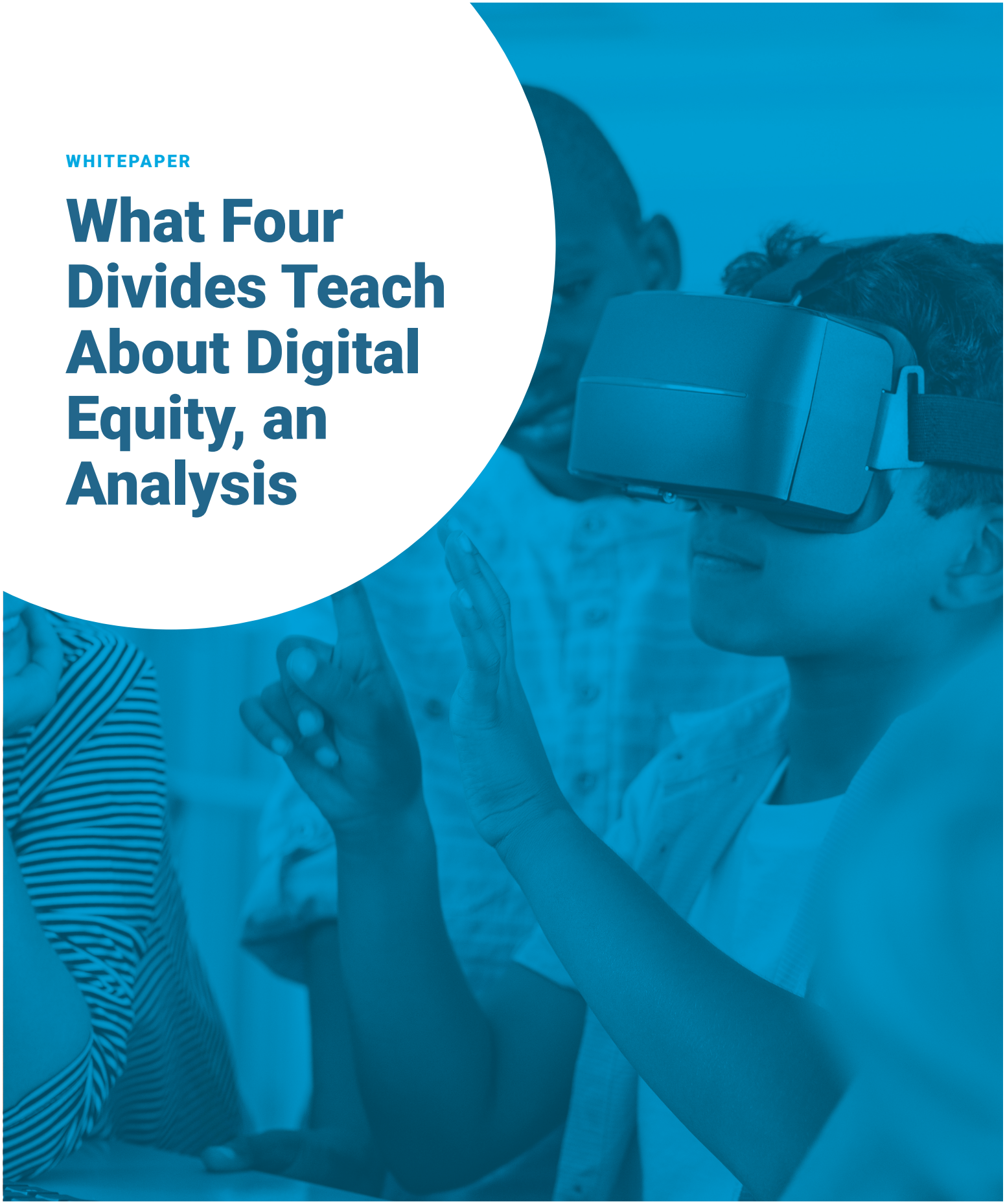
WHITEPAPER

# What Four Divides Teach About Digital Equity, an Analysis



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**By reconsidering digital equity and how it relates to larger notions of equity in education, teachers, administrators, and leaders bolster their efforts to prepare all students for the future.**

Indeed, equity typifies the aspiration of what it means to educate: equipping students with the knowledge and skills they will need to excel in their future.

**This future can entail a lot of things, including:**

- **Entering the workforce and accessing stable employment.**
- **Supporting a family and serving as a role model for the next generation.**
- **Participating as an active citizen and upholding democratic values.**
- **Welcoming neighbors and investing in community.**
- **Recognizing common humanity and participating as a global citizen.**
- **Collaborating with diverse groups of people to seek solutions to local, national, and global problems.**
- **Sowing bright and sustainable futures for generations to come.**

Thus, the purpose of education is not only to benefit the educated by supporting them in all aspects of their life but also to benefit the community, both local and global, of the educated.

Of course, this is an idealistic view of education; and the current reality often does not rise to meet it, leaving us to grapple with possible solutions—many of which are founded on digital equity.

# What Is Digital Equity, and Why Is It Important?

Equity is a necessarily evolving concept because the outputs of educational equity are contingent upon the world in which the educated exist. In present circumstances with fast accelerating technological advancements and a migration toward digital mediums for work, collaboration, community, and citizenship, equity must to a large extent be digital.

The following data illustrates how technology impacts daily experiences.

**Work Life:** Nearly all Fortune 500 companies post job openings exclusively online and over 80 percent of all jobs require digital skills.

**Academic Life:** A federal survey found that 70 percent of teachers assign homework online. Many teachers also post grades online, offer feedback to students, answer questions, and address parents through digital platforms.

**Personal Life:** Seventy percent of Americans use social media, spending on average two hours per day, which means they are building online communities, sharing life updates, and engaging with news and other informational outlets.

**Citizenry Life:** Over 35 percent of US citizens prefer to access news online, with 20 percent using social media as a primary news source. Unable to navigate the virality of false or misleading news, only 26 percent of adults were able to correctly discern between factual and fictitious statements.

Without digital inclusion, the predominance of technology becomes a barrier to entry and participation. By working to curb this, digital equity sets out to ensure that everyone has the technological capacity to participate in the labor market as empowered employees, partake in educational opportunities, engage positively with others, and practice informed citizenship.

## Barriers to Digital Equity

The road to understanding digital equity, and the barriers both necessitating and inhibiting it, is paved by the circumstances of inequity. In other words, the barriers to digital equity, which are commonly termed divides or digital divides, shape our understanding of it.

While the different divides are framed in the context of digital equity, they rarely are purely digital in nature. Instead, they are affixed with preexisting conditions of inequity and inequality that are simply mutating with a modern, digital outlook.

In order to address the underlying forces of these divides, solutions must be systemic, holistic, and community driven. In the next sections, we define, quantify, and analyze four specific digital divides; consider their separate enacted and proposed solutions; and feature educators overcoming each divide.

# The First Digital Divide: Access and Connectivity

Over the last several decades access to computing devices and internet connectivity in schools have greatly accelerated. However, the permeation of technology into so much of the learning experience exacerbates the access and connectivity divide outside the classroom, which especially impacts already marginalized groups of students.

## A Brief History of Technology in Schools

To better understand this divide, it's necessary to first grasp the rate at which access and connectivity in schools has swelled. Specifically, over the last two decades, there has been a pronounced drive to outfit schools with broadband internet and adequate computing devices. *(Figure A)*

While this is truly an incredible feat, digital inequity persists with ensuring access and connectivity in family homes, public libraries, and other after school gathering areas so students can take full advantage of technology-rich learning environments.

### ACCESS

**1997**

**Reports found that the ratio of students to computers was 24:1.[1]**

**2018**

**Over 50% of educators report that their school is 1:1.[2]**

** And according to a 2018 study by COSN, 43 percent of Technology Directors said they would be 1:1 within three years.[3]*

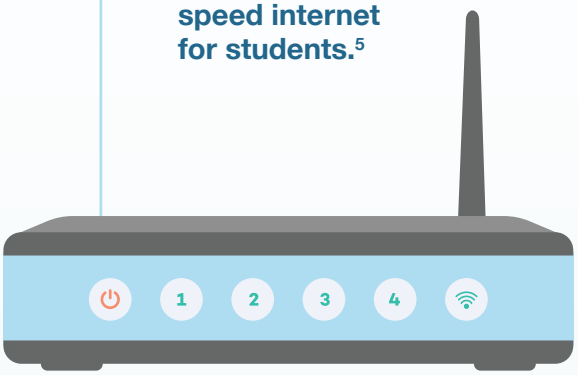
### CONNECTIVITY

**1997**

**Only 14% of US classrooms had internet access.[4]**

**2019**

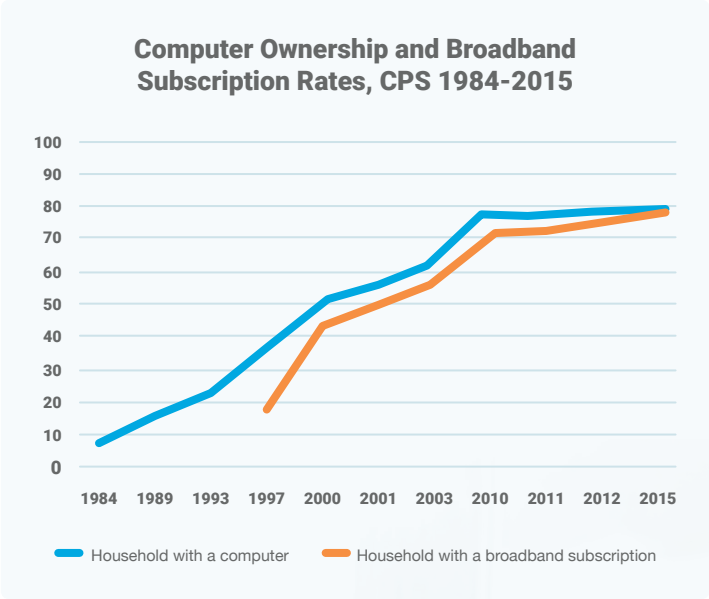
**99% of all K-12 districts in the US have high-speed internet for students.[5]**




*(Figure A)* Sources: 1 2 3 4 5

## Access and Connectivity Beyond the School Walls

Transitioning from schools to homes, the following census research offers a perspective on access and connectivity in households along a similar timeline as above. The data illustrates significant growth in the rate of households with a computer from 1984 to 2010 and internet access from 1997 to 2010. However, rates have largely plateaued since.




### According to the most recent survey in 2015:

**78%**
**of households had a desktop or laptop**



**75%**
**of households had a handheld computer**



**77%**
**of households had a broadband subscription**

*To dive deeper into the data and more fully comprehend the nature of this divide, the following four charts visualize the data by specific respondent characteristics.*

EXAMPLE 1

## Computer Ownership and Broadband Subscription Rates by Race

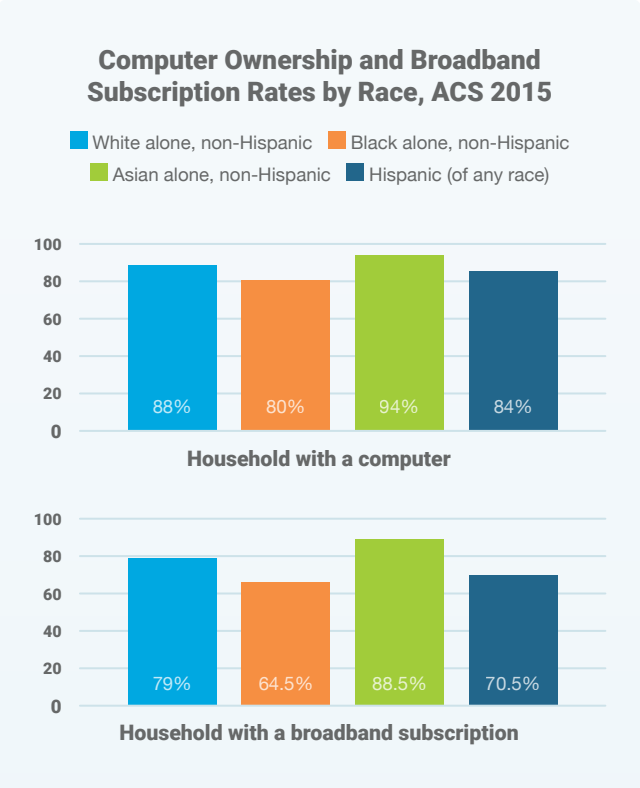
Survey data identifies that race is a factor in understanding the access and connectivity divide. Compared to black and Hispanic respondents, white and Asian respondents are significantly more likely to have access to internet-connected devices.

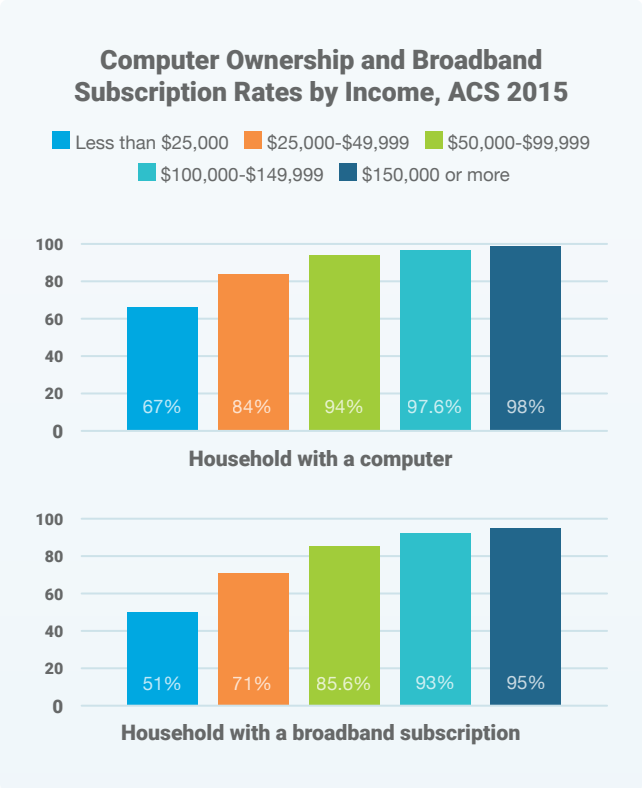
EXAMPLE 2

## Computer Ownership and Broadband Subscription Rates Income Bracket

When the data is associated with the incomes of respondents, there is also a clear correlation between access and connectivity and income bracket.

Between the lowest (less than $25000) and highest bracket ($150000 and more), there is a 30 and 40 percent gap in terms of device ownership and broadband subscription rates, respectively. Compared to all other brackets, the lowest income bracket (less than $25000) and the second lowest bracket ($25000 to $50000) exhibit significant lags in both computer ownership and broadband subscription rates.

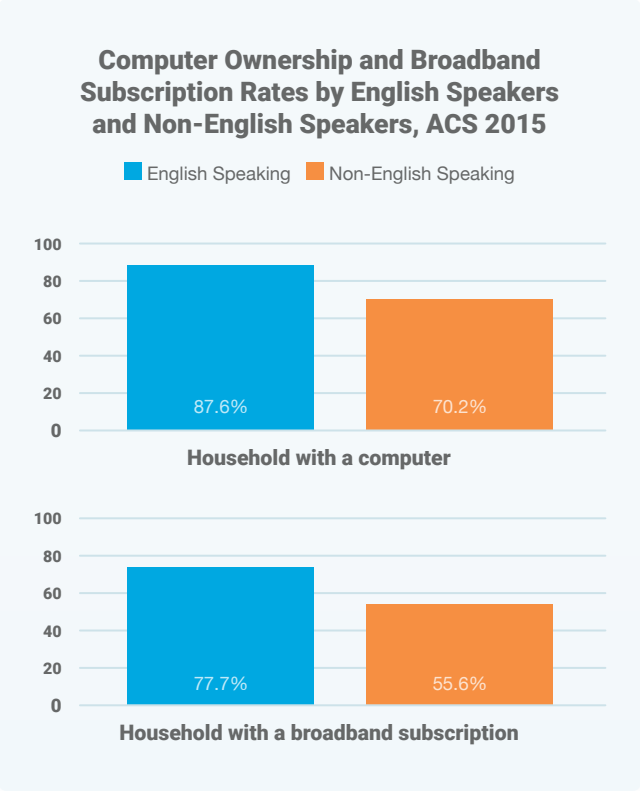


EXAMPLE 3

## Computer Ownership and Broadband Subscription Rates by English Speakers and Non-English Speakers

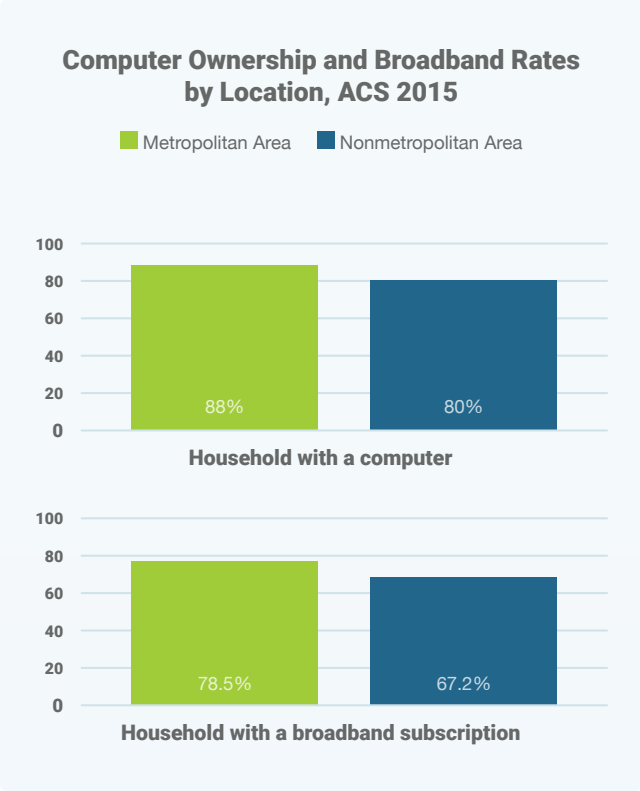
The discrepancy between device ownership and broadband subscription rates is also apparent when it comes to English speakers and non-English speakers, with close to 20 percent gaps in access and connectivity.




EXAMPLE 4

## Computer Ownership and Broadband Subscription Rates by Location

Finally, the rural-urban divide also reaps inequity when it comes to access and connectivity, with those residing in metropolitan areas being close to 10 percent more likely to have a computer and a broadband subscription.




## The Takeaway

**Despite the density of the data, the takeaway is fairly simple: access and connectivity rates are impeded by longstanding inequities in society that affect minorities, low-income families, non-English speaking households, and rural residents.**

## Overcoming the Access and Connectivity Divide

In an effort to continue closing the divide and uplift those marginalized from it, there are a number of local and national programs taking root.

For example, the Digital Equity Act was introduced in the Senate in 2019 and would initiate two new grant programs for digital equity (access and connectivity) and digital inclusion (skills, supports, and technologies to benefit from internet access).

There are also city-driven initiatives seeking to implement similar programs through local legislation—including Chicago, San José, and my home city, Portland.


## How the Access and Connectivity Divide Impacts Equity in Schools

The persistence of the access and connectivity divide in parallel with learning that depends upon access to devices and connectivity to the internet further alienates students who are already underserved and disadvantaged.

At the same time, new digital divides, stemming from a growing prominence of technology in education, are being uncovered. While different in nature, the lessons in the data shared in this section will be a valuable roadmap to analyze the divides that follow and contextualize them within the already-present inequities in our society.

> **The persistence of this divide in parallel with learning that depends upon access to devices and connectivity to the internet further alienates students who are already underserved and disadvantaged.**

## Promoting Access and Connectivity: *Matt Hiefield and Beaverton School District*

As a member of Beaverton School District's Digital Equity Team, Matt seeks to address the digital divides facing students as well as their families and communities. Believing that digital equity is nuanced and evolving, Matt and his team have implemented hotspot projects, educational parent nights, and community surveys to continually change how they perceive and address digital equity and the divides inhibiting it.

Read more about Matt and his team's work on equip →

**EDUCATOR**
**Matthew Hiefield**

**POSITION**
**Social Studies Teacher, Digital Curator, and Digital Equity Team Member**

**DISTRICT**
**Beaverton School District**

**LOCATION**
**Beaverton, Oregon**

> **When several family members are competing for connectivity time that perhaps includes limited data, a student's ability to fulfill school assignments can be challenging at best. Finding out the extent of the digital divide in an individual school district is a starting point, and it means being intentional and transparent in asking questions to students and families.**

# The Second Digital Divide: Digital Readiness

Following access and connectivity, the second digital divide refers to digital readiness, or the skillset that enables people to use technology as informed digital citizens, capable workers, and empowered learners.

## Studies on the Digital Readiness Divide

The skill prerequisites for digital readiness are not implicitly developed; research continues to confirm that direct instruction and technology practice are necessary to nurture these skills.

**EXAMPLE 1**

### Digital Readiness Among American Adults

A study led by John B. Horrigan, who is a researcher and consultant, quantified this divide among adult Americans. *(Figure B)*

Horrigan also notes that when atomizing the data those ranking with low levels of digital skills tended to be older, have less education, and have lower incomes compared to their more skilled counterparts. In summarizing his findings, he urges:

> **"As a nation, we need to make the investments so that communities and government have similar capacity to help citizens be digitally ready... it is in everyone's interest to take steps to ensure all Americans can take advantage of technology's benefits.**

**29%**
**of adult Americans have low levels of digital skills.**

**42%**
**have moderately good levels of digital skills.**

**29%**
**have high levels of digital skills.**

**70 million***
**are not "digitally ready" for robust online use.**

** Nearly twice the number (36 million) of people with no online access.*

*(Figure B)* Source

EXAMPLE 2

## Web IQ Aggregated by Age and Educational Attainment

In a separate study by Pew, researchers surveyed adult Americans to gauge their Web IQ and aggregated the data both by age and educational attainment.

When segmenting by age, the study finds that younger people are more knowledgeable in social media but rank equally or even below their older counterparts when it comes to basic technology functionality, policy governing tech, and other digital citizenship factors.

When segmenting by educational attainment, the study finds a correlation between school level and one's technological prowess.

These findings disavow the common 'digital native' narrative, which alleges that young people are predisposed to have advanced digital skills. Instead, education seems to have a larger influence on digital readiness.

### Web IQ, Segmented By Age

*% of internet users answering each question correctly*

A B C D F

| | 18-29 | 30-49 | 50-64 | 65+ |
|---|---|---|---|---|
| Internet and WWW are the same (False) | 23% | 22% | 23% | 22% |
| Privacy policies ensure companies keep info confidential (False) | 46% | 40% | 46% | 49% |
| Net Neutrality refers to? (Equal treatment of digital content) | 62% | 60% | 60% | 61% |
| Which is bigger, KB or MB? (MB) | 78% | 75% | 74% | 67% |
| Can identify picture of "captcha" | 80% | 75% | 64% | 45% |
| Can identify picture of 'advanced search' | 80% | 75% | 69% | 55% |
| PDF can be transferred w/ any major email program (True) | 80% | 82% | 78% | 61% |
| Wiki is a web app that lets users collaboratively edit content (True) | 84% | 72% | 61% | 43% |

### Web IQ, Segmented By Education

*% of internet users answering each question correctly*

A B C D F

| | HS or less | Some college | College grad+ |
|---|---|---|---|
| Internet and WWW are the same (False) | 28% | 20% | 21% |
| Privacy policies ensure companies keep info confidential (False) | 35% | 46% | 56% |
| Net Neutrality refers to? (Equal treatment of digital content) | 49% | 63% | 73% |
| Which is bigger, KB or MB? (MB) | 70% | 73% | 79% |
| Can identify picture of "captcha" | 62% | 69% | 73% |
| Can identify picture of 'advanced search' | 62% | 72% | 81% |
| PDF can be transferred w/ any major email program (True) | 65% | 80% | 89% |
| Wiki is a web app that lets users collaboratively edit content (True) | 56% | 68% | 79% |

EXAMPLE 3

## Digital Nativism Disavowed

Further refuting digital nativism, research by Neil Selwyn uncovered that technology use among digital natives is limited to only a few activities, such as using various social media platforms. As a result, younger generations do not have the prerequisite digital skills needed to thrive in modern academic and workplace environments.

Beyond the inaccuracy of the digital native label, this narrative often overlooks and even perpetuates the digital readiness divide among youth, according to recent research by Paul A. Kirschner and Pedro De Bruyckere.

## The Digital Readiness Divide and Equity

In response to the digital readiness divide there is a major push to upskill today's workforce, educate adults about safe online behaviors, and inform everyone about information and media literacy. At the same time, teachers can help students graduate digitally ready and able to lead as examples by addressing digital skills in the classroom.

While working to close this divide, however, it is essential that we consider it in the context of digital equity, knowing that the access and connectivity divide haunts the digital readiness divide. Inequitable access and connectivity breeds exclusion and limits opportunities to develop digital skills.

Students who lack access and connectivity, whether in school or at home, have less experience using technology and are likely to have families with less experience. The digital readiness divide, in this context, is more likely to impact non-white, impoverished, and rural students, which preys on already existing inequity.

In order to combat this trend, comprehensive solutions must be built from the students out to the community. For example, some schools are pursuing family-wide programming, whether through after-school programs, parent resources, or collaborative homework assignments.

Digital skills thrive in community environments—positive online behavior and informed technology use begets more.

> **In order to combat this trend, comprehensive solutions must be built from the students out to the community.**

## Promoting Digital Skill Development: *Rich Boettner and Hilliard City Schools*

Hilliard City Schools is helping students become digitally ready through their annual Digital Wellness Month initiative, which connects students, parents, and teachers through conversations and learning opportunities centered on fostering positive digital experiences. During the month-long learning experience, kids and adults develop lifelong skills to navigate the digital world and better shape their relationship with technology.

Read more about Rich and his team's work on equip →

**EDUCATOR**
**Rich Boettner**

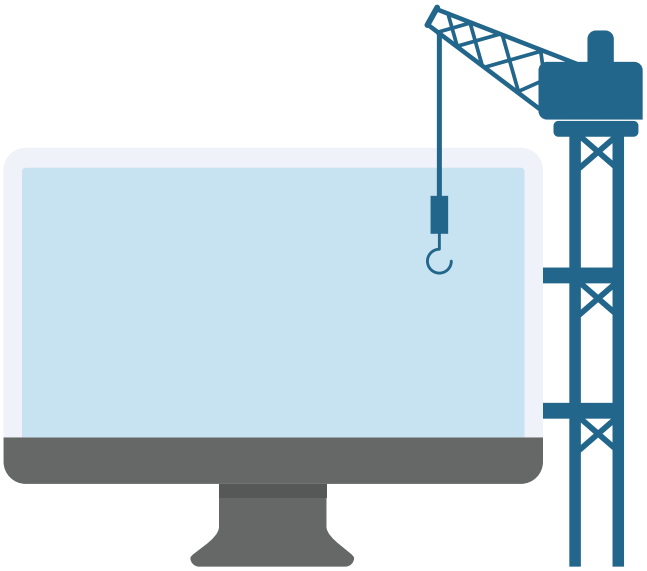
**POSITION**
**Chief Technology Officer**

**DISTRICT**
**Hilliard City Schools**

**LOCATION**
**Hilliard, Ohio**

> **There are things we need to know about how using technology can help us or how it can hurt us. We must know where those lines are. And we must know how to manage those things to have a healthy digital life.**

# The Third Digital Divide: Digital Use



As access is bridged and digital skills developed, the next divide is the digital use divide, which concerns the nature of technology integration in student learning.

## The Potential of Technology Integration in Learning

Technology can be used in a lot of ways: students type a paper instead of writing it by hand, complete an online worksheet at home rather than in class, or find a relevant source for research using Google instead of the encyclopedia.

These activities, however, barely scratch the surface of technology's potential in teaching and learning. Technology integration can go far beyond a simple substitution for a traditional assignment and become a force that redefines what, how, and where students learn. For example, instead of looking at current events online, students learn by speaking with experts or people with first-hand knowledge over Skype.

When used in these ways, technology creates meaningful, personalized, and deep learning experiences. Some may even say its role in the classroom models the same disruptive innovation that's occurred in the private sector. Okay, well, we said that actually, and you can read all about it here.

And because I want to spare myself the regurgitation and don't want to risk spoiling the findings for you, *here is the gist of this idea*:

1. **Technology can disrupt current methods of teaching and learning.**
2. **However, it is often not used to this capacity.**
3. **Luckily, there are great strategies to enhance the depth of tech integration in the classroom, which we summarize.**

> **As we spoke with educators and poured through articles, we've come to realize the immense value in aiming for disruption and measuring the quality of tech integration through the disruptive behaviors it fosters: the ability for educators to reimagine instruction and redesign learning experiences through it.**

AN INFOGRAPHIC

# Technology Use in the Classroom

Technology integration often doesn't rise to these higher levels of integration and is instead used in a passive capacity, rather than an active one.

While there are a plethora of reasons technology use remains passive, the need for adequate teacher training and resources reigns supreme.[5]

**A study by PwC found that nearly two-thirds of technology integration in the classroom is passive (watching videos and reading websites) with less than a third of technology use being active (producing videos, coding, and analyzing data).[1]**


**47%**

**of classrooms showed evidence of using technology to gather or evaluate information for learning.[2]**

**35%**

**of classrooms used technology to communicate or work collaboratively. [2]**

**37%**

**used technology to problem solve, research, or create projects and original works. [2]**


**Passive use of technology grew in relation to active integration between 2009 and 2014.[3]**

**Between 2009 and 2015, reporting by District Administration found that teacher training for technology integration had declined.[4]**

Sources: 1 2 3 4 5

## The Digital Use Divide and Equity

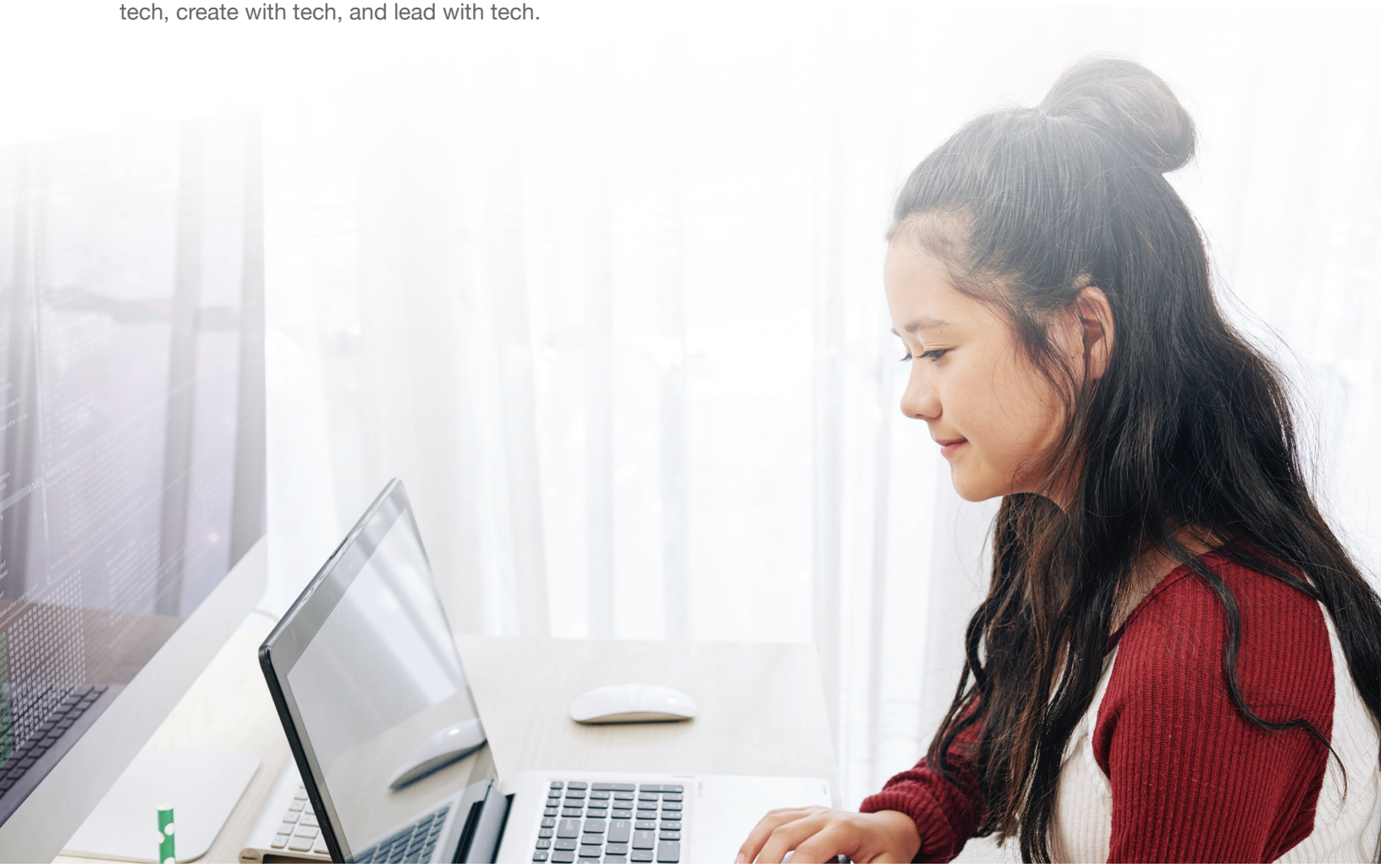
Like the other divides, the digital use divide follows the lines of deeper digital inequities.

A study by Connected Learning Alliance found that students in higher-income schools experienced technology as a creative and playful medium while those from middle and lower-income schools used it at a far more basic level.

A second report also uncovered that lower-income, non-white children were more likely to use technology for drill and practice compared to their more affluent peers, who used technology in learning for problem solving and higher-order thinking.

To bridge this divide, the need for support cannot be overlooked; active, creative, and hands-on learning fueled by technology is essential for student success in a world in which they are expected to think with tech, create with tech, and lead with tech.

> **“Students in higher-income schools experienced technology as a creative and playful medium while those from middle and lower-income schools used it at a far more basic level.**



## Activating Learning with Technology: *Kristin Magyar* and *Highland Falls Fort Montgomery Central School District*

To harness student enthusiasm, Kristin seeks to engage her students in hands-on projects that are relevant and connect to the real world. One such project was a toy invention unit with a final presentation that modeled Shark Tank and Toy Box TV. Throughout this project, students followed the design thinking process, collaborated with their peers, and practiced communication for presenting their work in a product pitch.

By actively learning with technology, students gained valuable experience using digital tools to create, iterate, and innovate.

Read more about Kristin's work on equip →

**EDUCATOR**
**Kristin Magyar**

**POSITION**
**Pre-K-Grade 6 STREAM Teacher, District Technology Leadership Team Member**

**DISTRICT**
**Highland Falls Fort Montgomery Central School District**

**LOCATION**
**Highland Falls, NY**

> **After prototyping, students created infographics for their marketing campaigns. The students developed ideas using more graphics and less words, which was hard for the students who wanted to talk and have lots to say about everything.**

# The Fourth Digital Divide: Representation

The fourth, and final for our purposes, digital divide is in reference to representation in the learning content, technology industry, and computer science workforce.

In order to feel a sense of belonging, connected to the learning, and empowered to pursue advanced academics and employment, diversity and representation are necessary.

In an article by Kevin Clark in the Journal of Children and Media, he explains:

> **The digital divide will not be truly closed until the content available reflects the full spectrum of our experiences and perspectives, so that fathers and mothers of all hues and demographic categories have access to books, videos, websites, and a whole host of media created by and containing characters who look like their daughters and sons.**

As more students gain access to technology and engage in online learning, it is essential that they are exposed to content that promotes inclusivity, showcases representation, and is accessible to all students. Especially in STEM and computer science contexts, special considerations need to be made to ensure that learning represents all students, even when the fields may lag in this.

## A Computer Science Case Study

To illustrate the lack of diversity and representation, the following section will examine the computer science field as an example.

Built on long-standing social barriers, this lack of representations skews female and minorities' self-perception and whether they feel a sense of belonging in the field, which all halt their interest and advancement. And this lack of representation impacts us all, especially when it comes to building an adequate computer science pipeline, developing accessible technology, and closing socioeconomic divides like the wealth gap.

**Pipeline Build:** Half of all new jobs in STEM are in computing. Now in 2020, unfilled computer science positions reach over one million with only eight percent of college graduates in STEM electing to major in computer science. From a purely numbers standpoint, the more students who are exposed and encouraged to pursue compute science will help to temper the insufficient computer science pipeline.

**Technology Accessibility:** The design and function of technology is biased toward those developing it. For example, speech recognition software with smart speakers is more likely to understand men than women, and the same is true for people with accents. Another example is that facial recognition software repeatedly fails to recognize women and people of color, which again is in part due to the gender and race of those designing it.

**Wealth Gaps:** Finally, greater equity in the computer science workforce will also help to close gender and racial wealth gaps by enabling these groups to access higher incomes that empower them, their family, and their community.

**WOMEN**

**26%**
**of all computer science positions[1]**

**18%**
**of all computer science degrees[2]**

**BLACK AMERICANS**

**12%**
**of all computer science positions[3]**

**10%**
**of all computer science degrees[4]**

**LATIN AMERICANS**

**16%**
**of all computer science positions[5]**

**12%**
**of all computer science degrees[6]**

Sources: 1 2 3 4 5 6

## In Support of Representation

To remedy these divides, it's essential that students have access to computer science and technology-driven learning experiences. For example, a study by Computer Science Education Week found that the likelihood women will major in computer science increases tenfold when they are enrolled in AP Computer Science, and Black and Latinx students are seven times more likely to major in it. Moreover, it's essential to help students reach these more advanced computer science courses.

In order to do so, schools need to overcome the middle school cliff, which is where female and minority students often drop out of STEM courses. Starting at a younger age, instruction must break through these stereotypes to help overcome this notorious hurdle that prevents students from delving into more advance classes and building skills in computer science. Beyond reaching younger students, progress will also require curriculum be inclusive and representative.

**Some strategies include:**

1. **Finding content that features the work of diverse people in the field.**
2. **Hosting all-female camps, clubs, or other learning experiences.**
3. **Bringing in diverse speakers, whether in person or through skype.**
4. **Taking students on field trips to local businesses.**

*Following these strategies will help overcome the representation divide in instructional content by promoting inclusivity throughout the learning experience.*

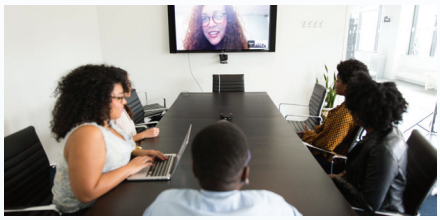
# STUDYING COMPUTER SCIENCE

**What my friends think I do.**

**What my mom thinks I do.**

**What I think I do.**

**What society thinks I do.**



**What I really do.**

## Cultivating Inclusivity: *Charleston County School District*

John Patrick Shell is an engineering teacher in CE Williams Middle School's career readiness program. In this role, he endeavors to immerse students in real-world learning experiences, impart essential career-ready skills, and inspire students with the opportunities available within STEM. To make technology-based learning experiences more inclusive and ensure students can see themselves in the STEM field, he invites experts into class, takes students on field trips to regional businesses, and offers an all-female robotics camp.

Read more about John's work on equip →

**EDUCATOR**
**John Patrick Shell**

**POSITION**
**Gateway to Technology instructor**

**DISTRICT**
**Charleston County School District**

**LOCATION**
**Charleston County, SC**

> **Students are able to use the technology to learn, create, and build. They use the technology to reach the highest level of Bloom's Taxonomy. This experience redefines what students are able to see and do with technology in the classroom.**

# What Four Divides Teach About Digital Equity

As with all the digital divides discussed, this representation divide is affected by greater challenges to equity. There is a throughline that connects each of the divides discussed here and that extends from these to larger socioeconomic divides.

In the Educational Policy Journal, authors Michele Knobel and Leeann Stone write: "There is no single digital divide in education but rather a host of complex factors that shape technology use in ways that serve to exacerbate existing education inequalities."

Digital equity is complex, multi-faceted, complicated, and dense. Still, by framing it as a divide, it gives a false sense that closing the divide achieves digital equity. The access and connectivity divide bred inequity in skill development, inequity in learning opportunities, and inequity in content inclusivity. Digital equity won't end with inclusivity either; social and emotional learning, assessment modes and methods, platform accessibility, and a host of other divides also arise.

As is often echoed, a silver bullet does not exist. Yet, what we hoped to have demonstrated in our analysis is the opportunity to tackle issues of digital equity through small, community-driven changes—in a district's parent night, a parent-teacher-student partnership built on digital wellness, a business project that instills design thinking, and a camp that encourages female students to pursue STEM.

And along the protracted, noble, and necessarily idealistic journey, digital equity is a North Star we can collectively follow and pursue.

> **"There is no single digital divide in education but rather a host of complex factors that shape technology use in ways that serve to exacerbate existing education inequalities.**

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