Inequality of Access to Internet Technologies Among Students

David Baker, Mike Limpus, Paola Torres

CST 462: Race Gender & Class Digital World

Brian Robertson

Team 8

Introduction

With the outbreak of the COVID-19 pandemic, schools all over the world switched to online distance learning. While this change was inconvenient for most, it was nearly insurmountable to the millions of school children without Internet access. (Federal Communications Commision, 2019). Even before the pandemic, however, lack of access to the Internet put school-aged children at a major educational disadvantage compared to those with Internet access. Education resources offered on the Internet can express a wide range of interests as well as offering different levels of interaction depending on the child's learning environment. Providing Internet access to children who wouldn't otherwise have it would allow for them to have a better chance at a more robust education. This research paper will explore potential causes of and solutions to the ongoing problem of inequality of Internet access.

Literature Review

Recent changes in education have reflected pre-existing educational inequalities

Instruction across the country moved to an online setting due to the pandemic. This shift highlighted the fact that a large portion of households with students do not have access to basic Internet technologies. Currently, there are 16 million students in the U.S without access to a computer (Bruce, 2020). This access inequality is apparent among socioeconomic status of a household and race. Students of lower income households are at a greater risk of falling behind than their peers in their schooling due to lack of necessary resources. It is estimated that 60% of lower income students receive below average quality instruction online with about 40% not receiving instruction at all (Bruce, 2020). While socioeconomic status is a determining factor in the inequality of access, race also has a part in the access divide. Black and Hispanic students are

less likely to have access to necessary technological resources to succeed in school. As a result, it is estimated that Black students can fall behind their schooling about 10 months, while Hispanic students can fall behind about 9 months. For comparison, on average, students fall behind about 6 months (Bruce, 2020).

Access differences create statistically significant educational outcomes

There is an observable disparity between online learning resources and differing income households. Using Google Search data, Bacher-Hicks et. al. show that there is a correlation between access to Internet-based learning resources and household income. This is shown severely in the months following the school shutdowns following the coronavirus outbreak in 2020 (Bacher-Hicks, 2021). Their research suggests that gaps in student success based on income will grow in the coming years as a result of the pandemic. They argue that providing greater access to the Internet could narrow the gap in student achievement relative to household income. This study uses Google Search data as a basis for statistics, using publicly available search intensity statistics provided by Google.

Effects of providing better access to underprivileged students

Using the Internet allows the student to learn through stand-alone software products, participation in online courses, attending video sessions, and a large degree of other applications provided by the ubiquitousness of technology. As students grow older, they are more comfortable with technology which creates even larger gains in education (Lynch & Kim, 2017). Providing low-cost Internet access to people, especially families, gives them the opportunity to access resources that would otherwise be unreachable.

Low-income students have academic outcomes significantly lower than those with more opportunities for access to learning tools and Internet access. Students in higher-income families and with more parental involvement had higher involvement rates and scores in a study by Lynch and Kim (2017). Improving access to technology and Internet access would help prepare students so digital literacy is not the greatest limiting factor in improving educational results. The study also found students benefited from exposure to the educational materials through the summer, resulting in better preparedness for upcoming classes (Lynch & Kim, 2017).

Research Question

There is a clear correlation between income and access to technology. Even though this divide has taken the forefront recently due to the current state of the world, it has been a long standing issue. Students who lack appropriate access to what has become fundamental technology are at risk of falling behind in their schooling and, ultimately, their education. Therefore, it is important that this inequality of access is addressed.

Much of the research on limits to Internet access is focused on the effects of increased access and modifications to structured delivery. Our goal is to focus more on methods of physically bringing Internet access to the individual or family rather than the well-documented positive outcomes of connectivity. We will explore methods to address how this inequality of access can be bridged across socioeconomic and racial backgrounds. How can Internet access be more widely provided to populations who are less privileged along these lines?

Research Design

Our target research participants are lower income families with current students, lower income students, or individuals that have experience working with students of lower income families. We will recruit participants from our current service sites. In the case where members

are unable to find qualified interviewees at their respective sites, local school districts will be contacted for interviews. Our research questions will be provided to our participants in the form of a survey. The survey will consist of the following six questions:

- In your experience, how do you feel about the general accessibility of the internet among different income groups?
- What do you believe to be low-cost or accessible means for people to access the internet?
- What are the devices you and your family access the Internet through?
- Do you feel like the cost of an Internet connection is more prohibitive than the cost of purchasing a device to connect to the Internet?
- Based on your observations, what percentage of families and students have immediate access to basic technology such as a stable internet connection and a computer or laptop?
- In your experience, does online learning affect students?

The same set of questions will be sent to each participant via email with a deadline for responses of February 8th.

Service Organizations

Circles of Empowerment is a group operating out of Arroyo Grande, California that seeks to meet the spiritual needs of its members by providing opportunities to learn and share through service and ceremony. While its members are from many ethnicities and backgrounds, there is a large emphasis on First Nation approaches to ceremony and relating to the natural world.

The group places a lot of emphasis on learning from elders and recording knowledge they are passing on. Providing an online environment for exploring themes the group wants to highlight enables them to do outreach and to help connect others to valuable spiritual knowledge. Access to the Internet among members and people interested in these themes varies from paying

for regular home Internet connections to depending solely on mobile devices. Understanding the needs of a group driven to participate in teaching and learning could help understand larger needs in how to connect people to educational resources.

Several members have children and while their Internet connectivity is not used primarily for connection to the group, interviewing them can help understand what barriers they have to dependable Internet connectivity.

Early Learning Essentials is a nonprofit preschool based in Utah. The main mission of Early Learning Essentials is to provide all the necessary resources a child needs right from the beginning of their schooling career. Their goal is to bridge the gap between income and success in schooling. As such, the organization not only focuses on the learning aspect of a child's early schooling career but also provides health, nutrition, mental health, and family services. Thus, the focus of our service project is to create an online presence for the organization to inform both current parents and the general public of the resources provided by Early Learning Essentials. The goal is to reach as many households as possible that would benefit from these services. Interviewing staff at this nonprofit organization can give us an understanding of the availability of basic technology for the average lower income household in a medium sized city in the United States.

Mountains Community Hospital is a small local critical access hospital with a health clinic and pharmacy based in Lake Arrowhead, California. Their goal is to provide essential medical services to the residents of the local mountain. They provide these services by way of a 24 hour emergency room, medical offices, a rural health clinic which offers low-cost healthcare, and a pharmacy. The service project that will be completed with this site will consist of working

under the IT department to assist in the maintenance of the hospital's record database, as well as their computer infrastructure. This site will provide an opportunity to speak with professionals in the IT space, and they will be able to offer their insight on the issue of equitable internet access.

Research

The Operations and Development Manager at Early Learning Essentials completed our survey. He was an ideal candidate for the survey because the organization he works for, Early Learning Essentials, mostly works with families that are below the poverty level. Given his position, he has worked and interacted with many families with school-aged children. Thus, he has an understanding of these families' needs and resources availability.

A Circles of Empowerment founding member was available to take the survey. She has been involved with the group since its beginning and helped define the direction of the group. She has experience with teaching, outdoor education, raising children, watching her children raise children, and has insights into the direction the group is hoping to head. She also lives in a rural area and has had to deal with intermittent access to an Internet connection.

Two responses were gathered from educators in the San Bernardino County area. One respondent is the Principal of Charles Hoffman Elementary School, located in Running Springs, CA. She has worked in education for 23 years, and has served as principal since October 2021. Another respondent is a special education teacher for elementary students in San Bernardino, CA.

Our final interviewee is an English-as-a-second-language teacher in Daegu, South Korea. After getting her Bachelor's of Arts in English, she began teaching English to secondary students in South Korea. Her input is unique, as it is viewed through the lens of South Korean students, rather than that of students in the United States, which this paper primarily focuses on. This

perspective will be valuable to compare and contrast with, as many of the experiences of her students are similar to those in the US. This similarity will help shed light on the unique challenges of the socioeconomic and cultural factors at play in the United States.

Findings

The research survey results were indicative of trends the participants observe about the availability of Internet access to less privileged populations. All of the participants pointed to the cost of regular Internet access as more prohibitive than acquiring a device (Appendix A). Location was also mentioned by several participants as being a driver of lack of access among low-income, mostly rural populations. Suburban and urban populations reportedly have more opportunities for access to the Internet than those who are low-income and live in rural areas.

As cost is the main barrier to accessing the Internet, several important points emerged from responses on this point. Lower income populations mostly use mobile devices due to their portability and cost as opposed to a home computer. The ability to use a mobile device as a work platform is limited and current design patterns may exclude older devices. The responsibility of creating designs on these platforms to be as functional as possible is made important when considering there are people who will use these platforms as their main point of access. Another issue in providing low-income people with resources to low-cost connectivity is getting the word out to the right people who could most benefit. Spreading the word about programs to provide people with low cost solutions needs to take into consideration extra disparities beyond cost in device ownership and location.

There are a few common themes that emerged among the participants' answers. Most of the participants agreed that along with income levels, a students' location also can affect their accessibility to internet access (M. Fritz, personal communication, February 8, 2022). It was

noted that individuals who live in rural areas have less options for internet connectivity and, oftentimes, the available options are not cost effective for lower income families. Participants also commonly noted that some students only access the internet via a mobile phone (Fritz, personal communication, February 8, 2022). It was noted that among low income families, the propensity of owning a personal computer depended on the tech savviness of the household. Finally, although most participants agreed that location, i.e. living in a rural location, affected internet access, most thought that accessibility to the internet has been broadened due to public internet access in certain locations, meaning that, even if a family does not have access at home, they can travel to a location to gain free public access. The estimates for accessibility to technology ranged from 40% to 90% (Merrell, Dieli, & Fritz, personal communication, February 8, 2022).

We found that access to the internet is bounded by geographical location as much as it is by income. More than one of our respondents noted that low-cost access is more freely available in urban communities. It was noted that transportation cost is a factor in rural communities, as there are fewer means to commute to a public resource. This is supported by the study conducted by Bacher-Hicks et. al., which used location as a basis for their research. They found that there was more online learning engagement in “Areas of the country with higher income, better internet access and fewer rural schools” (Bacher-Hicks et. al., 2021).

Conclusions

Our research found that the cost of consistent internet access from an Internet Service Provider was the main barrier of access to online education resources. Furthermore, we discovered that rural communities have a more difficult time accessing public resources, such as

libraries or restaurants with public wifi. As such, we have narrowed down a key target demographic with unmet needs to be addressed: low income individuals within rural areas. We can conclude that solutions must be found to provide internet connectivity to rural communities in a way that is both low-cost and reasonably accessible. This distinction is noted by one of our interviewees:

"'Low-cost' and 'accessible' are not interchangeable terms… In terms of accessibility, an individual must travel to a location which can be a challenge to those with physical disabilities or limited access to public transportation as in rural communities." (M. Fritz, personal communication, February 7, 2022).

Our initial research question asked what solutions were possible for connecting individuals from a racial and economic standpoint. We learned a great deal from our interviewees about the problems that prevent easy access to the Web, especially in regards to economic status. However, we were left without many answers as to the causes of this issue as they relate to race. As such, we feel as though our research question was only partially answered through interviews.

Our conclusions show parallels to the material learned in CST 462S. We have specifically examined the main topic that was covered in Module 6: The Digital Divide. Our findings reflect that of one of the main readings in that module, "What is the Digital Divide?". This article points out income levels and geographical restrictions as two of the main causes of the digital divide (Steele, 2019), which our research supports.

Recommendations

The analysis of the research question's responses created possible paths forward. A possible future research topic emerges as technology accessibility through the scope of race. As previously mentioned, the interviews yielded information about technology accessibility in low

income and rural communities. In the analysis of income and location, the intersection of these two elements with race was not examined. Future research may also focus specifically on students and families in rural communities and their experiences with technology accessibility in their everyday lives. Through this specific focus, we might gain a better understanding of how those communities experience technology through cost, reliability, and different methods to gain access to technologies and ultimately the effects caused by these.

Reliable access to necessary technology is no longer a commodity but rather a necessity. To keep people connected to resources like education, a wider effort by the government to bring the Internet to people with no access could be used to address inequality in connectivity. At the local level, cities and towns can consider implementing larger free or low cost public networks for their citizens. This will help address the cost concern for lower income families as well as families in rural areas. If the local government sets up access points in rural communities, this will diminish the need for families to travel or pay an abundance of money for a reliable Internet connection. At the larger government level, programs for subsidizing the cost of Internet access or laptops for school-aged children of lower income families would help with cost concerns. The gap of accessibility would narrow due to the technology becoming more affordable for these families. There is much to be done at every government level to address this access inequality.

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Appendix A

Service Site Survey Responses

Survey Response: Operations and Development Manager at Early Learning Essentials Responses

1. What is your name and occupation?

Lance Merrell, Operations and Development Manager

2. In your experience, how do you feel about the general accessibility of the internet among different income groups?

There is some difference. Lower income people generally have less access to internet, but the gap has closed significantly in the last 5 years. Right now, in our region, the bigger factor is location. If you live in an urban or suburban area, you have access to internet. If you don't and you're lower income, then you don't have access.

3. What do you believe to be low-cost or accessible means for people to access the internet?

Accessible can mean a variety of different things. In a couple local cities, there is free internet access, mostly through google fiber, at low speeds (10mb). Otherwise, an option at $40 or less is fairly accessible. There are several local grants available that cover about the amount for qualifying individuals in an effort to increase access.

4. What are the devices you and your family access the Internet through?

3 computers, 2 phones, 3 tablets, chromecast, xbox, various smart home devices

5. Do you feel like the cost of an Internet connection is more prohibitive than the cost of purchasing a device to connect to the Internet?

If looked at on an annual scale, I would say that yes, it is. However, most people when making these purchases AND have access/finance issues, they don't have the greatest budgeting skills, so its not taken into consideration.

6. Based on your observations, what percentage of families and students have immediate access to basic technology such as a stable internet connection and a computer or laptop?

We serve families primarily below the federal poverty level, but our numbers are around 90% that have access in the home. That number increases if they look at options outside of the home.

7. In your experience, does online learning affect students?

Yes, though there is a variation across methods and software options. Some teachers are better than others. Some online/premade curriculum are better than others. In general, at least at the pre-k age, in class/in person teaching is significantly more effective.

Survey Response: Founding Member, Education Specialist, Ceremony Participant, Mother and Grandmother of Several Participants at Circles of Empowerment

1. In your experience, how do you feel about the general accessibility of the internet among different income groups?

I have a son that did computer clinics when computers were being donated to farm worker families' kids, just like when old people have access to computers they can get all

cluttered, you know it's good to teach what they're getting to use especially if it's not the top notch technology. Using the older stuff just needs guidance from the community.

2. What do you believe to be low-cost or accessible means for people to access the internet?

I'm not sure what that means. I only use StraightTalk and my Android device. I occasionally use them as a hotspot and my computer if I need to upload a letter. Low cost access is almost unheard of as far as I know.

Occasionally I get a letter from the state with an offer for low-income internet access. So they would provide a phone and access through that program

3. What are the devices you and your family access the Internet through?

The only ones that I have at this point are I have an Android device and they said it has like 15 hours of hotspot activity I can put on other devices but I did hook it up and sent a letter to the print shop to be made physical and that made me feel pretty savvy for an old gal.

4. Do you feel like the cost of an Internet connection is more prohibitive than the cost of purchasing a device to connect to the Internet?

In my experience, being the one that carried some of the bills for the household, [an Internet connection] was definitely expensive. With my plan right now that has unlimited international calling to Canada and Mexico and the added hotspot liberty is $55 a month and I was paying $166 before for the household. Additionally, I was told the satellite dish, they weren't going to come out and maintain it anymore because the tree grew too tall, and what do you do then?

5. Based on your observations, what percentage of families and students have immediate access to basic technology such as a stable internet connection and a computer or laptop?

That's a good question and I would say it would depend on how invested the parents are, because if the parents are maybe ESL and they don't have the time or [aren't] able to know. In my family my kids are tech savvy.

Some of our community members live in San Jose, Santa Barbara, places that are more urban, but we try to supply outdoor experiences and if we don't have a technological component, people just want to get out their phones and start sharing or watching the videos.

Out on our land we used to have no cell phone reception, but they put in a cell phone tower right at the bottom of the road and now I've been in a full moon ceremony out there with someone sharing on their cellphone.

6. In your experience, does online learning affect students?

I believe it does. If the family is smart about how they use technology, like I try to augment my grandchildren by going online for lessons about insects and taking those lessons into the backyard outside. It was kind of about making that balance to get them used to the ideas and concepts and lessons in the computer and take it out into the world. So, if families can do that then more power to them.

Megan Dieli: Principal, Charles Hoffman Elementary School, Rim of the World Unified School District

1. In your experience, how do you feel about the general accessibility of the internet among different income groups?

It is not accessible for those in rural areas that do not have much choice in Internet providers and cost would be difficult for low income families.

2. What do you believe to be low-cost or accessible means for people to access the internet?

$10 a month

3. What are the devices you and your family access the Internet through?

iPad, iPhone, PC Laptops, Alexa, WiFi router

4. Do you feel like the cost of an Internet connection is more prohibitive than the cost of purchasing a device to connect to the Internet?

Yes

5. Based on your observations, what percentage of families and students have immediate access to basic technology such as a stable internet connection and a computer or laptop?

70%

6. In your experience, does online learning affect students?

Yes

Karina McLane, Special Education Elementary Teacher, San Bernardino County Superintendent of Schools

1. In your experience, how do you feel about the general accessibility of the internet among different income groups?

Access is not available to all students but all of my student are low income

2. What do you believe to be low-cost or accessible means for people to access the internet?

$40 a month

3. What are the devices you and your family access the Internet through?

Cell phones, smart tvs, laptops and gaming consoles

4. Do you feel like the cost of an Internet connection is more prohibitive than the cost of purchasing a device to connect to the Internet?

Yes

5. Based on your observations, what percentage of families and students have immediate access to basic technology such as a stable internet connection and a computer or laptop?

40%

6. In your experience, does online learning affect students?

Yes

Matilda Fritz, ESL Secondary School Teacher

1. In your experience, how do you feel about the general accessibility of the internet among different income groups?

In general, access to internet is readily available in a variety of spaces. If families do not have access in their homes, they can visit local libraries, students have internet access at their schools, cafes on the prohibition of a coffee purchase. I live in South Korea and here most public spaces have access to free public wifi - the buses, trains, parks, downtown areas. On top of that, the cost of installing internet access in ones home is across the board cheaper in this country than in the USA. Therefore, I think most groups of people have access to the internet or an ease by which to acquire it. That being said, where there tends to be the most disparity is in what devices are used to access the internet. I teach in a low-income metropolitan neighborhood, and many of my students don't have computers at home. Most but not all have their own smartphone, varying widely by make and model.

2. What do you believe to be low-cost or accessible means for people to access the internet?

"Low-cost" and "accessible" are not interchangeable terms. Financially, the internet can most easily be accessed through libraries or schools where there is little barrier to entry and access to devices that can access the internet if an individual does not possess their own. These are the most cost effective options but have the different geographical prohibition. In terms of accessibility, an individual must travel to a location which can be a challenge to those with physical disabilities or limited access to public transportation as in rural communities. Additionally, the operating hours of these spaces will affect how accessible they are to the communities they serve.

3. What are the devices you and your family access the Internet through?

I have wifi set up in my own home and and a laptop, phone, and tablet with which to access it. I spend most of time at work with a work-provided Samsung computer and the school's provided internet.

4. Do you feel like the cost of an Internet connection is more prohibitive than the cost of purchasing a device to connect to the Internet?

It is often more difficult to make one large lump-sum purchase than to make monthly payments, but paying for monthly internet connection means having a steady, stable income. A person can buy a phone more cheaply by purchasing an older model, a used product, but if they don't have a reliable income then they likely will not be able to maintain consistent internet connection.

5. Based on your observations, what percentage of families and students have immediate access to basic technology such as a stable internet connection and a computer or laptop?

75%. Most of my students have stable internet connection from home, but most access it through their phones, not a computer or laptop.

6. In your experience, does online learning affect students?

Absolutely yes. Online learning is great for accessibility, but for it to be most effective, students need to be highly self-motivated with adequate time management skills - things which most students develop during their K-12 years. It's the teacher's job to make online learning as interactive, engaging, and interesting as possible and meeting that challenge is something most teacher's are still growing into - and only the most motivated & financially equipped teachers are doing it (in my personal experience). That being said, I can't imagine most American schools are

readily equipped for online learning. Wealthy school districts may be able to provide a wide array of useful technology or even training for the teachers, but most schools are underfunded and teachers work with what they already have in class, what is already in their own homes, or they spend their own money for more effective online schooling (for reference, my mother is a public high school Special Education teacher in Hesperia Unified School District, a region, department, and community that is consistently underserved. She has been a teacher for 30+ years & taught entirely online through 2020. She struggled). But that challenge is also difficult to meet when the students have inefficient access to technology - again, my online students mostly join lessons through their phones which puts some limitations on the contents of my lessons and their ability to engage with it. On top that, we do not ask our students to turn their cameras on during class, and we do so out of respect for our students' home life, the dynamic of which can also affect a student's ability to learn at home, but this practice does lessen the accountability of our students during class. The same problem arises - online learning is most effective for students whose families have the financial means to create an effective learning environment at home. But most families have limited tech, limited space/privacy in their homes. Most parents work, but a student has a caretaker present at home during a weekday may have a better experience handling personal administration; however, that's not often possible. Students from low-income households are left behind. Basically, the quality of a student's education is lessened for 2 main reasons: most K-12 public school teachers do not have the experience, skills, or technology/resources from their school necessary to make a dynamic, interactive, and coherent online learning environment; most K-12 students haven't fully developed the personal administration skills to be effective online students (excepting maybe the oldest or most motivated students). On top of everything, online learning most distinctly affects students'

communication skills. I teach ESL in South Korea, and specifically I teach speaking-focused classes for all 3 grade levels while other teachers teach writing/grammar-focused classes. Our students were online for one full year (2020) and were in-person for all of 2021. After one year of in-person classes, the first grade students significantly surpassed the L2 speaking abilities of the upperclassmen. This is partly because they've been learning the building blocks of the language in school, the environment designed to facilitate learning, with lessons and activities designed to be in-person. But it also because it's easier to grow their confidence in-person. Online classes leave students isolated. They cannot communicate with their classmates easily, and their opportunities to use their second language productively and comfortably are significantly less. The students who were online are far more shy both in their second language and their first. Being isolated doesn't just affect their learning, but also how they are socialized during their adolescence, a kind of learning equally as important as the contents of their textbooks.

Appendix B

Document Review

In 2017, Canchola et. al. found that 77 percent of households with income less than $25,000 had access to the internet. 81 percent of households with $25,000 to $49,999 had access. For households with income above $50,000 saw an increase to 91 percent.