). Such observations are important for analysis given their relevance in the context of the recent pandemic that took place worldwide.

Research conducted by the National School Boards Association (2021) revealed that “Rural students were twice as likely as urban students to report a lack of adequate technology to complete their coursework during the pandemic” (p. 23). Within rural areas, the more remote, the more likely rural students have no or limited access to the internet; some have few internet provider options or are unable to afford the service. This can result in students lagging behind

their peers if they don't always have access to technology like cell phones or computers that can create that opportunity.

In response, different non-profit organizations are implementing strategies to narrow the divide. For instance, the Federal Communications Commission (FCC) has taken steps to assess and improve broadband access; however, there are some issues as service providers' self-reported data often overstates availability in rural communities. Organizations like the American Technology Initiative address the needs of Americans by providing them with open-source software that they can use. Another non-profit, ASCENDtials, offers a holistic approach to education, focusing on San Diego's Black, Indigenous, and people of color (BIPOC) communities. Their programs, such as literacy workshops, aim to equip BIPOC adults with literacy in critical areas, including financial, spiritual, cosmic, civic, and environmental. The FCC has also reportedly looked into this issue, but the lack of technology has resulted in lower Census numbers, and service providers' self-reported data has been criticized as it's believed to be overestimating their effectiveness in the rural community. The Washington State Office of Superintendent of Public Instruction (OSPI) has done two things to help this – to study the access the learners need with technology and broadband and to see what barriers exist that are preventing them from achieving such access.

The digital divide can hinder students' academic progress and limit their preparedness for a tech-driven job market. In their study on technology as a tool for diversity and inclusion, Parsons and Riva (2021) argue that technological access is crucial for achieving educational equity. They highlight the need for policies that bridge gaps in technology access, emphasizing the role of digital tools in expanding economic opportunities for underserved populations. This

aligns with the OSPI's efforts, which involve researching barriers that prevent rural students from gaining essential digital skills.

The common theme across these studies is the need for effective policies that ensure equitable access to high-speed internet and digital devices. These technological disparities contribute significantly to educational inequality, particularly for rural students who may lack the technological skills needed for higher-paying jobs. Addressing these disparities is crucial for creating a level playing field in education and employment opportunities for all (Graves, 2021). According to the National School Board Association, the first step to fixing the digital divide is to provide all rural students with equal access to the Internet; the second would be teaching them how to develop digital literacy (2021).

Research Question

In what ways does limited access to high-speed internet and digital technology in rural areas contribute to educational inequality, and what policies, programs, or public-private partnerships could effectively reduce this gap to create equitable learning opportunities? Students in provincial and agricultural areas face unique challenges due to limited or inadequate internet access and a lack of digital devices, issues that were highlighted and exacerbated during the COVID-19 pandemic. These barriers can prevent them from fully engaging in modern online learning, limiting their access to educational resources and putting them at a disadvantage in both academics and future job markets. High-paying careers increasingly demand digital literacy, and without basic technological skills, individuals from underserved areas may be left behind, perpetuating cycles of poverty and further deepening class inequalities. This digital divide in education also raises broader societal concerns, as it intersects with issues of class and access to opportunity in an increasingly tech-driven economy. Given these challenges, it's crucial to

examine existing policies and determine whether current federal and state programs are sufficient to meet rural students' needs. The literature shows efforts from organizations like the FCC and the OSPI, but also highlights gaps, such as the tendency of service providers to overestimate rural broadband coverage. These findings suggest a need to evaluate new or improved interventions. For example, how might targeted funding, infrastructure improvements, or community-based initiatives help rural students gain consistent access to digital learning tools? This question seeks to identify specific barriers and feasible solutions that could bridge the digital divide, providing insight into the larger social and economic implications of technology access in education.

Research Design (1 pg)

Our target research participants are individuals aged 10 to 60 who were in school during and after the COVID-19 pandemic, with income ideally at or below the national average. We have prepared a set of interview questions to understand the impact of limited technology access on their educational experiences:

- If you grew up in a rural area, do you feel that the lack of exposure to technology hindered your success? If so, how?
- Have you benefited from any school or government programs that provide access to digital devices or technological resources?
- What specifically could schools have done for you regarding technological education and hardware/software provisions to improve learning?

- In what ways has limited access to reliable internet or digital devices affected your ability to complete assignments or participate in school activities compared to students who you think may have better access?
- How did the shift to online learning during the COVID-19 pandemic affect your access to educational resources, and what challenges did you encounter with using available technology at home?
- Based on personal experiences, how do you think the limited access to technology impacts student's ability to keep up with peers with full access?

For data collection, we will use Google Forms as it provides an efficient method for gathering responses. We plan to distribute the survey through Reddit, posting it in relevant subreddits focused on education and student experiences. The responses will be reviewed and filtered to remove spam or irrelevant entries, ensuring we have quality data for our analysis. The deadline for survey submissions is set for November 19, 2024, allowing us sufficient time to gather and analyze the results. This structured approach aims to yield insights into how limited technological access in rural and low-income communities affects students' learning experiences and long-term opportunities.

Service Organizations (.5-1 pg)

Jose and Polina are doing their service learning at the American Technology Initiative - a non-profit organization that aims to support displaced American tech workers by offering volunteer and employment opportunities. Many tech workers face layoffs, often due to globalization. They invite others to contribute to their mission through partnerships, membership, volunteering, or donations. The organization's purpose is targeted to all Americans, which

includes those in remote communities. Its nonprofit model aligns with the affordability aspect of alleviating the issues with access to appropriate software tools. This would benefit many of those students in the rural areas who fall behind due to their lack of access to technology and broadband. Additionally, the American Technology Initiative creates software that is free for others to use, which can alleviate the financial burdens people in disadvantaged communities might face.

Taylor is completing her service learning as a volunteer web designer at ASCENDtials, a non-profit organization based in San Diego that aims to empower its local BIPOC community. It was founded in 2014 by Mika Marzette, and for the last ten years has developed and led programs that ignite real change in the community and in spaces that are not inclusive towards BIPOC people. They build up the community through events like farmers markets, climate clean-up, managing a community garden, and provide educational programs that combat systemic racism in the current education system. ASCENDtials mission of uplifting its local community through education and community programs aligns with our goal of understanding how limited technological access can affect education.

We are interviewing people outside our organizations. The people will be selected by reaching out to appropriate subgroups (subreddits). The trust will be based on good faith, and any inappropriate answers will be edited out.

Conduct Research

To gather participants for our research, we decided to look outside of our sites since we were unable to locate the target audience at our respective sites. We aimed to reach relevant audiences by posting a link to our survey with a brief descriptive message in three subreddits we

identified as viable given the active number of participants and believed to have communities that aligned with our research topic. These subreddits included: r/College, r/applyingToCollege, and r/education. Unfortunately, we were unaware of specific group rules prohibiting survey links in these subreddits. As a result, our posts were removed.

After encountering restrictions on Reddit against survey links, we adjusted our strategy to locate a target audience for our research. We identified an active Discord community of gamers, whose demographics were wide enough to align with our target audience. With approval from the community moderators, we were able to post the survey with a brief message describing our target audience. This approach allowed us to connect with a highly engaged audience. A total of seven people were surveyed.

Findings

Based on responses from a Google Forms survey of individuals aged 19 to 50, more than half of the participants reported challenges related to unreliable internet, lack of internet access, or limited access to digital devices, often impacting their ability to complete assignments or participate in school activities. Many had to rely on hotspots, plan around outages, or spend more time on manual research due to these limitations (Questionnaire Findings, Appendix A).

A lack of exposure to technology during formative years was seen as a barrier to educational and career success. Respondents highlighted issues such as costly or unavailable internet services in rural areas. While some schools attempted to address these barriers by providing devices like Chromebooks and offering digital courses, others lacked the resources to implement such programs - 33.3% of respondents reported not benefiting from any educational programs targeting the digital divide, and 16.7% were not sure (Figure A4). When asked about

the methods to mediate the hardships of limited access to digital services and electronics, some respondents highlighted accommodations such as WiFi routers in schools, the introduction of technology education classes, provision of online resources such as Microsoft Suite and online textbooks. Few respondents were satisfied with their school's effort to bridge the gap, and one highlighted the importance of better government funding to educational institutions before schools can decide further on their strategies (Figure A6).

Despite these challenges, most respondents rated their comfort with technology as above average (Questionnaire Findings, Appendix A). The COVID-19 pandemic further exposed inequalities, as the transition to online learning strained limited resources in households with multiple students. One respondent stated, "It just meant I had to turn in my assignments as soon as I could before the internet gave out or risk losing points. So no full credit for my assignments if that happened" (Questionnaire Findings, Appendix A). This meant that their focus wasn't on completing the assignment as well as they could, but instead, it meant that they just needed it complete whether it was good or not. A lack of communication and support from schools also affected performance during this time (Questionnaire Findings, Appendix A). Key themes from the findings include rural-urban disparities, the adaptability of students when given resources, and the critical need for schools to address technological gaps.

Conclusions

As internet technology becomes increasingly critical to succeeding in the modern day, understanding how information technology and design influence inequality - either by contributing to it or mitigating it - is crucial. When technology is created with diverse needs in mind, it can empower underrepresented groups and promote equity. However, communities with

limited accessibility to digital hardware or internet services are often excluded from the benefits of technological innovation, leaving them behind.

Surveying rural students helped answer the main research question: “In what ways does limited access to high-speed internet and digital technology in rural areas contribute to educational inequality, and what policies, programs, or public-private partnerships could effectively reduce this gap to create equitable learning opportunities?” to a sufficient degree by directly targeting the individual experiences of our subjects. Some respondents shared the ways that limited access to technology meant that it was more difficult for them to finish assignments, and, many times, the timing of assignment submission had to be adjusted because of unreliable internet connectivity (Figure A2). The results also highlighted the importance of school programs that provide hardware devices like iPads and Chromebooks, as half of the respondents reported benefiting from them (Figures A4 and A5). To tackle the second part of the research question, respondents were asked what could have been provided by schools to improve their knowledge base with technology. Answers included provisions of hardware devices, Wi-Fi hotspots for students to access, and more prominently, computer science classes and resources for success in the world of online schooling (Figure A6).

A literature review of the topic illustrated a clear correlation between access to technology and socioeconomic status. It is more challenging for learners to get work done with quality in mind when access to technology is limited, and COVID-19-related research highlights it. There is a need for government programs focused on providing all schools with the necessary infrastructure to ensure all students have equal access to the internet and technology.

Recommendations

Based on the results of the survey and overall conclusions, some recommendations came up that could alleviate the issue of the technological gap between rural and urban communities in the United States.

- Expand Access to Technology: Both state and local governments should focus their efforts on providing digital infrastructure to areas that may lack it. This could include increasing access to affordable internet with enterprises like Starlink, providing low-cost devices, and offering public Wi-Fi.
- Emphasize Inclusive Design: Developers and companies should prioritize inclusivity when creating technology. This means designing tools that are accessible to people with disabilities, considering the needs of underrepresented groups, and ensuring platforms are easy to use across different cultures and languages.
- Provide Digital Literacy Education: Communities need more opportunities to learn how to use technology effectively. Schools, libraries, and community centers could offer workshops or courses on digital skills, coding, and using technology to solve real-world problems. Everyone equally needs to be encouraged to participate, thus helping marginalized groups.
- Advocate for Ethical Technology Policies: Policymakers should establish stronger regulations to prevent unethical use of technology, such as biased algorithms or exploitative data practices. These policies should focus on ensuring transparency and fairness while also protecting user privacy.
- Encourage Collaboration Between Sectors: Partnerships between businesses, nonprofits, governments, and schools could lead to more impactful solutions. Sharing resources and expertise can ensure initiatives reach a wider audience and are more effective.

This time, the focus was very general and broad, considering the overall human population in remote areas of the United States. Some recommendations for further research could be topics that potentially dig deeper into the problem and provide better data on disparities. Variables for consideration could be gender, race, disabilities, veteran status, and immigration status of students in remote areas. At the same time, the topic can broaden to extend to corporate spaces, or outside rural areas - how does technological education in middle and high schools affect performance in corporate environments? How much faster do people learn new technical skills based on how early they began learning them? And of utmost significance, how do we, as a society, strive to provide equal access to affordable, high-speed internet? Those are some of the questions that could pique interest in the context of life in the early twenty-first century, which is heavily affected by the increased need for digital connectivity.

References

Graves, Janessa M, et al. “Disparities in Technology and Broadband Internet Access across Rurality: Implications for Health and Education.” *Family & Community Health*, U.S. National Library of Medicine, 2021, pmc.ncbi.nlm.nih.gov/articles/PMC8373718/.

National School Boards Association, Center for Public Education. (2021). *An urgent need to fix the digital divide.* National School Boards Association. https://www.nsba.org/-/media/CPE-An-Urgent-Need-to-Fix-the-Digital-Divide.pdf

Stewart, B. L., Goodson, C. E., & Miertschin, S. L. (2021, July 31). *COVID-19 Technology Student Success Challenges: Influence of Tools and Strategies*. CoED Journal. https://coed.asee.org/wp-content/uploads/2021/07/COED_VOL12_ISSUE2_A1_Final.pdf

Appendix A

Questionnaire Findings

Appendix A represents the data collected from the Google Forms questionnaire, which collected information from people who fell under the criteria of our research. The six respondents' ages ranged from 19 to 50 years of age.

Responses:

Topic: How Beneficial Were the Educational Programs in Rural Areas

Respondents were asked whether living in a rural area affected their access to technology, with 50% reporting that it did. A follow-up question urged to elaborate on the feedback.

Figure A1

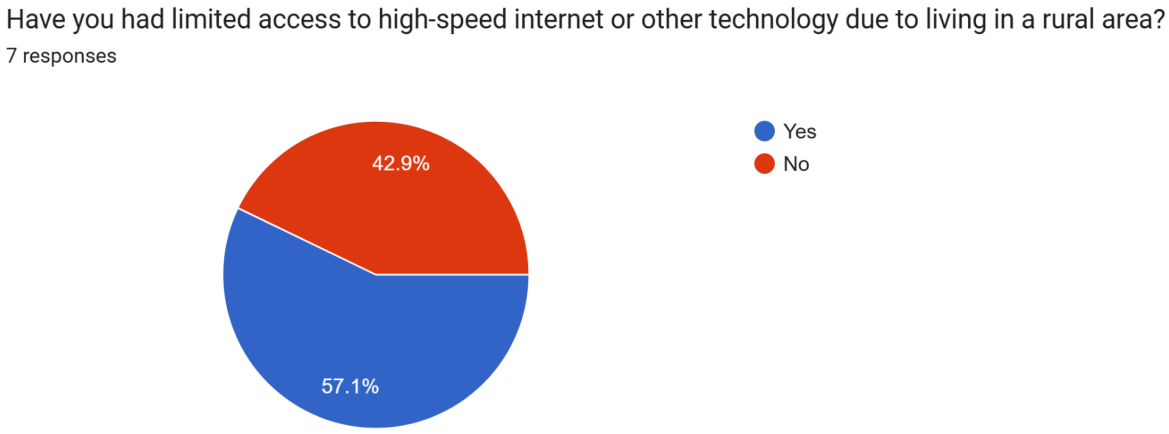


Figure A2

In what ways has limited access to reliable internet or digital devices affected your ability to complete assignments or participate in school activities compared to students who have better access? If the internet access was reliable, enter N/A.
It meant I had to turn in my work early because sometimes the internet would give out and you would have to wait until it came back to turn in assignments. You had to seek out the hot spots and plan accordingly to even be able to turn them in.
N/A
N/A
N/A
N/A
I would say just the time it took for research was the hardest part. Rereading book passages takes a significantly longer time than looking it up.

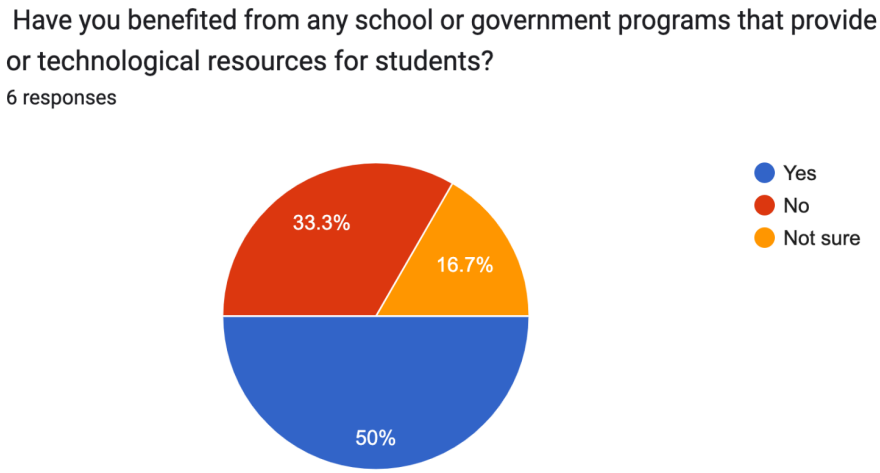
A related, more broad question was asked about overall success in education and career.

Figure A3

If you grew up in a rural/remote area, do you feel that the lack of exposure to technology hindered your success in education and/or career? If so, how? If not applicable, enter N/A
Yes because not a lot of cable companies that were affordable were able to offer us internet unless we were willing to pay a lot for it so when we had internet we had to careful with not using up all of it. Not to include having these obstacles made it a bit harder to catch up with school work sometimes.
Yes, since when I did my conventional schooling there was no wifi access in schools or at home, All information had to be manually found in books, which would have otherwise been way easier with a google search. Once I moved to a larger city, learning technology wasn't too difficult.

The respondents were asked whether there were school programs that sought to alleviate any obstacles to access to technology that they benefited from.

Figure A4



When inquired on the specifics of such programs, or which services were provided, the responses varied.

Figure A5

If so (reference Figure A4), what were the programs?
none
In high school each student was provided with an iPad
typing class, lots of digital tests, cyber security course
Whatever gave schools Chromebooks
Schools providing students Chromebooks + purchasing online textbooks for students

A related question was presented asking what respondents wished their schools had done to benefit their students.

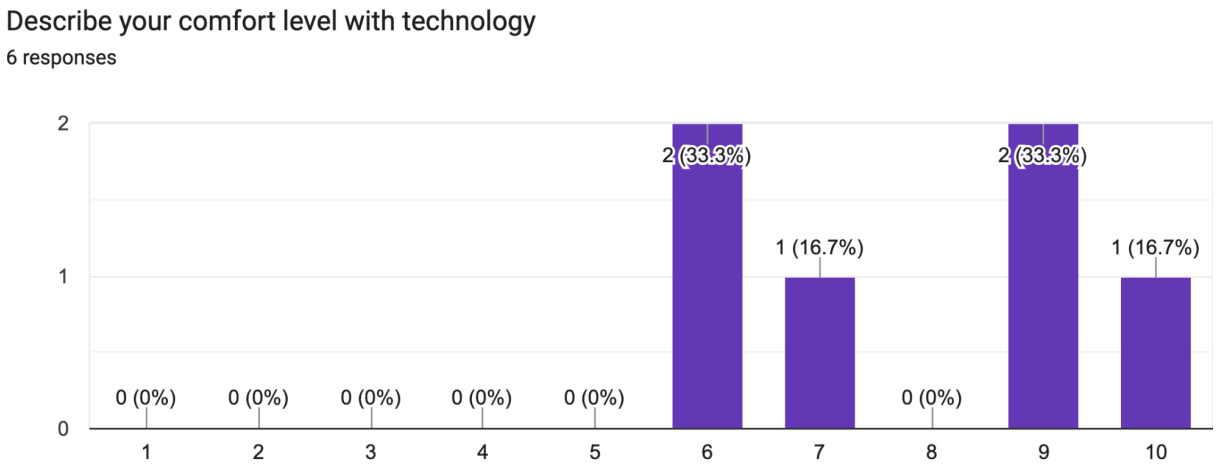
Figure A6

What specifically could schools have done for you regarding technological education and hardware/software provisions to improve learning?
Schools could have offered wifi routers for students that could not afford it or were having difficulties with the internet that they already had. As well as opportunities to work on assignments on a different deadline if they could.
I believe throughout my schooling I was provided with enough electronic resources to succeed
They could add a computer science class to more public schools for kids to have the option earlier in life.
Schools already helped me get used to using technology everyday, as well as useful software such as Microsoft Office and its doodads
I think schools could put more effort into providing more online resources for students. Not a lot of schools provide helpful videos or articles to help students excel online.
Nothing because the schools themselves lacked funding.

Topic: Level of Confort With Technology:

Respondents were asked to reflect on their level of comfort with digital devices and services, with 1 signifying not being comfortable, and 10 as tech-savvy. All have ranked themselves on above-average levels, with 33.3% at 6, 16.7% at 7, 33.3% at 9, and 16.7% at level 10.

Figure A7



Topic: COVID-19

The Covid-19 pandemic affected most of the world and forced many to move to online schooling. Some schools, teachers, and students were not prepared for this transition regardless of the location. Therefore, the following question followed.

Figure A8

If you were a student during the COVID-19 pandemic, how did the shift to online learning during the pandemic impact your access to educational resources? What specific challenges did you face in using technology and resources available at home to support your learning?
It was difficult to go from a classroom environment to strictly online but it got easier with time because you removed the stress of preparing for class. However having multiple students in one house made it difficult because it meant multiple people were trying to use the internet at once.
N/A
N/A
Did not have this problem. Was fortunate enough to not have to worry about access to technology.

During my sophomore year I had an entire school year online. While it was new to me, it was new to my teachers as well. However I feel like the way the schools/teachers handled the situation was poor. There was a lack of communication and support via online which caused lower grades.

One person elaborated, stating “It just meant I had to turn in my assignments as soon as I could before the internet gave out or risk losing points. So no full credit for my assignments if that happened”.