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FIELD REVIEW

Toward People's Community Control of Technology: Race, Access, and Education

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ABSTRACT

This field review explores how the benefits of access to computing for racialized and minoritized communities has become an accepted fact in policy and research, despite decades of evidence that technical fixes do not solve the kinds of complex social problems that disproportionately affect these communities. I use the digital divide framework—a 1990s policy diagnosis that argues that the growth and success of the internet would bifurcate the public into digital "haves" and "have-nots"—as a lens to look at why access to computing frequently appears as a means to achieve economic, political, and social equality for racialized and minoritized communities. First, I present a brief cultural history of computer-assisted instruction to show that widely-held assumptions about the educational utility of computing emerged from utopian narratives about scientific progress and innovation—narratives that also traded on raced and gendered assumptions about users of computers. Next, I use the advent of the digital divide framework and its eventual transformation into digital inequality research to show how those raced and gendered norms about computing and computer users continue to inform research on information and communication technologies (ICTs) used in educational contexts. This is important because the norms implicated in digital divide research are also present in other sites where technology and civic life intersect, including democratic participation, public health, and immigration, among others. I conclude by arguing that naïve or cynical deployments of computing technology can actually harm or exploit the very same racialized and minoritized communities that access is supposed to benefit. In short, access to computing in education—or in any other domain—can only meaningfully contribute to equality when minoritized and racialized communities are allowed to pursue their own collective goals.

Keywords: Digital Inequality, Digital Divide, Education, Technocentrism

The Digital Divide and Technocentric Thinking

Combating technocentrism involves more than thinking about technology. It leads to fundamental reexamination of assumptions about the area of application of technology with which one is concerned; if we are interested in eliminating technocentrism from thinking about computers in education, we may find ourselves having to reexamine assumptions about education that were made long before the advent of computers.

–Seymour Papert (1987). "Computer Criticism vs. Technocentric Thinking."

In the first months of the Covid-19 pandemic, media attention focused on a number of inequalities endemic to American public life, including the greater risk of mortality for Black people suffering from coronavirus disease (Golestaneh et al. 2020). Enduring, deeply interconnected, racialized inequalities related to education, health, safety, labor, and political power rapidly took on the intensity and urgency of crisis (Chao and Park 2020; Kim and Bostwick 2020; Williamson, Eynon, and Potter 2020). As schools improvised best practices to continue instruction during the pandemic, access to educational technology emerged as a practical concern for many families and a symbolic reminder of the matrix of social inequalities that mark everyday life for many Americans.

Recognizing the many constraints to accessing remote schooling for students from minoritized [1] communities, policymakers, journalists, and researchers revived a decades-old approach to the equitable distribution of broadband internet connections, personal computers, software, and the skills needed to use all of these for learning: *the digital divide*. As one policy report described the situation of lower socioeconomic-status schools located primarily in minoritized communities, "Students in high-poverty schools faced disparities in access to educational resources before the pandemic, which are almost certain to be widened by learning losses because of the *digital divide*" (Stelitano et al. 2020). The digital divide framework has been defined many ways in the nearly thirty years since it was invented (which is, as this essay will show, part of its appeal), but it originally referred to "stark differences between those who were using the Internet and those who were not" (Zickuhr and Smith 2012). As larger and larger portions of the American public connected to the internet at home, school, or via smartphone, researchers expanded the term *digital divide* to describe any correlation between socially consequential difference (e.g., race, class, sex, age, disability, geography, citizenship) and access to many kinds of computing resources. In this way, access to computing was embedded within the digital divide framework as both a problem and a solution. Addressing any observed digital divide by providing access to some computational resource could promote social justice, civic participation, and economic equality since computers were seen as increasingly vital to modern life, and lesser access to such vital technology might exacerbate or intensify extant forms of inequality (Lievrouw and Farb 2003; van Dijk 2006).

Prior to its reappearance in the context of pandemic response, the digital divide framework was incorporated in many domains of research, including education, information science, and human-computer interaction, and was frequently described as an acute problem for lower socioeconomic-status students (a class composed disproportionately of students of color), who risked missing out on the educational, social, and participatory benefits of computing at school or at home. Despite the intuitive

premise and laudable intentions of much digital divide research and policy, this framework (and its frequent redefinition) has allowed the complex power dynamics at play at the intersection of computing and public life to escape scrutiny, obscuring larger, structural forms of inequality that are not so easy to solve. To apply this question of access and power more pointedly, what exactly does the popularity and persistence of the digital divide framework say about computing and racial inequality?

Inherent in the digital divide framework is the idea that access to a given kind of computing resource for all "would solve particular problems in the economy and society" (van Dijk 2006, 22). Still, despite many decades of established social scientific work that would attenuate or even dispute such an approach, the idea that access to computing resources constitutes a way of addressing inequality shows up in all kinds of digital divide research (and its subsequent rearticulation as digital inequality) (Greene 2021; McSorley 2003). As Nissenbaum (2001) observed twenty years ago, the digital divide framework asks us to believe that lack of access to important computing resources "will cause even greater social injustice than we currently experience" (Nissenbaum 2001, 120). In this brief review essay, I roundly reject this reasoning and say instead that it is social injustice *in the present* that computing research should center. In other words, the uneven character of access to computing resources is produced and reproduced by the racialized social terrain of wealth, power, and reputation that defines much of contemporary American life (Delgado, Stefancic, and Harris 2017; Omi and Winant 2016). Ironically, for minoritized communities, access to computing can be one of the means by which minoritization is achieved (Benjamin 2019; Eubanks 2018; Noble 2018).

Access to computing resources functions as a self-reinforcing and powerful justification for many kinds of interventions in racialized and minoritized communities: it directs public investment, valorizes certain kinds of cultural production over others, and reinforces the idea that people of color are largely peripheral to computing cultures.

When researchers center access to computing resources, they tacitly invoke a compelling but incomplete story about inequality, a persuasive and reassuring narrative that resists empirical evidence about the ambiguous and complex relationship between difference and technology (Benjamin 2016; Brock 2019; Coleman 2009; McMillan Cottom 2020; Nakamura and Chow-White 2012). Although my work here focuses on access to various forms of computing for racialized and minoritized students in the context of schooling, my argument applies potentially to all of the many domains where people yoke public, collective doings to the charming and seductive capacities of computers (Licklider 1960) [2]. Access to computing resources functions as a self-reinforcing and powerful justification for many kinds of interventions in racialized and minoritized communities: it directs public investment, valorizes certain kinds of cultural production over others, and reinforces the idea that people of color are largely peripheral to computing cultures (Cave and Dihal 2020; Hobson 2008).

To analyze some of the complex relations at work in the continuing appeal of access to computing for racialized and minoritized students, the next section sketches out a brief cultural history of computer-assisted instruction. The contemporary American public largely accepts the centrality of computing with respect to education, but critics and scholars have frequently warned against such "technocentric" thinking. The presently accepted fact of the educational utility of computing in education emerged from utopian narratives about scientific progress and innovation, narratives that also traded on raced and gendered assumptions about users of computers. Following this, I summarize the origins of the digital divide framework and its eventual transformation into research on digital inequality and information and communication technologies (ICTs), arguing that research has consistently failed to identify a predictable relationship between access to computing resources and increased social, political, or racial equality. Since the turn of the millennium, research has frequently shown some students benefit from education involving ICTs, but these benefits are usually concentrated among smaller groups of technically proficient students (Cuban 2003; Cuban, Kirkpatrick, and Peck 2001). As an alternative to the digital divide framework, I conclude by foregrounding the lived experience of people in minoritized communities, arguing that access to any form of computing could only ever fully benefit minoritized and racialized communities if these communities were allowed to pursue their own collective technological aspirations.

The Axiom of Computer-aided Instruction

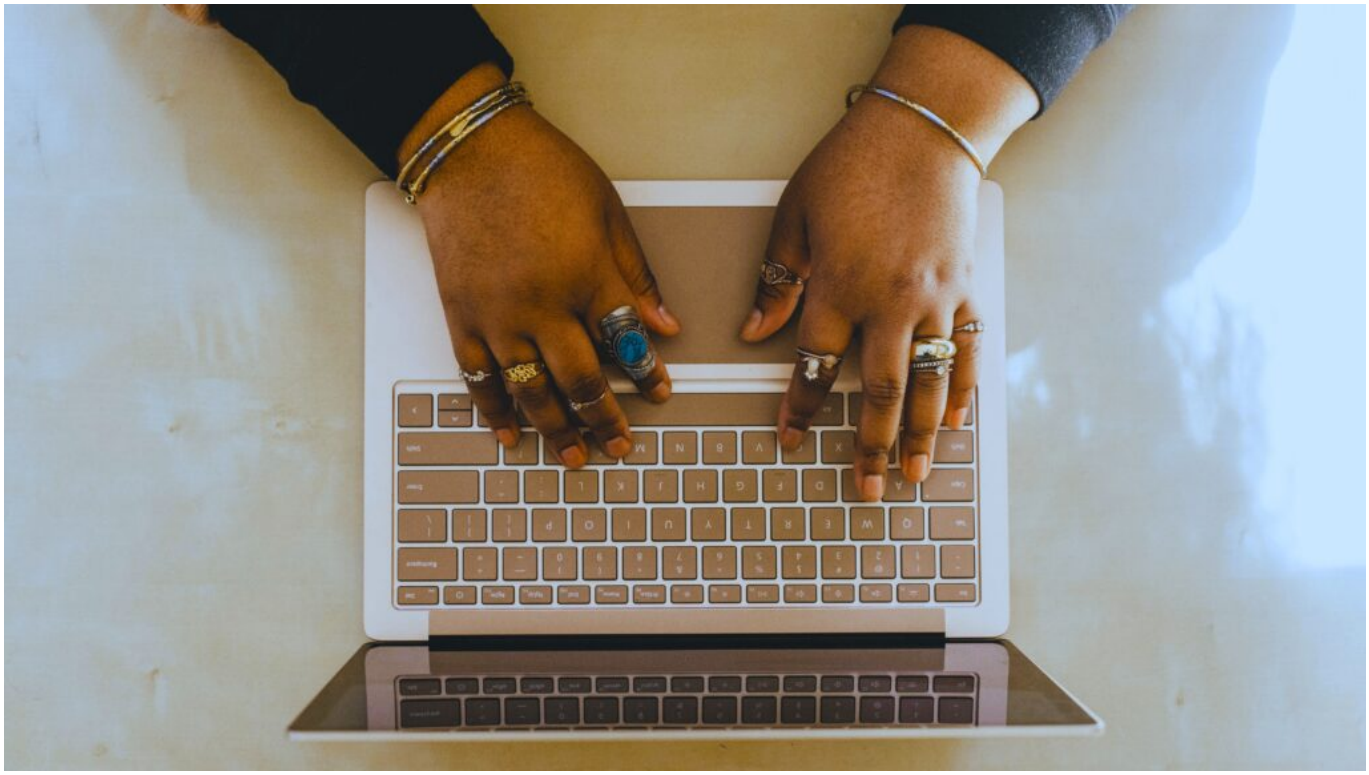
For the past half-century, the growth and spread of various forms of computing in the United States (and worldwide) has created new markets, spawned new industries, and changed many existing forms of economic life (Braesemann, Lehdonvirta, and Kässi 2020). Amid this spectacular economic success story, the harms of lesser access to computing for various minoritized groups has enjoyed widespread acknowledgment (Winston 2007). Since the turn of the millennium, researchers and educators have focused on lack of access to computing resources among women and girls (Main and Schimpf 2017; Philbin et al. 2019), people of color (Turner 2016), the poor (Eamon 2004), immigrants (Ono and Zavodny 2008), the aged (van Dijk 2006), rural residents (Lai and Widmar 2021), and the disabled (Duplaga 2017).

Fears about inadequate access depend, ironically, on the spread and growth of educational computing overall. It is only against this ubiquitous backdrop that lesser access to computers emerges as a moral or practical threat.

Especially as it concerns educational contexts, access to computers for racialized and minoritized communities stands out as a kind of caution in an otherwise triumphant national tale of technology, growth, and futurity. Fears about inadequate access depend, ironically, on the spread and growth of educational computing overall. It is only against this ubiquitous backdrop that lesser access to computers emerges as a moral or practical threat. As Mizuko Ito points out in a work specifically focused on the

history of children's learning software, "computers are ubiquitous in U.S. schools and are present in almost all homes with children" (Ito et al. 2009, 1). Ito also points to no small anxiety accompanying the successful diffusion of computers, a persistent "worry about a digital divide that puts advanced uses of computers out of some kids' reach" (Ito et al. 2009, 1). It is, therefore, important to note that computers and computing are widespread in private homes and have been largely taken up by all kinds of schools and other public institutions, such as schools, libraries, museums, and other heritage sites (Cohron 2015).

Computers then are economically important, but they are also *culturally* important—that is, they are objects of extreme collective fascination (Donath 2014; Lunenfeld 2011; Turkle 2011). The origins of contemporary computers can be traced to works of science fiction and philosophy that fantasized about mechanical means of augmenting human knowledge and its organization (Bush 1945; Dyson 2012; Wells 1938). These speculative approaches were followed by advances in science, engineering, and information theory, all of which contributed to the now common way of equating all kinds of human activity as flows of information through computerized systems (Agre 2001; Buckland and Liu 1995; Castells 2009; Muddiman 1998). Computers were developed by powerful institutions (the academy, the military, and corporate America) and, in many ways, their contemporary symbolic power derives from that genealogy. From their incorporation in utopian visions of spreading science throughout humanity (Rayward 1994), to their infrastructural role in informational, global commerce (Lunenfeld 2011), and, later, to their appropriation by influential counter-culture figures such as Stewart Brand and Ted Nelson (Nelson 1993; Turner 2008), computers have been linked to many important sites of economic, cultural, and political power (Campbell-Kelly et al. 2014). We tend to view computing technologies, wherever and however they are deployed, as having something to do with innovation, science, and objectivity (Dourish 2017; Habermas 2005; Leonardi 2010). But when we talk about contemporary computers, we must also contend with other values they embody, values which frequently do not have anything to do with science or objectivity but implicitly or explicitly trade on those background understandings (Nissenbaum 2001). Complex digital technologies place their users into particular relations of accumulation, extraction, and profit, frequently to the benefit of powerful corporations that operate these systems (Knobel and Bowker 2011).



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The association of computers with scientific values such as innovation and futurity partly explains why the role of computing in education is so infrequently questioned. In the context of education, computers have a staying power very different from other kinds of technology, a way of keeping themselves new and vital (Crooks 2018). In the first half of the twentieth century, amid a demographic shift in the ethnic composition of the United States, teachers incorporated forms of informational media such as lantern slides, models, maps, and globes to educate American public-school students about an increasingly mediated, interconnected world (Good 2020). Such instruction and the media upon which it depended trained students to view themselves as cosmopolitan citizens of a democratic world rightly ordered by American values and national interests. Since then, many other novel forms of technology or media have appeared, become the subject of intense pedagogical interest, then gradually receded in perceived importance. This trend is true of radio, telephone, film, television, and video media, all of which challenged face-to-face, teacher-led, bibliocentric instruction when they became available to the American public, then gradually found use as supplementary resources.

Computer-aided instruction, by contrast, has continued to challenge face-to-face instruction for several decades, most recently during a mania for massive, open, online courses (MOOCs) (Bannan-Ritland 2002; Collins and Halverson 2009; King et al. 2016; Monahan 2008). While there is ample evidence that computer manufacturers' marketing efforts have a lot to do with the tight association of computing and education, such marketing would not have been successful if computers were not already intelligible as central to masculinized, upper-middle class, white forms of work and leisure (Newman 2017). Emergent computing cultures (e.g., academic computer science, the nascent tech sector, government-funded research) intentionally excluded groups who had contributed technical labor to produce modern computers, including Black people and women, an exclusion that promoted a presumed natural fit between whiteness, masculinity, and computing (Hicks 2018; Light 2006; Shetterly 2016).

[F]or the education of students from racialized and minoritized communities, computers maintain a durable appeal as vectors of improvement and racial uplift.

In the specific case of American public schooling, especially for the education of students from racialized and minoritized communities, computers maintain a durable appeal as vectors of improvement and racial uplift. Pre-World-Wide-Web computer networks built and deployed in educational settings included programs aimed at bringing computation to the "underprivileged," a term that functioned as a synonym for Black (Rankin 2018). This early invocation of the benefits of access illustrates the durability of stereotypes about computing and its presumed beneficiaries. It also convincingly dates the idea of computing as a means of addressing the concerns of minoritized and racialized communities as already extant in 1963: the progressive mission of providing access to computing to the "underprivileged" *predates* modern computers.

This progressive zeal for increasing access to educational computing was evident in the creation and growth of the Programmed Logic for Automatic Teaching Operations (PLATO) system, a computer-assisted instruction network that existed from the 1960s until the mid-2000s (Rankin 2014). PLATO and its networks were an important site of educational computing largely supported by state and federal funds. The advent of the "micro-computer" likewise allowed for many forms of educational computing, including hobbyist approaches that promised users the ability to learn independently. In the 1980s, the educational programming language, Logo, and the personal computers used to deliver it, provided another kind of infrastructure for computer-assisted instruction. Logo, distributed to schools, libraries, and other informal learning spaces, inspired a large and committed community of educators, who touted the program's benefits for teaching mathematics, robotics, and computer programming (Ames 2019).

In a pattern familiar to all educational computing paradigms, researchers attempted unsuccessfully to find proof of some generalizable and replicable educational benefit attributable to use of Logo, prompting Seymour Papert, the public face of Logo, to decry "technocentric" research approaches that ignored social and cultural aspects of computing (Papert 1987). Papert argued that accusations that computer-aided instruction had failed to produce promised benefits committed the same logical error as overblown promises that computers would revolutionize teaching: both approaches, although seemingly opposed, overemphasized the importance of computers, ignoring the complex interactions of meaning, values, representation, and power at work in the application of computing to any domain. As a corrective, Papert, argued for "computer criticism," a more sophisticated, contextual form of cultural analysis that would focus on "the ways in which computers are constructed, used, and represented" (29).

Papert's warning against technocentrism was frequently ignored in subsequent research on computers in education. As with other kinds of disappointing interventions, Logo gained new life as a form of outreach for minoritized and racialized subjects. Although no general benefit to using Logo for teaching ever emerged, Logo's advocates pivoted to justifying its use as a way to reach "underprivileged" students, a

plan continued more recently in the One Laptop Per Child (OLPC) program. OLPC also promised learning benefits to students in minoritized communities in the United States and abroad through the provision of computers (Ames 2019; Resnick 1996). In the case of both Logo and OLPC, more equitable educational outcomes failed to materialize despite significant public and philanthropic investment.

> *[T]he persistent appeal of access to technology and the equally persistent failure of tech-focused solutions to address social problems reinforce each other: they are complementary forces which, although seemingly contradictory, form a unity.*

These works collectively suggest that the benefits of computers to learning and schooling have become part of what we understand computers to be. But these high expectations, resting as they do on deep cultural associations and shallow analysis, are frequently challenged by empirical studies. What emerges then is a narrow and myopic approach to the question of how computers might contribute to a more just or fair society, one that casts racialized and minoritized subjects as bereft, as a social problem in need of technical solutions (Bijker et al. 2012; Brock 2019; Knox, Williamson, and Bayne 2019; Nelson 2002). In this way, the persistent appeal of access to technology and the equally persistent failure of tech-focused solutions to address social problems reinforce each other: they are complementary forces which, although seemingly contradictory, form a unity (Lefebvre 2008). Our delusion and disappointment with one set of technocentric solutions fuels a search for another tool, another lever. In this way, the perpetual failure of access produces a demand for more access.

From Digital Divide to Digital Inequality (and back again)

For many policymakers and scholars, differential access to computing resources that fall along race, class, gender, age, disability, or geographic factors is a fundamental question of justice (Cohron 2015; Eubanks 2007; van den Hoven and Rooksby 2008). This commitment has frequently manifested in research that adopts the digital divide framework (or, more recently, digital inequality). As originally articulated in a series of federal reports from the Department of Commerce in the 1990s at the moment of the commercial expansion of the internet (United States Department of Commerce National Telecommunications and Information Administration 1995), the digital divide concerned lesser access to computing resources by assorted demographic groups. The digital divide informed a great deal of research for nearly two decades by arguing that access to internet-enabled computers produced digital "haves" and "have-nots," a state of affairs to be remedied by public investment. These reports outlined the unambiguous economic growth of the tech sector in the United States in the late twentieth century and the increasing diffusion and convergence of various forms of ICTs, including telephony, television, computers, and the internet (Mansell et al. 2009). In primarily economic terms, these reports warned that ICTs would be central to US prosperity, but large swaths of the population might be excluded from future development. The digital divide originally focused on internet access but grew to include access to many

other ICTs, including personal computers and broadband network connections at home or school, as well as the skills and knowledge needed to make productive use of technology (Hargittai 2002; Robinson et al. 2015). From the perspective of the digital divide framework, schools and libraries would be important sites of computing for students from racialized and minoritized backgrounds, whose lesser access to computing resources could impede learning or social mobility.

But the digital divide framework, clearly influential and arguably dominant, has always had skeptics (Burrell 2012; Eubanks 2011). As early as 2001, education researchers such as Larry Cuban (Cuban 2003; Cuban et al. 2001) described the contours of ICT use applied to educational settings as a pattern of "high access, low use," meaning that the mere availability of ICTs did little to alter established educational routines. As opposed to reports by the National Telecommunications and Information Administration, Cuban's work argued that computers were "oversold and underused," not central to educational activity, but frequently peripheral, irrelevant even. Importantly, Cuban's research also called for attention to cultural aspects of computing, echoing Papert's caution about "technocentric" analysis. For example, Cuban found that students who demonstrated facility with ICTs could use this knowledge as a form of social capital. Although these benefits were not correlated with traditional measures of learning or academic success, they tended to accrue to elite groups within the larger student body. This well documented and expertly researched characterization—one echoed in subsequent findings of other engaged, long-term qualitative studies about equity and access—did little to slow the enthusiasm for incorporating ICTs into learning at all education levels, at home or at school, and in any setting with a conceivable connection to learning.

Digital divide research has consistently pointed to qualitative and quantitative differences in how racialized and minoritized subjects access, use, and adapt to ICTs (Gonzales 2016). To be clear, these differences are real and persistent. Although the premise of digital divide research is certainly evidence-based, the interpretation of these differences remains disputed. For over twenty years, the Pew Internet and American Life Project has produced high-quality survey research about technology use among various groups in the United States, insisting on the importance of equitable access to technologies for a number of "disadvantaged groups" including the elderly, the poor, the young, and people of color (Smith 2015; Smith and Olmstead 2018). But what exactly constitutes a digital divide has tended to drift over time, even though the original interest injustice and inequality has remained. In this way, the consequences of a measurable digital divide have resisted empirical validation. First, many researchers understood that physical access to computing resources was, by itself, a necessary but insufficient condition for the kinds of activity that interested researchers. So some researchers shifted their approach, focusing instead on the "differentiated uses" to which students put computing, hoping to find relationships between targeted groups of users and desirable activities (Sims 2014).

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Other researchers recognized that ICTs also require the skill and expertise of their users in order to function. This line of research, instead of abandoning the digital divide framework, turned to a cumbersome terminology of "levels" to pin down and characterize what exactly is supposed to make ICTs beneficial and how this might relate to patterns of use and access (Scheerder, van Deursen, and van Dijk 2017). For example, the skills and literacies needed to search for information online could be considered an aspect of a "second-level" digital divide, a measurable difference in any skill needed to make ICTs productive (Hargittai 2002). These levels proliferated. An increased rate of successful retrieval of information, for example, which accumulates to certain groups more than others, would indicate a "third-level" digital divide, a gap in how some groups translate online searches into material benefits (van Deursen and Helsper 2015).

These splintering interpretations point to the complexity of ICT use, the endless variety of ways that technology use speaks to and increasingly constitutes lived conditions (Haraway 1991; Ito et al. 2009; Sims 2017; Suchman 2006). Ultimately, many kinds of digital divide researchers abandoned the term in favor of an interest in digital inequality, a broader term meant to acknowledge that ICT use can take many forms, to incorporate previous approaches, and to reorient the field toward a base commitment to justice (Pei and Crooks 2020; Robinson et al. 2015; Watkins 2018). As Dimaggio et al. (2004) wrote of this needed reframing:

Until recently most research has focused on inequality in access (the "digital divide"), measured in a variety of ways. We agree that inequality of access is important because it is likely to reinforce inequality in opportunities for economic mobility and social participation. At the same time, we argue that a more thorough understanding of digital inequality requires placing Internet access in a broader theoretical context and asking a wider range of questions about the impact of information technologies and informational goods on social inequality.

Whatever term they use, researchers still frequently assume that access to ICTs is a cause of economic privation, not an effect of current structural inequalities.

Regrettably, digital inequality research does not necessarily improve on the flaws in the digital divide framework. Whatever term they use, researchers still frequently assume that access to ICTs is a cause of economic privation, not an effect of current structural inequalities (Selwyn 2004). Digital inequality research recapitulates a number of fundamental assumptions common to the digital divide framework. First, it takes observable differences in access to ICTs among different groups as a potential cause of some future detriment, a logical leap that departs from what is empirically observable (Tufekci 2012). Second, digital inequality research attempts to solve inequality through access to valorized forms of ICTs, regardless of whether or not evidence exists that such access will produce desired benefits (Eubanks 2011; Sims 2017). Finally, digital inequality research ignores the many forms of value that are extracted by commercial technologies (Crooks 2019a; Pei and Crooks 2020). Technologies demand labor, time, and information in order to function and to remain functional, resources that are frequently supplied by users and their social networks and communities (Denis and Pontille 2017; Gonzales 2016; Graham and Thrift 2007). From this perspective, ICT access that promises to solve inequality appears not just oversold and underused, but extractive.

Again, even as any generalizable benefit of access to ICTs in learning proved elusive, in schools that serve racialized and minoritized communities, the question of access achieved a certain gravitas (Barron et al. 2014; Buras 2014; Kraft et al. 2015). In education research, the term of art "urban schools" refers to those high-poverty schools that serve minoritized communities, primarily Black and Latino, frequently in city centers hollowed out by white flight and now the site of intense housing displacement and gentrification. These schools often face pressure to make use of cutting-edge technologies to address the persistent conditions of inequality that are a fact of daily life for many in the community: since 2010, these technological fixes have included one-to-one computer programs (Ames 2019; Crooks 2019a), hybrid online/in-person "blended" learning scenarios (Rasheed et al. 2020), after-school programs (Garcia and Morrell 2013), and design-based curricula (Sims 2017).

These successive waves of technological innovation come at a time when the basic principles of U.S. schooling have become unsettled, as evidenced by a policy consensus that blames under-resourced schools themselves for failing to produce equity in minoritized communities (Erickson 2016). Urban schools, produced through residential segregation and sustained economic disinvestment, are sites of extreme inequality and precarity. These schools are highly disciplined environments, where data produced through educational uses of ICTs also supports restrictive regimes of accountability and surveillance (Barnard-Wills 2012; Crooks 2019b; Gangadharan 2017; Lupton and Williamson 2017). ICTs used to deliver public education achieve a troubling duality: they stand as both a proposed solution for persistent problems of economic inequality and one of the means by which such inequality is reproduced in the form of surveillance, privatization and, all too frequently, criminalization (Browne 2015; Green and

Zurawski 2015; Kaba 2021; Selwyn 2010).

Do minoritized communities have less access to desirable ICTs because they are poor or are they poor because they lack access to ICTs? Digital divide and digital inequality frameworks answer in the affirmative for both questions, allowing access to shift between cause and effect. This is misleading. Access takes on its particular character as an effect of larger inequalities. While equity of access is an important consideration, in my own research, I have found that the value of access to ICTs to minoritized and racialized students is largely exaggerated. Moreover, access-based approaches to research frequently ignore novel and interesting uses of technology that users themselves have developed. For example, in a South Los Angeles high school that implemented a program partly inspired by One Laptop Per Child, a small group of uncompensated student IT workers became responsible for a great deal of sustained maintenance and troubleshooting work; this work demanded students' time, energy, and creativity, but conferred social and reputational benefits (Crooks, 2019b). For most students and teachers, however, the one-to-one program did not meaningfully change any aspect of instruction and amounted to yet another tool of surveillance. These dynamics are complicated, depend on established hierarchies of power within organizations and communities, and cannot be captured with technocentric approaches.

For their proponents, ICTs are seen as somehow outside or above the experience of human existence—an external force that can, for example, positively impact the life conditions of students so as to improve them (King et al. 2016; Star 2015). But there is no evidence that this is the case, nor can there be for such a broad and factually complex claim. Such reasoning displays currents of technological determinism, a largely discredited view that assumes that technology produces direct and determinate impacts on human behavior (Winner 1980). However much such a claim might defy popular perceptions, access to technology does not combat structural inequality in society. This is, to be blunt, "magical thinking" that equates technological access with racial, economic, or political progress (Eubanks 2011).

In both digital divide and digital inequality research, certain observed uses correspond highly to values and biases in society. For example, video games have often been derided in popular media as an unproductive use of ICTs, but have recently been recuperated as educationally valuable (Gee 2003; Newman 2017; Squire 2011). Media scholars have pointed to the ways that specific uses of video games are culturally and psychologically meaningful for gamers of color, how participation in games and gamer communities provides affective benefits for users who are multiply minoritized within the broader culture (Gray 2020). Neither digital divide nor digital inequality research has extensively considered games and the ways that minoritized and racialized subjects engage with them, instead focusing on other uses of ICTs that always render minoritized students as bereft.

Digital divide and digital inequality frameworks valorize certain forms of access and use while discounting or dismissing others. For example, in 2018, nearly 80 percent of surveyed Black internet users reported connecting via smartphone (as opposed to desktop or laptop computer and a broadband connection) (Brock 2019). But for many researchers committed to digital inequality framings, this way of accessing the internet is assumed to be inferior because these users engage in non-valorized forms of cultural production. Leading technology theorist Andre Brock points out that Black users of social media

services such as Twitter have incorporated novel forms of ICTs into cultural and informational practices that are meaningful, influential, and completely misunderstood by digital divide and digital inequality researchers (Brock 2019).

Conclusion: Community Control

Digital divide (and later, digital inequality) scholarship begins with an impulse toward justice—the imperative to include racialized and minoritized communities in technology's presumed benefits. As scholars of critical race theory, education, and computing have pointed out, a strategy that prioritizes inclusion might ignore and leave intact the power structures that produce exclusion in the first place (Benjamin 2016; Ogbonnaya-Ogburu et al. 2020; Zamudio et al. 2010). Instead, others have argued for incorporating minoritized communities themselves in accounting for the value that computing brings to their activities, an accounting which, although bound up with access, might not be limited to an interest in individual use or non-use of artifacts or platforms (Crooks 2019a; Dillahunt et al. 2017; Harrington, Borgos-Rodriguez, and Piper 2019).

Digital divide and digital inequality research renders racialized subjects as bereft—a collection of individuals defined by their lack of needed goods, knowledge, or skills. This presumption of inferiority with respect to valorized uses of technology in education reflects broader beliefs about the inherent inferiority and limited technical potential of students of color, particularly Black students.

As Greene (2021) writes, decades of policy and research focused on access to computing resources has tended to obscure important economic history. This history has been subsumed in the popular imagination by a fascination with computers. A more realistic economic history would include many structural changes wrought by federal policy, including "deindustrialization, capital flight, stagnant wages, or a shrunken, punitive welfare state" (174). To this I would also add that access to technology has become a way of obfuscating a story about race in America. The durable appeal of access ignores some aspects of computing in racialized and minoritized communities, including many novel forms of culturally meaningful practice (Brock 2019; Chan 2014; Garcia, Fernández, and Jackson 2019; Gray 2020). Digital divide and digital inequality research renders racialized subjects as bereft—a collection of individuals defined by their lack of needed goods, knowledge, or skills. This presumption of inferiority with respect to valorized uses of technology in education reflects broader beliefs about the inherent inferiority and limited technical potential of students of color, particularly Black students. The deficiency of subjects racialized as Black in computing is continually reproduced both by popular representations of technology and discriminatory practices in the technology sector, including higher education (Cave and Dihal 2020; Daniels 2015; McGee 2020). Moreover, these assumptions about the inferiority of Black technological practice can manifest in any domain where computing technology mediates public life, not

just in education. In this way, technocentric analysis constricts the sociological imagination, blinding us to those structural dynamics that produce and reproduce racial stratification.

Recognizing the degree to which digital technologies of all kinds reify notions of race, class, gender, sexuality, disability, citizenship, and other socially consequential forms of human difference as static, inherent, and separable attributes distributed by chance, many technologists and activists have called for creative approaches to address structural inequality in the design and use of technology. Central to works looking beyond a narrow focus on divides or deficits is the commitment that racialized and minoritized communities themselves put ICTs to use in ways that entail self-determination (McIlwain 2020), political mobilization (Garza 2017), pleasure (Brock 2019), sovereignty (Duarte 2017), or other vital undertakings.

> *No technology, no matter how charming or clever, can accomplish the difficult, generational work of building a more just world.*

Just as Nelson (2011) looked to the Black Panther Party's community health programs to better understand contemporary public health conflicts and their racial contours, we might also look to their work to understand the confluence of race, technology, and education. As the 1972 revision of the Black Panther Party's Ten-Point Program states, "We want land, bread, housing, education, clothing, justice, peace and people's community control of modern technology" (as quoted in Alkebulan 2007). It is to this end that researchers, policymakers, community members, and practitioners genuinely interested in dismantling inequality must direct their efforts. No technology, no matter how charming or clever, can accomplish the difficult, generational work of building a more just world.

Footnotes

1 As opposed to terms like *underrepresented*, *minority*, or *underserved*, the term *minoritized* draws attention to the specific contours of American racial and sexual hierarchy in public life. This term emphasizes power relations rather than demography and points to the ways that the public sphere is defined, constituted, and managed according to the specific interests of a dominant cultural group and according to enduring structural hierarchies based on race, class, gender, sexuality, legal status, disability and other consequential, interlocking forms of difference (Ferguson 2004; Muñoz 1999; Noble 2016).

2 In this essay, I focus specifically on minoritized communities in the United States, but the digital divide framework has also been used frequently in research on technology in international development. Particularly in ICT4D (information and communications technology for development), scholarly arguments about digital divides and the usefulness of various forms of computing for ameliorating global economic inequality have occurred alongside U.S.-focused research (see Toyama 2015, for example).

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