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TIMES THIRTY: ACCESS, MAINTENANCE, AND JUSTICE

ABSTRACT

Based on an ethnographic project in a public high school in a low-income neighborhood in South Los Angeles, this paper argues that access to information and communication technologies (ICTs) cannot be taken as helpful or empowering on its own terms; instead, concerns about justice must be accounted for by the local communities technology is meant to benefit. This paper juxtaposes the concept of technological access with recent work in feminist Science and Technology Studies (STS) on infrastructure, maintenance, and ethics. In contrast to popular descriptions of ICTs as emancipatory and transformative, in the setting of an urban school, access produced extensive demands for attention, time, and information. This paper focuses on the labor of a group of student workers, Student Technology Leaders (STLs), and how they became responsible for the significant amount of repair and maintenance work involved in keeping hundreds of new computing devices available for use. An expanded process of accounting can more realistically frame issues of justice and its relationship to ICTs. I use a town hall meeting held with these students as an example of a processual vision of justice, one that encourages the beneficiaries of technological access to evaluate costs, benefits, and ethical concerns together.

INTRODUCITON

In the language of scholars, technologists, development agencies, policymakers, educators, community organizations, and other stakeholders, "access" indexes a strategy for pursuing equity via the dissemination of various forms of ICTs (information and communication technologies). A flexible term, access "tends to refer to making ICTs available to all citizens," particularly those from minoritized[1] communities (Selwyn 2004). Providing hardware, software, or training in minortized communities might give people a chance to participate in computer-

[1] As opposed to terms like underrepresented, minority, or underserved, "minoritized" draws attention to the historical specificity of American racial and sexual hierarchy and the multiplicity of identities. Following the work of Muñoz (1999), I use this term as a way to point to social location relative to the persistent white supremacy, economic precarity, heteronormativity, and misogyny of contemporary American life.

mediated forms of work, play, and politics from which they might otherwise be excluded. As Eubanks (2011) writes,

> Our mainstream idea of justice is thus captured by the image of the level playing field…Embedded in this context, most work on social justice and technology has focused on the challenges and benefits of providing marginalized populations access to high-tech tools (p. 25).

Yet despite such a high-minded and plausible formulation, justice—social or otherwise—has not necessarily followed access. To wit: a computer access program based in Calgary's homeless shelters served the bureaucratic needs of program administrators to the detriment of shelter clients (Moser 2009). Another access program sought to teach working-class women computer literacy despite the significant knowledge of computerization participants had already accumulated in the context of low-wage employment (Eubanks 2011). A New York City high school revamped in the image of the tech industry highlighted foundational socioeconomic disparities in its student body (Sims 2017). Workers hired to wire public high schools in Los Angeles for new forms of high-tech learning experienced low pay and precarious working conditions (Monahan 2008). Quite famously, The One Laptop Per Child Program (OLPC) sold over 2.5 million laptops to economically challenged communities in the Global South and the United States to stimulate digital learning; while students did not measurably improve learning outcomes, they became a captive audience for various forms of commercial media (Ames 2016). These access-based projects (and many more) vary in terms of the technological objects and users upon which they focus, yet they share a common method: a field-based approach that exposes targeted populations to a technological intervention in the hopes that it will create social, political, or economic benefits (Murphy 2017). Despite the social justice concerns that inspire it, this approach has frequently entailed the extraction of various forms of capital from resource-poor communities. In this way, access to technology figures as both a way of expressing care for minoritized communities and one of the means by which such minoritization is reproduced.

Based on field work in a public high school in a low-income neighborhood in South Los Angeles, I argue that access cannot be taken as helpful or empowering on its own terms; instead, ethical concerns must be accounted for by the local actors technology is meant to benefit. In what follows, I juxtapose the concept of technological access (and the various conceptual precursors that underpin its seeming self-evidence) with recent work in Science and Technology Studies (STS) on infrastructure, maintenance, and ethics. Next, I introduce the empirical basis of my argument: a specific group of student information technology workers known as Student Technology Leaders (STLs) were charged with addressing the extensive demands for attention, time, and information produced by access. Lastly, I use an expanded process of accounting to frame issues of justice and the responsible use of computers. A town hall meeting held with these students is an example of a processual vision of justice that encourages the beneficiaries of technological access to evaluate costs, benefits, and social justice concerns together.

FROM THE VIRTUE OF ACCESS TO THE ETHICS OF MAINTENANCE

The logic that underpins access-based policies treats inadequate use of valorized forms of technology as *both* effect of economic privation and cause of future harm, such as social exclusion or economic marginalization (Jones and Bridges 2016). Access is often prescribed as a policy response to the "digital divide," a narrative creation of US President Bill Clinton's Department of Commerce (United States Department of Commerce National Telecommunications and Information Administration 1995). The digital divide originally described the consequences of differential levels of Internet access between the poor and the broader population in the United States; today the term refers to differences in any aspect of technology use (i.e., hardware, software, and/or skills) differentiated by demographic factors (Warf 2013; Hargittai 2002). Scholars have noted that the digital divide concept confuses

proximity to computing technology with various forms of equity; disregards the resources needed to maintain technology in working order; overlooks the ways use of digital media mark status and privilege; and glosses over changes in the nature of consumer technology, particularly cloud-based architectures, mobile computing, and smartphones (Gonzales 2016; Burrel 2012; Sims 2014).

Just as digital divide narratives emerged, technology scholars developed relational and ecological approaches to infrastructure—the way technological systems shape human relations and the reciprocal, ongoing reconfiguration of those same systems by human action (Star & Strauss 1999; Howe et al. 2016). As Dourish and Bell (2007) summarize this approach, "Infrastructures drive and maintain standardization, reflect and embody historical concentrations of power and control, and are instruments through which access is managed" (p. 416). By using moments of breakdown in complex sociotechnical systems analytically, the canonical work on infrastructure has foregrounded power dynamics, i.e., the distribution of agency across people, machines, routines, rules, standards, or procedures (Star & Strauss 1999; Star and Bowker 2000; Bowker et al., 2010).

By contrast, a related and subsequent literature on maintenance and repair attends not only to breakdown, but also to the labors that keep unruly matter legible, functional, and useful (Jackson 2014; Domínguez Rubio 2016). This emphasis on repair takes a different temporal relationship to the study of technological objects, studying them not just as inert things out in the world, but as dynamic, continuous routines that collect social, economic, and material resources (Denis & Pontille 2015; Orr 2006). Jackson (2014) writes,

> Above all, repair occupies and constitutes an *aftermath*, growing at the margins, breakpoints, and interstices of complex sociotechnical systems as they creak, flex, and bend their way through time (p. 223, italics in original).

Analytical approaches focused on maintenance have been of central interest to feminist scholarship on technology, science, and society (Martin et al. 2015). Feminist STS has long worked in highly synthetic modes, attending to the broad realm of technologically mediated life with attention to the entangled nature of politics, ethics, ontology, and materiality (Wajcman 2007; Barad 2007; Åsberg & Lykke 2010). Feminist scholars have directed STS as a field away from "nihilistic" critique toward an ongoing "aesthetic and political" engagement with ethics, "a modest attempt to share the burden of stratified worlds" (de la Bellacassa 2011, p. 94). In this formulation, scholars themselves must engage with their subjects to enact an ethics of care in knowledge production (Barad 2007; Haraway 2016). Care here is provocatively multivalent and can refer simultaneously to an affective state, an everyday labor of maintenance, and/or an "ethically and politically charged practice, one that has been at the forefront of feminist concern with devalued labor" (Bellacasa 2011, p. 90). Ethical enactments consist of "counting in participants and issues who have not managed or are not likely to succeed in articulating their concerns" (ibid., p. 94), a way of thinking about justice I will return to in the final section of this paper. Formulations of justice are complicated by overlapping, conflictual obligations with respect to micro- and macro-political considerations including "immigration, citizenship, family law, sex work, tourism, and postcolonial rescue" (Murphy 2015, p. 724).

In the next section, I turn to a research site where the decision to invest in hundreds of new screens, justified as an empowering hardware-based project for youth of color in a poor neighborhood, became a source of demands on the limited resources of the student body.

MAKING ACCESS HAPPEN

This paper reports on two years of field work (2013 – 2015) at Academy High School # 7 ("Number Seven"), one of 25 schools run by the largest charter management organization

(CMO) in Los Angeles, Academy Schools.[2] During this period, Number Seven embarked on an ambitious project that sought to transform schooling by giving every student, teacher, and administrator in the school a tablet computer, Apple's iPad Air (64GB storage capacity version). In the 2014 - 2015 academic year, Number Seven's 600 students in grades 9 – 12 were 86 percent Latino, 4 percent African American/Black, and 10 percent "Other" (multiracial students of mixed Latino, African American, white, Asian, and/or Native American ancestry). These statistics describe the "intensely segregated nonwhite schools" frequently attended by Black and Latino students in Southern California and exemplify the broader national trend of increasing racial segregation in American public schools (Orfield et al. 2016, p. 10). Number Seven's staff consists of six principals, four counselors, and 35 full-time teachers. Number Seven has no library, cafeteria, or gymnasium.

As a public charter school, Number Seven represents a certain vision of American public education reform, one based on conspicuous disciplinary regimes, meritocratic discourse, responsibilization, and market-based forms of competition in the provision of social services (Baude et al. 2014; Gawlik 2012; Buras 2014). Charter management organizations operate autonomously from the publicly elected board of the Los Angeles Unified School District and enjoy considerable latitude in structuring the schools in their portfolios, more than half of which are located in the poorest parts of the city; over 90% of students served by these schools, are Black and/or Latino (Szymanski 2017). Students at Number Seven must apply to attend. In doing so, students and their families agree to extensive rules about attendance, school uniforms, personal conduct, technology use, and other measures designed to promote particular kinds of

[2] Aliases are used for the name of the school, the CMO, and all respondents. The text cited comes from the CMO's website.

school culture (Ambrosio 2013; Stassen 2012). Number Seven and other schools that serve minoritized communities face pressure to address persistent conditions of inequality by providing access to different forms of digital technology. In the past two decades, these technological fixes have included one-to-one computer programs, hybrid online/in-person instructional designs (e.g., "blended" learning), and games-based curricula (Crooks 2017; Christensen et al., 2008; Sims 2017).

The primary sources of data for this paper, collected between 2013 and 2015, include 275 hours of observation captured in field notes; interviews with teachers, students, and administrators; photographs of the site; and documents related to administration of the tablet program. I also conducted a town hall with 25 student workers who maintained and serviced tablet computers (an activity that figures prominently in a later section of this paper). This meeting, and the written responses of students that followed it, served as the culmination of a long collaboration with STLs; it also served as an enactment of the kind of extended reasoning and community-based accounting argued for in feminist STS' engagement with maintenance and repair work (de la Bellacasa 2011; Reardon et al. 2015).

The grant applications used to fund the CMO's one-to-one program explicitly used the language of access. According to these documents, the program aimed to increase the college preparedness of students and to encourage underrepresented racial groups to pursue STEM (Science, Technology, Engineering, and Math) majors in college. The one-to-one program was announced by CMO staff; local implementation fell to the school principal and a math teacher who also served as designated Technology Coordinator (and faculty advisor of STLs). The one-to-one program as a whole was largely improvised: only one teacher in the school reported getting any training in how to use tablets in class instruction. As it unfolded, the use of tablets in

the school followed a frequently observed pattern first documented by Cuban (2003) in a study of a one-to-one laptop programs: “high access and low use.” For the most part, tablet computers did not radically change classroom instruction routines. Students used tablets for reference questions, accessing documents, or individual activities between formal lessons, but teachers largely relied on analog media for coursework. By contrast, administration found many uses for tablet computers in instituting disciplinary measures, including extensive surveillance and expansion of standardized testing (Crooks 2015).

The one-to-one program was never evaluated by formal program assessments. The many similar one-to-one tablet programs that flourished briefly in Southern California around this time were part of what one seasoned teacher referred to in an interview as the “trendiness” of access (Lapowsky 2015). One-to-one laptop programs have not reliably demonstrated improved outcomes in terms of college matriculation or STEM uptake, although some studies have shown “positive improvements” in student writing or technology-based skills (Penuel 2014). No comparable research base has yet emerged on the use of tablet computers in one-to-one programs in American primary education. Over time, school administrators and teachers offered multiple rationales for the one-to-one program aside from the goals listed in grant applications, including justifying the program as part of a “paperless office.” School administrators frequently described access as a way of instilling in students a certain kind of facility or literacy with technology beyond what could be measured by conventional assessments. For example, Mr. Gomez, the school’s second-in-command, described the goal of the program this way:

> The research shows you have to use technology to engage students. My two-year-old has a tablet. I don't want him to have an iPad, but you have to. It's the future. If we don't show these kids how to use technology, they won't be able to compete.

The ongoing accomplishment of access, that is to say the addition of hundreds of tablet computers to the already complex and frenetic environment of a Los Angeles public high school, proved chaotic and laborious. Yet by the end of the second year, the devices had achieved the status of the mundane, the conflict and difficulties they had inspired in the work of teachers and students largely absorbed into the rhythms of school life. Tablets accomplished the feat of receding into the background, such that teachers and students became inured to their novelty and accustomed to the various demands they made. As Ms. Crause, a Special Education Resource teacher put it when referring to student attitudes about the use of devices in school:

> The novelty of the iPad wears off within a couple of days and so they grow almost unappreciative of technology. It's just another thing to them. They don't see it as a tool, they don't see it as a privilege. They almost desensitize to technology.

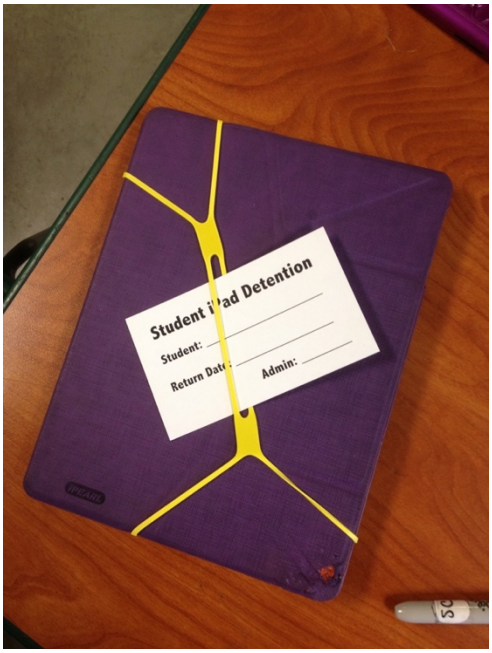
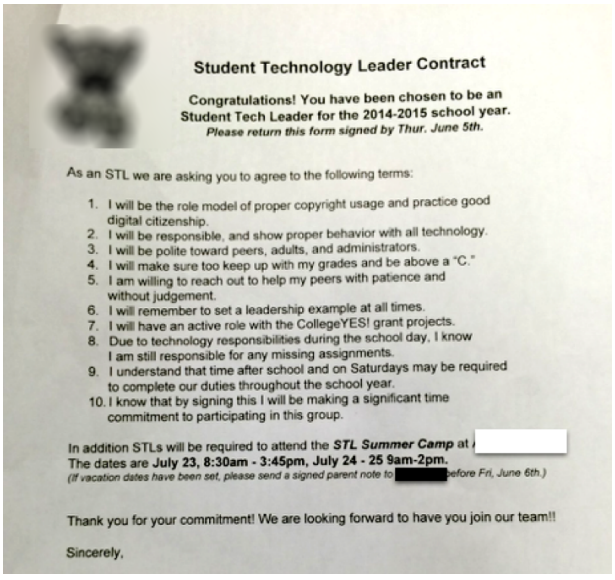


Figure 1. A contract of behavior demands that students carry their iPads at all times during school hours. This contract also promises that unauthorized use of school technology will result in suspension of privileges. Students punished for using their tablets in prohibited ways were forced to carry their tablets but were also prevented from using them by a rubber band.

The story of Number Seven's experience with tablet computers centers on contestation, conflict, and eventual détente around infrastructure in general and screens in particular. In order to "do tablets" (a common verbal construction used by students and teachers to describe working with the devices), a considerable amount of largely unanticipated tech support work had to be completed, work that turned a novel, highly anticipated technology into "just another thing." To maintain this *thing-ness*, teachers and administrators delegated a great deal of work to STLs. STLs did not receive pay or class credit for their work. In a written activity, these students reported spending an average of three hours per day doing tablet-related work and occasionally came in over vacation or on weekends. STLs developed systems to count, store, charge, repair, and configure student tablets, a set of duties that had to be planned, executed, and routinized in response to the demands posed by access.



Student Technology Leader Contract

Congratulations! You have been chosen to be an Student Tech Leader for the 2014-2015 school year.
Please return this form signed by Thur. June 5th.

As an STL we are asking you to agree to the following terms:

1. I will be the role model of proper copyright usage and practice good digital citizenship.
2. I will be responsible, and show proper behavior with all technology.
3. I will be polite toward peers, adults, and administrators.
4. I will make sure too keep up with my grades and be above a "C."
5. I am willing to reach out to help my peers with patience and without judgement.
6. I will remember to set a leadership example at all times.
7. I will have an active role with the CollegeYES! grant projects.
8. Due to technology responsibilities during the school day, I know I am still responsible for any missing assignments.
9. I understand that time after school and on Saturdays may be required to complete our duties throughout the school year.
10. I know that by signing this I will be making a significant time commitment to participating in this group.

In addition STLs will be required to attend the ***STL Summer Camp*** at
The dates are **July 23, 8:30am - 3:45pm, July 24 - 25 9am-2pm.**
(If vacation dates have been set, please send a signed parent note to [redacted] *before Fri, June 6th.)*

Thank you for your commitment! We are looking forward to have you join our team!!

Sincerely,

Figure 2. This "Student Technology Leader Contract" governs the work of student IT workers. It contains language mandating STLs keep passing grades in all their classes and make up for assignments they will miss due to technology duties.

In the next section, I focus on STLs and the labor that produces and maintains access. The demand of tablets for resources—attention, time, and information among them—challenges the social justice rationale for the program, painting instead an ethically ambiguous picture. In their multitudes, screens became at once a set of problems for students to fix, a persistent source of obstacles to learning, and a domain of expertise.

DEMANDING SCREENS

Imagine for a moment a fairly routine task: viewing a .PDF file. For typical users, this would involve trivial steps such as turning on a device, connecting it to the wireless network, downloading a document, and finally, loading this document into some environment where its contents could be displayed. Now imagine this same activity scaled up by the access of 30 or so student users and one teacher, all of them attempting to perform this same task. Every step of a routine operation becomes problem-prone at this scale: thirty times the passwords, thirty times the network connections, thirty times the potential diversions, thirty times the misfingering of virtual keys, thirty times the mandatory updates. A forgotten password or five, a tablet or three stuck on the log-in screen. A missing application, an out-of-date app, and so on, such that the management of access becomes a kind of demand. As opposed to a straightforward experience wherein a single user manipulates a single tablet, the actual configuration of access at Number Seven took on drastically different dynamics. Disruptions were by no means uncommon; to the contrary, they were quotidian, ubiquitous, unceasing, a deep mismatch between individual users and the needs of classrooms that the Technology Coordinator termed "mass-user-unfriendliness."

In this section I want to recast access in terms of these demands rather than the social justice it is assumed to promote. My interest here is not to criticize the actions of school authorities or to suggest that some other, more ideal configuration of access might have produced

more desirable results. Instead, here I take seriously the demands produced by access, by the sudden proliferation of screens in an urban school. Establishing and keeping access in the face of mass-user-unfriendliness called for many discrete steps—repairs, adjustments, workarounds, hacks, fixes, or kludges—which fell to individual classroom teachers, only one of whom received any special training in how to address these largely unanticipated realities. Teachers, already absorbed in performing the many duties of teaching, turned to a readily available source of expertise and skill in resolving the unceasing demands of needful tablets: students. In what follows, I describe some episodes of maintenance work performed by uncompensated student workers in terms of demands of access for attention, for time, and for information, respectively. What access demanded, students provided.

Attention

During an English class in the first year of the study, Coach Morales, who also headed up boys' soccer and the tai chi club, instructed students to draft short essays as practice for the upcoming Advanced Placement exam. Every student in the class chose to use a paper composition notebook to write in, although Coach reminded them that they could use their tablets if they wished. After each student had drafted and shared an essay and Coach had recorded scores in an app on his tablet, the lesson plan called for him to display the grades for this activity via the classroom projector. He manipulated his tablet for a minute, perhaps two, then turned to a student seated in the back of the room, an STL who happened to be enrolled in that class. "Hector," he said, holding aloft his tablet, "could you get this for me, please?" Without speaking, Hector rose, took Coach's tablet, and began making adjustments. Coach continued to address the class while Hector worked behind him. Brief moments later, the

projector lit up and an image of Coach's screen appeared on a whiteboard. Hector adjusted the image with a remote control before returning to his seat.

Wherever the needs of tablet computers appeared, teachers and students learned to acquiesce. Spontaneous support work happened frequently during observations. STLs present in the class as students could unceremoniously be pressed into service as ad hoc tech support, transformed in an instant from student to information technology worker. This work made STLs high-profile students, what Cuban (2003) called "tech gods," students whose technical acumen contributed to their reputation in school. As Coach Morales put it, "When I see one of them [STLs] in class, I feel good because I know they can help if I need them to. I can just grab one of them and go, 'Hector, run go get me a charger.' I can trust them." Local reward structures frequently devalue the labor needed to effect maintenance work (Graham & Thrift 2007). STLs received no pay or class credit for their work, but they did enjoyed certain reputational perks which figured prominently in their own evaluations of the one-to-one program.

Access then turned on the availability of students to provide a certain kind of attention, to constantly reconfigure, respond, troubleshoot, network, and tinker in the context of unremarkable, everyday activities. Consumer technologies used in home settings frequently demand this kind of work in order to keep a predictable form and function; this work is part of the affective, evocative, social life of objects (Gregson et al. 2009). In a classroom setting, however, maintenance functions simultaneously as a mundane, instrumental set of local practices and as a social undertaking, accomplished to maintain a community's capacities (Ribes 2017). That is to say, the school as a whole leaned on student workers to get its access, to have devices kept at the ready for instructional uses. As Coach Morales' comments underscore, part of what is

supported is the feelings of the community, a sense of competence, safety, and order, the knowledge that objects will retain their comforting shapes and configurations.

Time

In addition to spontaneous episodes of support, STLs performed regular, extensive, routinized duties, including a daily inventory of tablet computers. The protocol of the inventory evolved over the first year, ultimately taking the following form: during the afternoon advisory class (a non-instructional period created specifically to deal with tablets), pairs of STLs assigned to each classroom supervised the placement of tablets into armored carts; STLs maintained one such cart in each advisory class. The school's principals patrolled the halls with two-way radio transceivers, monitoring the process. STLs unlocked each cart and returned every student tablet to its indexed slot inside, secured a charging cable to each device, and checked for damage to the unit or its protective case. After the STLs had completed a checklist assuring that every tablet in their care had been successfully located, they locked the cart and hung a green card from the lintel of the advisory classroom's doorway. Should STLs discover a tablet missing in a room, they would hang a red card from the lintel and alert the principal, who would issue an order to lock down the school. During lockdown, all the school's entrances and exits were sealed and all students and teachers remained in classrooms until the missing device was located. These measures were deployed amid sensational media attention to thefts of tablet computers in other South Los Angeles public schools, thefts that, although widely reported, only infrequently occurred (Blume 2013). Extensive security measures at Number Seven were largely successful: during this study, no tablet was ever lost, stolen, or damaged beyond repair. Few teachers or students questioned the necessity of such an elaborate pageant of security work, of the colored flags and spot inspections, the shrill static of walkie-talkies audible in classrooms.

Figure 3. Afternoon check-in procedure. The green cards hanging from the lintels indicate that a given classroom has accounted for all of its tablets.

Access required the creation of a non-instructional class period in the afternoon, used exclusively for the collection, inspection, and counting of tablets by designated pairs of STLs. While an additional twelve minutes per day spent in non-instructional classes might seem trivial, this administrative adjustment resulted in a reduction of 36 hours of instructional time over the whole school year. Demonstrating neatly the action of information technology on the perception of time, the putatively trivial demands of the tablets themselves reconfigured some of the terms of classroom instruction and, as a result, renegotiated the fundamental terms upon which public education as practiced by Number Seven operated (Bowker 2005). Such action defies one of the CMO's previously stated priorities, listed in its own promotional materials as one of four "core values" that distinguish its model of education: "Increased Instructional Time." Access demanded this time, a resource that had already been allocated for other purposes, according to other values. In the rush of daily life, this profoundly symbolic and materially significant change was absorbed into the cyclical ebb and flow of assignments, tests, assemblies, conferences, and meetings, the whole phenomenal now of high school life.

Information

As a final example, students' work on the tablets involved the manipulation of many forms of information. Mobile technologies such as smartphones and tablets feature, by design, a short product lifecycle and a reliance on frequent software updates (Farman 2017). In this way, tablets frequently demanded digital information in the form of software updates. STLs performed many kinds of ancillary informational tasks in a variety of media, including recordkeeping, labeling, and scheduling. Downloading and installing major updates, for example, had to be coordinated, timed and executed in ways that would not interrupt access. Synchronizing such an update with teaching schedules, class calendars, and so on to assure the continuity of access

required the creation of documents to track these occurrences. In addition to these largely digital documentary demands, students had to manage analog documents as well, especially in connection to upkeep of the locking carts where tablets were stored when not in use. In the photo below, students are labeling the interiors of these carts, matching each slot to a designated tablet's device serial number, and recording each corresponding user's student identification number in a spreadsheet. Many steps in these processes depended on the manipulation or provision of analog and digital information: files to be transferred, forms to be filled, notes to be written, receipts to be traded, paperwork to be signed.

Figure 4. STLs organizing a storage cart. Much of this work concerns providing information in analog and digital forms.

The physical presence of tablets was merely the leading edge of a "working configuration" of numerous resources (Suchman 1996). In a reversal, tablets did not only satisfy

the informational needs of students, but student themselves were required to provide information demanded by the management of tablets and the various apps, platforms, and publishers that provided educational media. Local rules, legal contracts, terms of service agreements, and technical protocols multiplied, making demands for information in specific material forms. These documentary obligations were attended to largely through the labor of uncompensated students. Such documentary demands complicate the frequently touted vision of a "paperless office," one sometimes invoked by administrators to justify the tablet computer program (Gitelman 2014, p.128). In this example, access becomes a quid pro quo, an exchange of information at one site for the promise of its delivery elsewhere.

As the preceding examples have shown, access required attention, time, and information. The provision of these resources amounted to the continual transformation of the unwaged labor of students and the devices themselves into a configuration called access. This analysis underscores the complexity of the constant labors needed to keep access, a dynamic that does not figure in a general claim of the social justice virtues of ICT. The resources that kept tablets in a predictable, stable condition available for classroom use were not inconsequential. As one student worker wrote,

> Student Technology Leaders has been difficult in some ways in my schoolwork because there are some days where I get pulled out of class to do some work and when this happens, I lose some learning time. Then I get behind with my work and sometimes the teachers teach new material that I have to come back to later, such as after school, so I can ask her what I missed. This takes time off of other things.

What of this labor then? How might we determine if time spent by students filling out forms or making a tablet talk to a finicky projector was time well spent? How do we determine what the social justice value of a resource absorbed by access is to the students of a racially segregated, urban high school? In the next section, I will reject a rigid, distributive framework for evaluating social justice claims and propose a more situated, responsive alternative.

ACCOUNTING FOR JUSTICE

An examination of the paradox of technological access—the way it justifies the appropriation of resources in the name of empowering scarcely-resourced communities—calls for a more complex ethical accounting than can be provided by a generic claim of social justice. Feminist science studies provides numerous models for ethical reasoning, techniques that proceed from "embodiment, situatedness, and reflexive responsibility" (Murphy 2015, p. 719). In addition to its concern with ethical reasoning, feminist STS has also engaged extensively with the significance of maintenance and repair (de la Bellacasa 2011). Maintenance and repair serve as a foil to reframe contemporary access-based technology programs in terms of the politics of knowledge production and justice (Reardon 2013; Martin et al. 2015). While the specific requirements of repair and maintenance work make it impossible to suggest (as access rhetoric often does) that there can be a general sort of justice that follows from the incorporation of consumer ICTs into formal or informal education, my goal here is to preserve a way of connecting justice to the ever-broadening scope of technoscientific activity. This paper does not aim to rehabilitate access or protect it from accusations of failure, but instead to produce of this challenge some other, more useful analysis, to let it fail differently, perhaps (Verran 1991; Kenney 2015). Reardon et al. (2015) use the example of methods and materials lists in laboratory experiments to argue for an expanded way of thinking through the ethics of knowledge production, a way of bringing to the fore "all the material relationships that are part of knowledge-making practices, including political, social and cultural ones" (p. 13). This sits uneasily with the ethos of public education, which depends on a standard issue (of goods, of supplies, of opportunities), but such an approach can still be generative.

This process of working through problems in knowledge practices and justice, limited as it is to a particular situation, was partly implemented in my research project. STLs were

dismissed from class and from their work duties to come together to talk about the work they had been doing. This ad hoc town-hall-style meeting, for which all 25 students participating in the program were compensated, allowed students to speak about their experiences in the tablet program away from the disciplinary gaze of their teachers and school administrators. Of the 25 students who attended the meeting, 20 completed the written follow-up activity. I imagined, based on the interactions I'd had with students over the months I had been studying their work, that the occasion would give them a place to vent and complain about the exploitation of their free labor. Certainly, there were complaints, particularly about the great many hours per day that their work duties took up. As one student put it, "There are days we don't go to class at all." To my surprise, students overwhelmingly validated the educational and social value of their maintenance and repair work. STLs drew benefits from their particaption not despite the heavy time commitment, but *because* of it.

This town-hall-style meeting showed a complex affect at work among these students. In their written assessments of their work in the STL program, students were quick to praise the program and write about its benefits. This student's account is fairly typical:

> Student Technology Leader01: The work that I do as a Student Technology Leader is so much fun. Each duty that I'm assigned to leads me to new skills that would be useful and experiences that would look great in my résumé.

Another wrote:

> Student Technology Leader02: I feel like we learn something new each day because we find new things out [about technology] that we didn't know before.

Students frequently described their work in terms of their relationship with other students:

> Student Technology Leader04: Some of the students are thankful we are there to help when they need assistance for technical issues. While there is some that believe since we are Student Technology Leaders, we make it seem we're stuck-up from the rest of them, just because we're in the club. But if they would have applied to join the STL program then they would see we're not stuck-up. It's just what they think about us.

What emerged from STLs' descriptions of their own work was a complicated mix of joy and pleasure in the work, a description of an elevated social status, and a mix of defensiveness

and superiority about that social status. STLs achieved a kind of hyper-visibility in some social contexts, which contributed to their overall appraisal of the value of access they had produced. These affective benefits were brought on by an elaborate and ongoing engagement with maintaining and caring for tablet computers. In this provisional accounting then, these students, so familiar with the high costs of access, felt that the benefits of the program outweighed its costs, that it was worth it. STLs decided that access, though demanding, had produced a rewarding educational experience for them. STLs did not necessarily endorse the one-to-one program in any general sense. An STL warned,

> Student Technology Leader05: If another school wants to do this, make sure you know how much work it takes. People want to have technology and nice things, but it's not easy. This is a lot of work.

Another student qualified her support for the program in terms of demands for labor:

> Student Technology Leader06: Even though we are teens in a club we do a lot for the school and I don't think anything we do [with tablet computers] would be possible without us.

There are clearly many limits to this processual approach to justice. First, the 25 students who participated, despite guarantees of confidentiality, might not have felt comfortable giving a truthful accounting of their work, either in person or in writing. Secondly, the group of students interviewed stayed in the program, six of them for all four years of high school: students who could not manage the workload, academic demands, or personal issues would have already quit the program. No student left the group in the 2014 - 15 school year, except for seniors who graduated (although one student did confide in the written activity that she had been warned to raise a failing grade or be "fired" from the STL program). Admittedly, while students were experts on their own working conditions, they did not generally have the experience or vocabulary to discuss the politics of the tablet computers they were using: where they were produced, how they were paid for, what kinds of intellectual property regimes they extended into

public schooling. While students were eager and uniquely prepared to learn more about where the technologies they used in everyday life came from, our town hall and subsequent writing activities did not contain any substantive instruction on this topic. Finally, perhaps most importantly, this accounting can say nothing about the costs and benefits of mandatory use of tablet computers for the other 575 students in school who did not participate in the STL program, or for teachers, or for other school and community stakeholders. The ethical accounting that led these particular students to endorse the use of tablets in their school focused only on their contributions to the STL program and their perceptions of this contribution's effect on their school lives, both socially and academically. As such, this accounting process can only be thought of as a rough beginning, as a way to start an ethical discussion that must be open-ended, ongoing, and inclusive. This approach does not attempt to make generalizable claims about every situation or even every participant in this research. In intellectual celebration of such ambiguity, Murphy (2015) writes,

> the 'how' of technoscience is as much a question of the promise and limits of affectively charged knowing, as much a question of imperfectly drawing the scale of your responsibilities and relations, and as much a question of subjects in non-innocent economies, as much a question of erasure and disinvestment, as much a question of entangled reassemblies and appropriations, and as much a question of marked and unmarked labor as it is an effort to make knowledge and the world otherwise (p. 725).

CONCLUSION

Equity of access to the beneficial aspects of technology is a worthy goal, one that rests on an impulse to put contemporary technologies to work in addressing persistent historical inequities, including the well-documented lack of representation of minoritized communities in the technology industries (Garcia & Scott 2016). Still, efforts based on distributive paradigms have often failed in their goals or, worse, extracted resources from already minoritized

communities in the name of empowerment. While the access paradigm can certainly be self-serving for commercial technology concerns eager to burnish their reputations, it would be a mistake to dismiss the work done by scholars, educators, policy experts, technologists, and philanthropists over the last two decades as mere false consciousness. Instead, this paper has argued that claims for justice in technology should be more modest and account for some of the costs associated with any particular infrastructural investment. The important questions to explore from this perspective center on what kinds of costs and benefits are associated with a particular infrastructure and to whom these costs and benefits accrue. The accounting metaphor is limited, but it gives a sense of the provisional and situated nature of such a thing as use of technology, its changeable character and responsiveness to micro- and macro- social contexts. This approach serves as a call to incorporate the presumed beneficiaries of technological interventions in determining what those benefits could be and to allow collective concerns to enter the rigidly individualistic paradigms of technology use.

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