Measuring the Impact of Digital Literacy

Tech Goes Home Programs in Greater Boston

Simmons University
School of Library & Information Science
LIS 410: Information Services for Diverse Users

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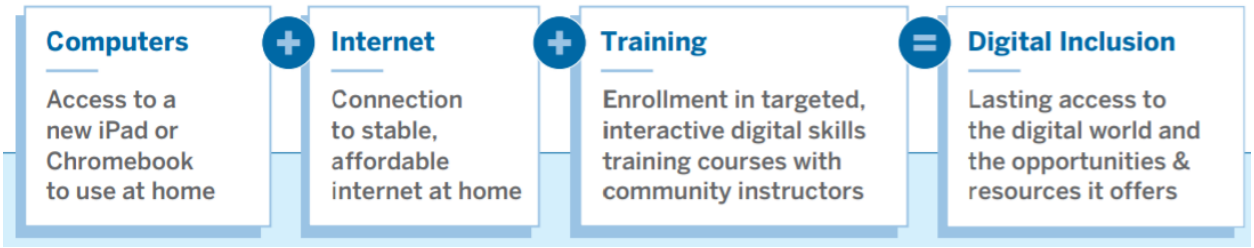
Introduction

Tech Goes Home (TGH) is a Boston-based nonprofit organization that works to connect community members to digital resources and close the digital divide for people throughout the Boston area. 15% of Boston households do not have access to broadband internet, a gap that increases among low-income families, with 44% of adults with an annual income below $30,000 reporting a lack of home broadband service. Nationally, 15 million K-12 students do not have adequate internet access and 10 million do not have an adequate device for online learning.[1]

TGH is dedicated to bridging the digital divide by providing digital literacy skills to community members and working to promote digital inclusion in the Greater Boston area. It is important to understand each of these terms and how they interact to promote equitable access to technology. The digital divide implies a gap, whether it be an economic status, ability, geographic location, or otherwise between those who have basic internet access and those that do not. Digital literacy involves the skills, knowledge and abilities needed for access once the technology is available. Digital inclusion is "the policy developed to close the digital divide and promote digital literacy. It marries high-speed internet...access and digital literacy in ways that reach various audiences."[2]

By connecting with community organizations and individuals, TGH provides educational workshops and programs to help build digital literacy skills for people of all ages. In addition, they provide internet-enabled devices and broadband internet to program participants so they can continue accessing the internet and building their digital skills after completing a TGH Program.[3] TGH programs include small business courses, early childhood programs, programs for school-age children and their families, and workshops focused on fundamental digital skills. Courses are held at sites throughout the city, including libraries, community centers, shelters, and other organizations. After taking a TGH course, participants receive a Chromebook and twelve months of internet service.

TGH defines their impact in terms of digital inclusion as follows:[4]



[1] Tech Goes Home, 2021
[2] Ekbia, 2016
[3] Tech Goes Home, 2021
[4] Tech Goes Home, 2021

Closing the digital divide is no small feat, and TGH has already reached thousands of people in the Boston area. In 2021, TGH partnered with over 100 community sites, offering more than 360 courses and serving more than 4,000 people. They expanded their partner communities in 2021, adding six new communities to the existing twelve that already partnered with TGH.

The Research Project

Students from the Simmons University School of Library and Information Science partnered with Tech Goes Home for a service learning project in the Fall 2021 semester. The key objective of the project was to identify and understand the economic impact of digital inclusion and how TGH can fill gaps within the digital divide with new and/or improved services.

The project was guided by four key questions:

I. What is the overall economic and social impact of digital inclusion?
II. What resources and services do Tech Goes Home provide that work toward bridging the digital divide?
III. In order to maximize the positive impact on the communities they serve, what resources and services can Tech Goes Home provide in the future?
IV. How can Tech Goes Home measure and demonstrate the economic and social impacts of their work?

The project was completed in phases. The initial step to the project was a literature review. Two literature review groups were identified: (1) Social & Community Impact and (2) Economic Impact. Students surveyed existing research about the impacts of digital inclusion and used that research to identify areas where Tech Goes Home may be able to measure the impact of their programs.

Next, students worked with existing data collected by TGH. Initially, the group intended to conduct data analysis with the existing statistics; however, it became clear that the data was incredibly complex and difficult to analyze without advanced statistical knowledge. Therefore, the data analysis team instead focused on strengths and opportunities in the existing TGH data, including how the data could be used in its current form and providing recommendations for future data collection and analysis.

Lastly, influenced by the findings of the Literature Review and Data Analysis groups, the final report group worked together with the other groups to identify additional recommendations and suggestions for the TGH team. All of the key findings from the Literature Review and Data Analysis groups and recommendations were then organized and arranged into this report.

Social and Community Impacts of Digital Inclusion

A significant part of the discussion around the digital divide is the social impact on individuals and communities that results from having broadband access and the skills to navigate a digital world. The literature on this topic points to the significance of digital inclusion in the ability to socialize, obtain an education, access health information, connect marginalized communities, and participate in democracy, particularly during a time when digital connection is even more crucial than ever.

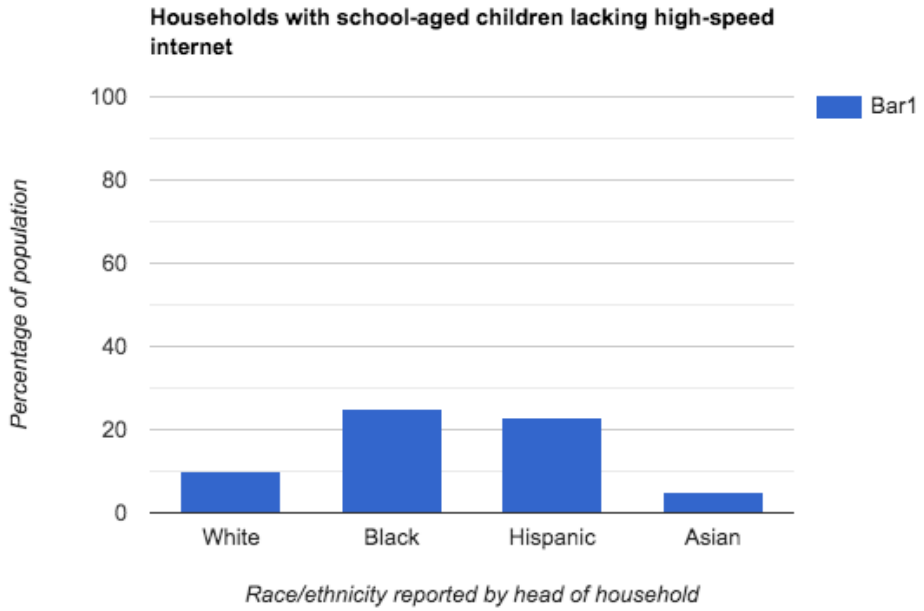
Education

The COVID-19 pandemic has brought this conversation more to the forefront because of inequities spotlighted by the forced physical distance of quarantine and social distancing. Mossberger and Tolbert note that the pandemic "exploded the myth that 'everyone is online'" and revealed that particularly disadvantaged students in low-income areas could not participate in virtual learning.[5] As Tomer et al. point out, students without home internet are at risk of falling behind their peers. This at-risk population includes learners of all ages in geographically isolated areas and people with accessibility issues.[6] For the K-12 student population, the pandemic exacerbated the "homework gap," which was already an issue with 17% of teens reporting often or sometimes being unable to complete their homework because of unreliable access to a computer or internet. For Black teens, that metric climbs to 25%.[7]

The COVID-19 pandemic has brought this conversation more to the forefront because of inequities that have been spotlighted by the forced physical distance of quarantine.

Tomer et al. speak to the significance of this gap for all types of learners by stating that education "enables individuals to be more resilient in response to social challenges as well as equipping them with life skills and experiences" and that lifelong learning contributes to increased participation, satisfaction, and well-being in a community.[8] Learners who are disadvantaged due to digital inequity are set back not only in their education, but also in many other aspects of their lives because of the long-term ripple effects of education. Therefore, the ability to access the internet to complete one's education is essential to build life skills and provide opportunities for future community engagement.

[5] Mossberger and Tolbert, 2021, p.19
[6] Tomer et al., 2020, p. 36
[7] Anderson & Perrin, 2018
[8] Tomer et al., 2020, p. 36



Social Isolation

For people who are online, the literature suggests that there is still a gap for many people in having the knowledge and skills to navigate the digital world. Those who are not familiar or comfortable with technology, especially those over the age of 65, are at risk of social isolation because of the challenge of staying connected to family and friends online.[9] For those that lack internet access and digital literacy skills, the risk of social isolation has been that much greater during the pandemic. Tomer et al. describe the social impact of broadband access by citing research that internet access helped people maintain local and long-distance relationships, increased people's feelings of connectivity and recognition of their neighbors, and enabled traditionally marginalized groups to connect with one another.[10] This is the age, then, where digital exclusion is largely synonymous with social exclusion, which affects individuals' and families' mental and emotional health. This is of great concern because these factors at the individual and familial level contribute to a community's well-being.

Health Information

As more and more health information moves online, people without access to computers or the internet are left behind. They may have access to fewer providers and be less informed when they are able to attend appointments.[1112] They also lose access to support networks from fellow patients, which can impact their emotional and mental health when facing challenging diagnoses like cancer.[13] In addition, many health insurance portals and applications have moved

[9] Conger & Griffith, 2020
[10] Tomer et al., 2020, p. 38
[11] Tomer et al., 2020
[12] Whitacre and Brooks, 2014
[13] Beaudoin, 2007

online. While insurance providers still maintain phone lines, their hours may be limited and wait times significant, requiring those without internet access to wait on hold for information that could quickly be found online if they had access. These healthcare disparities can have significant economic impacts. Low health literacy has been associated with "higher rates of emergency department visits, poorer skills in taking medications, decreased capacity to manage chronic disease, lower rates of medication adherence, reduced ability to recall information following a clinician visit, increased recidivism rates, and higher rates of hospitalization and death" and low health literacy is also linked to inadequate computer literacy.[14]

Whitacre and Brooks researched the impact of broadband adoption on a community's health during 2002-2009, focusing "on changes in 24 health measures among 92 metropolitan/micropolitan statistical areas."[15] When people have broadband access, they have access to medical information. As of 2011, 80 percent of people use the internet to search for health information and bring their findings to their physicians.[16] Many people feel that having access to information about their health helps ease the anxiety of the unknown. Having broadband access also affects the social sphere, specifically for those with certain medical conditions seeking out others with a similar diagnosis—helping create a community "to offer strong means of support and reciprocity."[17] In their *Digital Prosperity Report*, Tomer et al. noted how "cancer is a long-lasting disease that requires coordination between a network of caregivers. Online platforms allow patients to reach out to their doctors at any moment as their circumstances change [and a] network of caregivers to communicate updates, information, and tests more easily among themselves."[18] Electronic literacy is needed to access many health platforms and stay informed of one's own care plan and medical contacts. This is also an issue for those who are reluctant to adopt new technology. In addition, it is important to note the lack of racial and ethnic minorities with access to broadband, which significantly impacts the results of these studies.

Citizenship and Engagement

Broadband adoption and digital equity have also been found to improve citizenship and community engagement.

Broadband adoption and digital equity have also been found to improve citizenship and community engagement. Wolfson et al. acknowledge that solving digital inequity issues such as cost, access, and skills is necessary. However, they argue that what must be done to effect real change is to mend the community's relationship with communication technology, "and their ability to see it as a political and cultural tool that can be utilized not just instrumentally, but more broadly as a way to fight oppression and build collective political power." Woflson et al. refer to this process as "*emancipatory adoption.*"[19] This study's authors by no means argue that showing communities how

[14] Engelke, 2018
[15] Whitacre & Brooks, 2014, p. 767
[16] Whitacre & Brooks, 2014, p. 767
[17] Whitacre & Brooks, 2014, p. 769
[18] Tomer et al., 2020, p. 37
[19] Wolfson, Crowell, Reyes, & Bach, 2017, p. 442

technology can empower them will solve the digital inequity crisis by itself. However, they explain that this belief is a crucial factor that is often left out by those trying to mitigate digital inequity.

According to another study, broadband can affect civic engagement in the following ways: "1) internet access exposes users to a number of viewpoints on any given issue, as well as keeping citizens generally informed; 2) equipped with more information, citizens are more likely to become involved with community activities and organization; and 3) opening up more platforms through which citizens can engage with their governments."[20] However, this study focuses more on community participation in rural areas.

Racial Disparities

The issue of broadband access further highlights racial and cultural disparities. Tomer et al. found "when there is broadband available, there is also evidence to suggest that people of color have fewer choices in terms of [internet] providers, often forcing them to bear higher costs."[21] This only causes the divide between people with and without broadband access to grow. Many minority groups can only access the internet on a mobile device, which can limit the ability to effectively navigate online resources. This is made especially difficult when websites are not designed to be accessible for mobile devices, resulting in lower quality user experiences. During the COVID-19 pandemic, the lack of access to broadband was particularly highlighted, especially with children in minority communities not being able to access school work. The same happened to the adult population who struggled with "applying for jobs, working from home, or researching health-related issues."[22] Siefer and Callahan note that "the majority of people living in households with no broadband in the nation's largest cities and least rural counties — the places least likely to qualify for broadband infrastructure funding or any other federal digital inclusion assistance — are non-white, multiracial and/or Hispanic or Latino."[23] This shows that the issue of digital equity is also an issue of racial equity, where it is essential to address these racial disparities in order to bridge the digital divide.

Impacts of Digital Inclusion

Broadband access and other forms of digital inclusion affect more aspects of a society than just the economic sector. Health issues, including the COVID-19 pandemic, education issues, race and ethnic issues, as well as citizenship and engagement issues are all impacted by digital justice. While more research must be done, especially in the United States, society and communities as a whole receive important benefits from digital equity and inclusion.

Economic Impacts of Digital Inclusion

The economic impacts of broadband adoption, digital inclusion, and digital literacy

[20] Tomer et al., 2020, p. 39
[21] Tomer et al., 2020, p. 42
[22] Tomer et al., 2020, p. 42
[23] Siefer and Callahan, 2020

programs are complex and varied. Questions about what digital literacy is and who is considered digitally literate, often via access to digital spaces and broadband adoption, quickly demonstrate how interrelated each concept is to another. Tech Goes Home's initiatives address each of these key concepts by providing participants with access to the necessary hardware, access to the internet, as well as courses that promote digital learning of tech tools across diverse populations.

Broadband Access

Much of the existing literature around broadband internet has revolved around access as the main focus of study, with good reason. In a study using data from the National Broadband Map, researchers found a strong positive correlation in the United States between households with access to optical fiber and increases in employment and the number of firms at a county level.[24] Beyond the United States, countries with higher levels of broadband penetration have generally higher levels of GDP growth. Another study used data from a panel of 25 OECD countries between 1996 and 2007 to create a model — using pre-existing telephone and TV networks to predict maximum broadband penetration rates — to examine economic impact. They found a statistically significant positive relationship: a 10 percent increase in broadband penetration raised GDP per capita by 0.9-1.5 percent. Within the United States specifically, a 10 percent increase in the percent of households with access to fiber internet is associated with a 0.13 percent increase in total employment and a 0.1 percent increase in the number of firms on a county level. As rates of unemployment during COVID-19 showed, even 0.1 percent increases or decreases in counties such as Middlesex Massachusetts represent over 2000 individual jobs.[25]

Beyond the United States, countries with higher levels of broadband penetration have generally higher levels of GDP growth.

Although as of 2017, 83 percent of the US population has some type of broadband subscription (counting both fixed broadband and mobile phones), connectivity is unequally distributed across cities and neighborhoods. For certain demographics like highly educated, married women, high-speed internet use has shown to lead to a 4.1 percentage point increase in labor force participation. With increased access to home internet and telework options, individuals can increase their wages by reducing the overall pecuniary and nonpecuniary costs associated with going into an office such as commuting costs, childcare expenses, and minimizing workplace distractions to enhance productivity.[26]

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The COVID-19 pandemic illuminated the need for access to broadband adoption, digital inclusion, and digital literacy as the country was faced with the realities of inadequate access and distribution of internet technology for many Americans. While the need for internet services grew, questions arose around the

[24] Lapointe, 2015
[25] Czernich et al., 2009
[26] Dettling, 2017

capacity of existing networks to handle increased online traffic from telework, telehealth, homeschooling, and emergency management.[27]

To better understand the economic impact, it is crucial to understand the emerging impacts of technology. Most studies have focused on rates of employment. However, a recent study by GoDaddy, the largest existing domain hosting website, used a different metric to measure impact. In their study, GoDaddy explored how the density of domain name hosts in a community relates to local economic opportunities. Using statistical matching and time series data, results show the density of domain name hosts positively predicts community economic prosperity, recovery from the 2008 recession, and change in median income.[28] Many prior studies focus solely on the IT industry, leaving out how businesses outside the IT field potentially leverage digital tools for non-digital products to participate in digital marketing and SEO. Thus, studying domain names per capita gives a look at how brick and mortar businesses are leveraging digital marketing tools to engage economically.

The GoDaddy study found that approximately 80 percent of domain names were commercial, and that 48 percent of respondents to surveys considered their online ventures their main source of revenue. However, measures of availability from the Federal Communications Commission (FCC) found that indicators of use were better predictors of county productivity than deployment. There is a need for nationwide data that can more comprehensively capture participation in the digital economy—specifically how e-commerce is related to sales outside IT and how non-IT industries use the internet.[29]

Digital Literacy

This is where digital literacy begins to take a clear role. Access to the tools is only the first step; the next question becomes how to measure critical engagement with digital tools in a growing global economy. Digital literacy and its socio-economic benefits have been a topic of conversation for years. The digital divide that exists globally continues to widen as technological advancement progresses, leaving more people behind in its wake. Generally those left behind are the poor, those who live in underserved urban communities, and those who live in rural areas without access to broadband. As studies have shown, these populations typically lack digital literacy the most, given their lack of access.

Generally those left behind are the poor, those who live in underserved urban communities, and those who live in rural areas without access to broadband.

Accessing broadband is an essential first step, but broadband access means very little without digital literacy. Digital technologies are embedded within socio-economic practices today, such as applying to or onboarding in a new job, and this is what makes digital literacy crucial. In a lecture given by Executive Vice Chairman and CEO of the Nigerian Communications Commision, Professor Umar Garba Danbatta

[27] Mossberger & Tolbert, 2021
[28] Mossberger et al., 2021
[29] Mossberger et al., 2021

cites one of the biggest benefits to digital literacy as being the increase in confidence for new technology users. As Danbatta states, "digital literacy provides confidence required by individual citizens to utilize digital content and tools...it also helps citizens effectively collaborate on creating digital content and becoming innovative problem solvers within their socio-economic ecosystem."[30] By accessing and understanding different technologies, people can become more independent and active members of their communities.

This idea of increased confidence is echoed in a study of digital literacy programs in Israel. This study aimed to better understand the long term effects of digital literacy programs by interviewing people who had taken part in digital literacy courses the year prior, and showed that the main motivators for taking digital literacy classes were for employment opportunities and to become more familiar with the internet. Positive benefits to class participants included "accumulated knowledge, confidence in using technology, empowerment and enhanced sense of self-efficacy."[31] These show the effectiveness of digital literacy programs for people who are in need of technology skills, and proves that digital literacy is an investment in underserved communities that can lead to more community engagement and participation in socio-economic structures.[32]

The largest shortcoming evaluated in this study ties into a larger issue within the field of digital literacy. The people interviewed reported that some of the things they learned in the class faded with time, as they were not able to communicate or practice with instructors once the course had ended. Rather than this being a detractor from digital literacy, however, this shows that the need for digital literacy is constant, even after initial classes have concluded. These results call for an increased involvement in courses that reinforce key learning, and an increase in courses can only mean an increase in the longer term socio-economic benefits to communities. These findings reinforce the need for the work done by TGH in underserved communities, because with their continued efforts in these communities positive changes are possible.

While studies, such as the one above, can produce results that seem inconclusive or unreliable in determining success, scholar James K. Njenga suggests that the issue lies not in the findings, but in how we study digital literacy.[33] When taking a macro-level approach, as most studies do, this places equal attention on all social and economic strata within a community, diluting positive findings. He writes that macro level studies are "more often than not focused on economic improvements and not the whole socio-economic development and well-being at the micro level, with direct impact on individuals and societies…[the] macro level leaves out education, political stability and social liberties, the standard of living, and general health."[34] By taking a micro level approach focused on socio-economic results within the underserved populations that benefit the most from digital literacy, more positive outcomes are seen definitively.

[30] Elebeke, 2020
[31] Lev-On et al., 2020
[32] Lev-On et al., 2020
[33] Njenga, 2018
[34] Njenga, 2018, p. 2

Digital Inclusion

The world economy has undergone significant changes in the last few decades. A chasm has emerged between a select population experiencing prosperity, education and wealth, while the other side is left with unemployment, exclusion and impoverishment. Since the mid-1990s, inequality of personal access to online information and technology has been a topic of debate within political, economical, social and educational structures.

There is an increasing portion of these audiences being affected economically. Statistical data illustrates a large number of the affluent or rich include founders of the internet, those involved in digital communications, and social media companies; while a sustained trend of dropping income and rising poverty can be tracked for other populations.[35] A Fall 2020 study conducted for a nonprofit organization through a Connecticut state library digital inclusion survey found that "23% of the population's households lacked home broadband, and this expanded to 36% for low-income households. Inequities occurred along racial and ethnic lines, as 31.4% of Black or African-American households and 34.9% of Hispanics households lacked wired broadband connection. Likewise, 31.4% of Black or African-American homes and 36.5% of Hispanic homes did not have a computer."[36]

This age is driven by information and the internet. Access is a critical component to successful engagement in an increasingly digital society and those without access are at a significant disadvantage that affects the entire nation economically, socially and beyond. "The global nature of the internet and accompanying services and technologies now makes equal access to and participation in the online environment a necessity for education, employment, socioeconomics, finance and civic engagement."[37] Digital inclusion embraces a variety of avenues for narrowing the digital divide and increasing digital literacy. Jaeger states that "[t]he underlying components necessary for digital inclusion are adequate funding for technology, sufficient physical and technological infrastructure to support the technology, adequate bandwidth, and sufficient training in using the technology."[38] Training, economic and workforce development, services, and opportunities are all components of digital inclusion.

Many governments in developing countries support the importance and implementation of digital inclusion as a tool to "improve the socio-economic condition of underserved populations".[39] However, some argue that these efforts will become vague and intangible if "sustainable and moral development strategies are not included in the discourse and actions of the digital inclusion of public policies."[40] Universal access and computer literacy may not be the answers we crave to fix our digital divide. Bach et al. state that "an aggressive plan focused on socio-economic

> **Instead of focusing more on the problem of digital connectivity perhaps see the digital divide as an intertwined knot of social and economic exclusion.**

[35] Ekbia, 2016
[36] Real, 2021
[37] Jaeger et al., 2012
[38] Jaeger et al., 2012
[39] Serrano-Santoyo, 2020
[40] Serrano-Santoyo, 2020

inequality and social exclusion are the answer."[41] Perhaps digital inclusion initiatives must make a shift. Instead of focusing on the problem of digital connectivity alone, it is perhaps necessary to see the digital divide as an intertwined knot of social and economic exclusion. Bach et al. suggest that "ICT training initiatives must shift toward critical social and cultural practices that encourage full participation in community affairs, cultural life, and official institutions. Policymakers must design digital inclusion initiatives that ultimately lead to diversity in media ownership, expand digital literacy, and teach participants to create meaningful content."[42]

TGH is a perfect example of initiatives addressing issues of digital exclusion. Insufficient access is a socio-economic problem. The communities that are the most affected by digital exclusion are the same communities that can gain the greatest economic benefits from inclusion. TGH provides education and resources focusing on the issues of socio-economic inequality and social exclusion in regards to digital literacy, digital inclusion and broadband access. They are dedicated to working towards resolutions that bridge the obstacles of digital inequities and promote success for communities most affected by digital exclusion.

Tech Goes Home Data

Tech Goes Home provided data to the project team for review and analysis. This included aggregated data from their yearly surveys for 2018 through 2021. These surveys are sent to TGH graduates a year after completing the program to assess the impact of their learning on financial, educational, and social factors. The data provided also included a full list of the questions TGH asks, so the data group could see how those questions have changed over time.Though a complete statistical analysis was outside of the scope of this project, the team was able to examine TGH's existing data to identify strengths and opportunities for future analysis and research and gain insight into a variety of the impacts of TGH programs.

Employment

TGH offers a program specifically designed to assist individuals who currently own or are interested in starting a small business. In 2020 14% of TGH participants took the small business course, and 24 of the 53 respondents had opened or were in the planning stages of opening a small business. This impact is significant because small businesses can play a major role in closing the wealth gap[43]. TGH has also helped graduates improve their employment situations, especially as jobs move online. Of the graduates who responded, 52% indicated that they were able to work from home during the COVID pandemic, and 57% of graduates got a new or better job. 68% of learners also used TGH skills to search or apply for jobs online.

Education

Because one of TGH's programs is focused on parents with children, the impacts on childhood education are well-measured, and in 2020, 95% of children were better able to

[41] Bach et al., 2013
[42] Bach et al., 2013
[43] JPMorgan Chase & Co., 2021

participate in online schoolwork after participating in the program. In addition, 71% of parents who participated in TGH report that they are more involved with their child's learning, which is correlated with improved outcomes.[44] Educational achievement has lifelong impacts on earning potential, in addition to the obvious social benefit of children who stay in school.[45]

> **In 2020 95% of children were to be better able to participate in online school work after participating in the program.**

TGH's annual survey has asked a separate question about whether participants took the course in order to further their own education by applying to school, taking classes, or doing homework. Finally, starting in 2021, TGH added an "entered a new education program" option to the question that had previously been about whether participants had gotten a new or better job, which directly counts participants who entered school after participating in TGH.

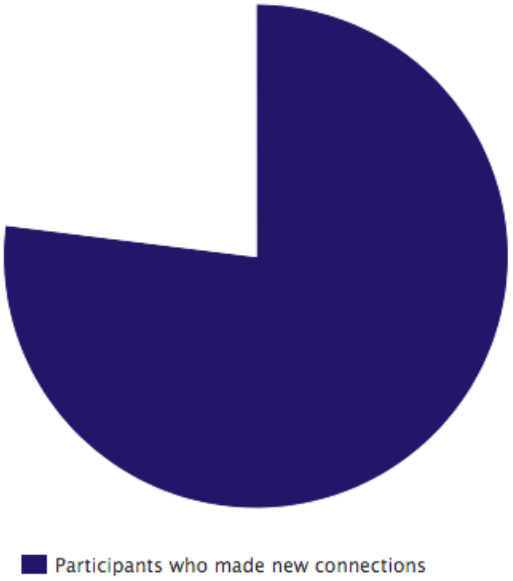
Quality of Life and Older Residents

Quality of life is notoriously difficult to measure. However, TGH asks several questions that can serve as indicators of the personal value of a computer, including whether respondents feel more confident in their computer skills, whether they use their devices to access general information and stay informed, and whether participants use their devices to connect with family and friends and use social networking sites.

In addition, TGH asks whether participants made friends and connections during the programs themselves. An average of 77% of respondents reported making new connections during the TGH program, which indicates that TGH programs not only provide digital literacy skills, they also enhance social networks, which can have community impacts as well.

These connections are particularly valuable for older adults, who often lag behind in digital literacy and may be isolated from friends and family who do not live nearby. TGH does collect demographic statistics about participants, so they could break down responses by age to see whether older adults are receiving social benefits from the programs.

[44] Jeynes, 2010
[45] Torpey, 2018



Healthcare

TGH has recently started asking about health impacts for members in their program and has information collected before the emergence of the COVID-19 pandemic as well as information related to the pandemic collected in 2021. TGH has been asking participants since 2018 whether they used their devices for health and wellness, and the percentage who do has been steadily increasing from 66% in 2018 to 78% in 2021.[46] Their COVID-related questions include asking about accessing health resources like testing sites and treatment and care options; accessing information about the virus like symptoms, protection options, and vulnerabilities; accessing telehealth; and accessing COVID vaccine information and appointments. These COVID-specific questions are of course critical to ask during the crisis moment of the pandemic, but also point to uses of technology for health information more broadly beyond the pandemic. For instance, someone who looked up COVID testing sites and care options might also use a device to look up doctors and care providers for other illnesses.

TGH has been asking participants since 2018 whether they used their devices for health and wellness, and the percentage who do has been steadily increasing from 66% in 2018 to 78% in 2021.

Housing

In 2021, TGH began to ask participants whether they used their devices to find housing, such as shelter resources, apartments, or sublets, and 53% of respondents did. This indicates a

[46] Tech Goes Home, 2021

clear impact, especially in the Boston area where housing can be both precarious and extremely expensive.[47]

Civic/Community Information

TGH has been asking whether participants use their devices to access city and community information since 2018; consistently, between 70 and 80% of participants do. This information allows them to be more engaged citizens and members of their communities, informing them of events and important information like street cleaning or trash schedules. In addition, in 2021, TGH asked about voter registration; 71% of respondents were registered voters. This question is a good measure of civic participation, but because many of TGH's participants may have difficulty registering to vote if they are not US citizens or don't have permanent addresses, it should not be used as the sole metric.

Recommendations

Based on existing data gathered by Tech Goes Home, this project has recommendations for future efforts by TGH to assess the impact of their programs. First, it became clear over the course of this project that expert analysis is needed to make the most of TGH's data. Therefore, the primary recommendation is for TGH to hire an economist, or partner with economics students to conduct in-depth analysis of the economic impacts shown in their data. Because this would take time and funding that may not be readily available, the project group can also recommend some steps TGH can take using their existing data and resources to demonstrate the impact of their programs.

If a full economic analysis is not possible for TGH, they may still be able to better utilize their existing data by working with a data science class or team of volunteers to code the free response questions from past years, which are a valuable source of data that aren't currently included in TGH's analysis. These volunteers could mine the free responses by looking for keywords that indicate achievements in key areas like employment, education, quality of life, healthcare, housing, and civic engagement. For instance, students could search the free responses for "job" or "promotion" to pull out responses indicating improved employment outcomes.

The project also identified areas where TGH can seek out information from other sources to bolster their data analysis. In general, there is a need for more national data about digital equity and the economic impact of programs like TGH. This is an area where TGH can connect with other organizations and researchers throughout the country to identify trends and data from other sources, such as the TechPak program in Saint Paul, MN, which is discussed in further detail below.

In addition, TGH can examine reports from organizations doing similar work to see how they have gathered and used data to their advantage. One such report is an analysis of the TechPak program conducted by Ecotone Analytics in January 2021. TechPak is a partnership between several community organizations in the Saint Paul, MN area that provides computers,

[47] Greenberg, 2020

broadband access, and digital literacy training to Ramsey County residents.[48] In this report, Ecotone looked at seven monetized outcomes: increased earnings from increased employment, promotion, and education due to digital skills gained; increased earnings from connection to job opportunities otherwise not reachable; increased educational attainment—GED and post-secondary; improved school outcomes for children with access to a computer; improved quality of life/value of the personal use of a computer (for recipient only); improved quality of life for older residents through improved mental health; and avoided greenhouse gas emissions from refurbished laptops. These outcomes, except for the last one, are directly applicable to questions that TGH includes in their yearly follow-up surveys, meaning that TGH already has data that could be potentially plugged into an existing model. In addition, because Ecotone's analysis is not an economic impact study but shows a social return on investment, it provides a fuller picture of the impact of a similar program. It is possible that Ecotone's model of analyzing TechPak would be a good model for TGH to use to show the social return on investment. TGH already has the data needed to run this analysis, and this could be a great starting place to start to show the vast impact TGH has on its participants and the community around them.

Next, the project team identified areas where TGH can maximize their existing data collection methods and strengthen their analysis to provide evidence of the impact of their programs.

One recommendation is to conduct more longitudinal surveys with participants to gather data about the long-term impact of programs. As another study found, people who participated in digital literacy programs reported that some of the things they learned in the class faded with time, as they were not able to communicate or practice with instructors once the course had ended.[49] TGH can apply this knowledge to their programs by providing opportunities for ongoing contact between program graduates and TGH instructors, and by conducting follow-up surveys at different benchmarks to measure the long-term efficacy of the programs. The project group recommends conducting follow-up surveys three and five years after program completion.

In addition, the project team recommends making small changes to survey questions or adding additional questions to capture more specific data. Some suggested questions and the rationale for including them are listed below.

Education

Modify the existing survey question that asks how participants used their device for "educational purposes" to assess specific tasks people may use their devices for, such as applying to an education program, completing homework, or taking classes.

Program Location

The current survey asks whether participants went on to take further classes at the location they took the TGH class. While this question is a good indicator of increased community connection on the part of the participants and the possibility that TGH programs

[48] Nielsen et al., 2021
[49] Lev-On et al., 2020

introduced users to new community resources, the project team also recognizes that some participants may not want to or be able to return to the place they took the class (for instance, if it was a shelter). In addition, if participants took a course at a shelter and then did not return to that shelter, this could indicate a positive effect of TGH programs and additional services. This is a consideration that should factor into TGH's analysis of this question.

For additional information about program location and community connection, some recommendations are:

- Ask if participants took more courses in general.
- Ask if participants learned about a new community resource or service in their TGH program.
- Ask if the location was convenient to the participant.

Housing

TGH should continue to ask if participants used their device to find housing in order to get more information over time.

TGH may also consider asking if participants search for housing changes a few years after the class to gather more information about the economic impact of the program. For example:

- Have they been able to stay in the same apartment?
- Were they looking for shelters before but are now looking to move to an apartment due to more stable income?

Healthcare

TGH should continue to ask participants about their ability to access online health information, and can gather helpful data by asking about specific healthcare needs. These questions would expand the survey's scope much beyond its current impact and would provide a fuller picture of the health impacts of TGH's programming.

For example:

- Have you used your device to:
  - Access telehealth?
  - Access health information, like symptoms, illnesses, and treatment options?
  - Access provider information, like hours, locations, contact information, and appointment scheduling?
  - Access health insurance information, like coverage, financial impact, or benefits?

Conclusion

The goal of this project was to assess the economic and social impacts of Tech Goes Home's programs. The project group assessed existing literature and data from TGH to develop an understanding of the impacts of digital literacy, including TGH's programs, and to provide recommendations for TGH to continue assessing their work and demonstrating their value.

The first question the project sought to answer was regarding the overall social and economic impact of digital inclusion. From our research, it is clear that connecting someone to the internet and teaching them how to use it effectively can make a huge difference in an individual's life. On a macro scale, digital inclusion is associated with higher GDP growth, higher employment levels, and greater economic opportunities. Individually, digital literacy helps people seek out and apply for jobs and contribute to their local economy. In addition, because minority and low-income households are less likely to have access to broadband internet, providing internet and digital literacy education can help reduce economic disparities in our communities.

Next, the project examined what services TGH can or does provide that work toward closing the digital divide. Luckily, TGH already provides an impressive amount of services to people throughout Greater Boston and continues to expand and improve their service offerings. Programs like the small business program and family programs connect community members with the information they need to be successful. In addition, TGH data shows that participants find the programs help them build social connections, access healthcare, and participate in their cities and communities. These services all work toward closing the digital divide and are a valuable asset to the communities TGH serves.

The third question examined how TGH can maximize their positive impact in the community. It is clear that TGH already has a positive impact, and this project shows that TGH programs can create positive changes in all aspects of participants' lives. The project team recommends that TGH continues to provide these services and to expand into more communities to reach a wide variety of people.

Lastly, the project questioned how TGH can measure and show the economic and social impacts of their work. While we were unable to provide in-depth analysis of existing TGH data and recommend TGH explore the possibility of hiring an economist or statistician to conduct detailed analysis, we found promising data that already demonstrates a strong impact in the community. We recommend TGH explore national data and seek out similar organizations to examine how they evaluate the effectiveness of their program. We also included recommendations for TGH to conduct more longitudinal surveys to assess the long-term impact of their programs. In addition, the project team recommended some additional survey questions to capture more specific data that will show detailed impacts of TGH programs.

It is clear that Tech Goes Home is a valuable asset to the Greater Boston community and that the organization has already made a great deal of progress in closing the digital divide. Participants in TGH programs improve their access to education, healthcare, social connections, and community information. Some have started businesses, gone back to school, or started new jobs as a result of the education they received through TGH. The problem of the digital divide is daunting, but effective programs aimed at increasing digital literacy and access to the internet go a long way in bridging the divide. By continuing to offer their life-changing programs, Tech Goes Home is working toward a more equitable future.

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