Beyond Technological Literacy

Open Data as Active Democratic Engagement?

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Abstract

We consider scholarly conversations about digital citizenship as a continuation of centuries of discourse about citizenship, democracy, and technoscience. Conceptually, we critique portrayals of citizenship from Jeffersonian polities to technical literacy to critical health and environmental justice movements. This analysis forms the basis for proposing an alternative, normative theoretical perspective on citizens' engagement in governance: the ethics of care. This framework enables a move from citizens' civic engagement as motivated by duty and risk perception to motivated by an affective desire to care for oneself and others. Using the ethics of care, we explore a digital citizenship project about civic open data in Charlottesville, Virginia, as an example of stakeholders caring about and for the construction of digital technologies as well as relationships of mutual interdependence between government and citizens. Despite pervasive assumptions and institutional gaps that limit this project's success, this case illustrates the potential power of reframing the motivations for democratic engagement as relational and affective rather than based on fear or duty alone.

Keywords: Literacy; Technological Literacy; Open Data; Digital Citizenship; Civic Engagement

Introduction

> I know of no safe depository of the ultimate powers of the society but the people themselves; and if we think them not enlightened enough to exercise their control with a wholesome discretion, the remedy is not to take it from them, but to inform their discretion by education.
> THOMAS JEFFERSON IN A LETTER TO WILLIAM C. JARVIS, 1820 (NATIONAL ACADEMY OF ENGINEERING AND NATIONAL RESEARCH COUNCIL 2002: 11)

> WHEREAS, open government is based upon the principles of transparency, efficiency, and collaboration; and […] the evolving technology landscape now offers additional opportunities to promote open govern-

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> ment; NOW THEREFORE BE IT RESOLVED that the Charlottesville City Council is committed to open government and the principles of transparency, efficiency, and collaboration.
> Charlottesville City Council Resolution (2017)

Transparency, efficiency, collaboration, and informed discretion: these are ideals that both democratic citizenship and digital technologies have the potential to help us realize. "Digital citizenship," understood as the intersection of democratic citizenship and digital technologies, offers the hope of empowering citizens to participate in state governance institutions and governance of sociotechnical systems.[1] But the same digital technologies that can enable these ideals can also be used to create profoundly undemocratic systems, such as India's Aadhaar project, which seeks to create the largest biometric database in the world (Singh and Jackson 2017), or "surveillance capitalism" (Zuboff 2015), in which citizens serve as sources of data to be sold. In each case, citizens become digitally codified and trackable subjects, that is, passive resources rather than citizens who engage actively in constructing progressive and innovative futures.

Although some features of the sociotechnical landscape that gives rise to current discussions of digital citizenship appear distinctive, if not unique, to our time (social media, for example), democratic political theory in America has from the earliest days of our republic conceived of citizenship as active engagement and recognized the challenges of motivation. Questions of motivation come to the fore in open data movements, which tend to overestimate the willingness of citizens to engage in the labor that is required to transform data into shared understanding and shared understanding into effective action. To put digital citizenship in historical and theoretical context, we compare and contrast the discourse of digital citizenship with three of its intellectual ancestors: (1) public understanding of science (PUS), which originated in the nineteenth century as part of the effort to establish science as a public resource worthy of investment; (2) technological literacy (TL), which began in the early 1990s as a movement to educate citizens so that they could participate in policy deliberations about technology; and (3) technological citizenship (Frankenfeld 1992), which provides a comprehensive framework for experts and non-experts to participate equally in governance and goes beyond PUS and TL by recognizing that addressing deficiencies in public knowledge, skill, and understanding is necessary but not sufficient to realize the potential of digital citizenship.

While fundamentally democratic in intent, these projects (PUS and TL) ultimately privilege STEM expert perspectives as more authoritative and valuable than everyone else's perspectives. Frankenfeld's idea of technological citizenship reflects an obligation for engagement in technoscientific policy as collaboration

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[1] By a "citizen," we mean the broader definition of a community member or resident, not the narrow legal sense of a citizen of a nation.

and assimilation (i.e., a sense of belonging in the political system for citizens) rather than alienation; however, TC assumes motivated citizens will result from understanding the power and risk of technology alongside meaningful opportunities to participate. As the literature review in this paper demonstrates, the opportunity to engage does not often spur citizens to action. Self-interest and fear are widely regarded as the most common motivations for engagement. Instead, we recommend a theory that has the potential to motivate citizens' engagement based on relationships: the ethics of care. Although there is growing scholarly conversation focused on the ethics of care, the concept has yet to be decisively defined. In this paper we take it to mean citizens and governments achieving collaboration, attentiveness to others' needs, and competence to fulfill their responsibilities for caring about and for each other.

To ground our account of these theoretical perspectives, we analyze the discourse surrounding a recently launched online open data platform in Charlottesville, Virginia, as described by the city council resolution quoted above. Called an open data portal, this platform makes the city's datasets about local real estate, crime, pet registration, bus routes, and more available for anyone to download. Charlottesville is a small city (pop. 48,000) in central Virginia and home of the University of Virginia. It has a well-educated population and a strong sense of local community and grassroots activism. The combination of these factors inspired local advocates (primarily workers in the city's many tech firms and leaders of technology-focused local nonprofits such as Charlottesville Women in Technology [CWIT] and Smart Cville) to lobby the city council for an open data portal. A team of city staff built the portal from September 2016 to August 2017, with feedback provided by a handful of residents who serve on the Open Data Advisory Group. The following discussion is based on our analysis of public documents and participant observation at public events held by local nonprofits to advertise the new portal and prepare people to use it. We follow the elected city council, city staff, and local data advocates to illustrate how digital citizenship movements discuss their work in terms of an ethics of care, although the Charlottesville stakeholders have not yet achieved their goal of mutual caring.

Local advocates claim that "knowledge is power" and "data is just data," (i.e. data is apolitical and objective), subsequently oversimplifying the relationship between data, knowledge, and democratic engagement. Data is supposed to produce new insights, but how and who spends the effort to turn data into knowledge and then power. These propositions assume existing data wrangling skills, the capacity to link data-based stories with political strategies, and the motivation to labor through these challenges. One of the most striking findings is that the advocates of the portal have a very capability driven mental model. They think providing information and digital access is enough, without considering motivation for why people would begin using the portal and continue to labor with messy data that often does not align with individual concerns. Lacking motivation results in skills present but without direction or data availability without knowledge production. As we show below, this rhetoric mirrors some of the weaknesses of historical attempts to produce informed and engaged citizens. Of critical importance is locating motivation to use data and for what ends

First, we discuss existing theories of democratic engagement demanding scientifically and technologically informed citizens. While productive in some instances, these fail to account for citizens' motivations beyond a sense of duty, fear, or economic transaction. Next, we suggest that an ethics of care can fill this gap by reframing citizenship as relational, affective practice. Finally, we show how the ethics of care applies to one case study, the open data movement in Charlottesville, to illustrate the emerging notions of 21st-century citizenship and governance more broadly.

Securing Public Support and Enabling Citizen Engagement: Citizenship as Motivated Practice

> As a former journalist, I believe that citizen engagement and citizen knowledge is what strengthens a democracy.
> CHARLOTTESVILLE CITY COUNCILOR KRISTIN SZAKOS (QUOTED IN CAIRNS 2017) JEFFERSON AND THE GOALS OF DEMOCRATIC POLITIES

This section discusses three theoretical approaches to understanding democratic citizenship with regards to science and technology. Projects intending to turn people into citizens informed and empowered by knowing about technology and science have a troubled if well-intentioned history. We trace these efforts from the movement for public understanding of science to calls for technological literacy and citizenship. Each approach intends to produce citizens knowledgeable and trusting of science and technology and individuals who can be productive laborers and political actors in technologically advanced nations.

Especially in an American context, discussions of citizenship – digital, technological, or otherwise – tend to evoke ideals like those espoused in the Charlottesville City Council resolution quoted at the beginning of this paper. To think deeply and critically about democratic citizenship, it helps to consider *why* the framers of American democracy believed democracy was the best of all the options available to them. We focus here on the thinking of Thomas Jefferson and the principles that have come to be known as "Jeffersonian" (Appleby 1993). We put those principles forward not because they are necessarily superior to other articulations of democracy, but rather because they have been very influential in American social and political thought.

At the most fundamental level, democratic government as envisioned by Jefferson was the best approach to reconciling two potentially competing goals: (1) the management of society's affairs and (2) the development of human potential. Jefferson was as much concerned about what kinds of people we might *become* by participating in democracy as he was with the kinds of people citizens needed to *be* to make democracy work.

The democratic/capitalistic system that Jefferson envisioned (and idealized) is more multifaceted than what we now think of as “politics” or “economics.” Here we use the term “polity” to capture the fusion of government, economic structures, and culture that political philosophy, especially political economy, has been concerned with (Groenewegen 1991). The democratic polity that Jefferson conceived of demanded from and offered a great deal to citizens, at least to those few individuals who were actually enfranchised in that system. Over time, Americans have tended to limit the scope of their thinking about government to the first goal mentioned above (managing the affairs of society), losing sight of the role of democracy in realizing human potential. We have thereby moved from what might be termed a “thick” conception of democracy to a rather thin one where democracy is equated to official governmental institutions and majority rule coupled to “one person, one vote.” This distinction is important in the context of citizenship opportunities because it draws attention to the multiple goals that we want democratic politics to achieve.

Public Understanding of Science

Although Jefferson was cognizant of the role that science and technology could play in making American democracy successful – scientific rationalism playing a big part in his own thinking – he operated in a context where science was still taking form as a disciplinary, institutionalized pursuit. That project was carried on largely in Great Britain, though with involvement from Western Europe, especially France, Germany, and Italy. The institution builders worked from the principle that people would not admire what they could not understand and created means for synthesizing and diffusing scientific knowledge. The early public understanding of science (PUS) projects from the 19th century assumed that understanding scientific facts and practices was critical to ensuring an ordered society led by a scientific elite who wisely invested public resources in the pursuit of useful knowledge. Almost exclusively members of the aristocracy or upper middle class, these reformers did not appeal explicitly to democratic values. They were, however, very much concerned with public support of science, which they believed would depend on public acknowledgement of science as progress.

By the end of the 19th century, the genre we know as “history of science” had emerged; the term “scientist” had become associated with a specific body of knowledge and role in society through promulgating scientific knowledge through public demonstrations, publications, and museums; and thus, establishing science as profession. The effort to establish science as an essential aspect of politics and culture had succeeded: science courses became required in primary and secondary education, departments of various sciences were established in universities, government agencies were created to support scientific research, and the word “scientific” became synonymous with rationality and reliability. These successes notwithstanding, however, decades passed where public understanding of science was deemed critically, perhaps even dangerously, flawed.

In the 1980s, scholars began to focus specifically on the challenges of citizen participation in policy-making in circumstances where many people’s knowledge about science is limited, skeptical, or inconsistent (Ziman 1991). The academic journal *Public Understanding of Science* was established in 1992 to document perceptions of science and technology and the formation of scientific and parascientific knowledge systems. Despite attempts to reformulate science communication and supporting scientific literacy campaigns over several decades, little was accomplished (Miller 2001). Wynne (1995, 362) notes this trend was due partly to PUS advocates confining themselves to “measuring, explaining, and finding remedies for apparent shortfalls of ‘correct understanding and use [of science].’” For example, PUS advocates relied on quantifiable assessment metrics, such as how well students do on standardized tests, which ignore how citizens construct their own means of understanding scientific facts and the workings of technological systems.

These flawed assumptions about public knowledge continue today. A 2015 *American Scientist* blog post titled “8 Myths About Public Understanding of Science” succinctly describes the misconceptions that scientists have about the public that perhaps explain why these PUS projects have been so unsuccessful (Burke 2015). These “myths” blame the problem on non-scientists’ inadequate education or intellect, lack of information about science, and insufficient trust in science. In addition, the myth that “it’s the public’s responsibility to learn scientific information of policy concern” dangerously frees scientists and public institutions from the responsibility to make scientific knowledge accessible, relevant, and trustworthy. Thus, the framework of PUS is flawed by its adoption of scientists’ perspectives and expert communities with little regard for the rest of society.

Technological Literacy

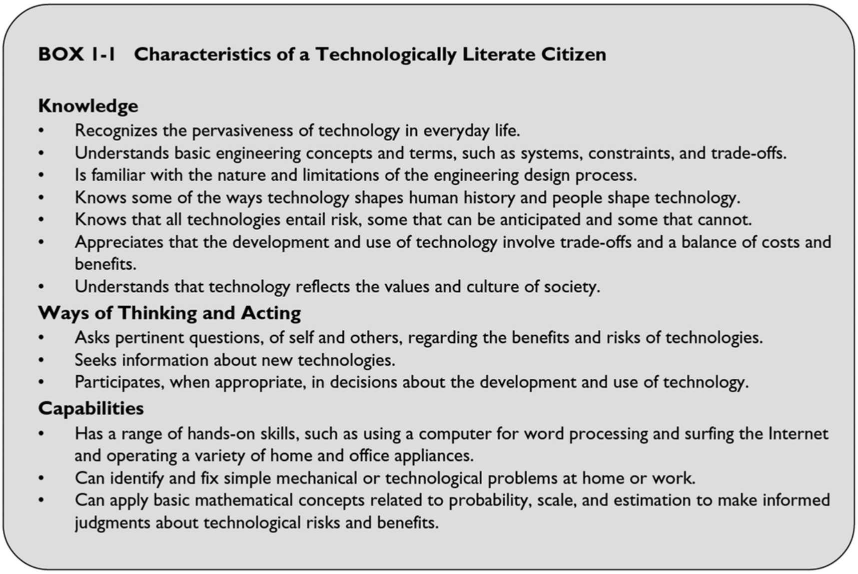
The technological literacy movement, which emerged at about the same time that PUS had been institutionalized through the establishment of a journal bearing the same name (1992), considered both non-expert perspectives and the potentially negative outcomes of technological innovation. The effort to diffuse scientific and technical knowledge was taken up in earnest by the engineering profession as embodied in the United States’ National Academy of Engineering (NAE). The effort was called “technological literacy” (TL) and built on E. D. Hirsch, Jr.’s concept of cultural literacy as articulated in *Cultural Literacy: What Every American Needs to Know* (Hirsch 1988). Hirsch emphasized shared knowledge as the basis for communication and making sense of the world. Bill Wulf, who served as president of the NAE, championed the cause of technological literacy and had something much more ambitious than basic skills in mind. He initiated a series of discussions among the NAE, the National Research Council (NRC), the National Science Foundation (NSF), and other groups. These discussions resulted in the formation of a Committee on Technological Literacy.

As presented in *Technically Speaking: Why All Americans Need to Know More About Technology* and related publications (e.g., [Bugliarello 2000]; [Young, Cole, and Denton 2002]) technological literacy became a theoretical framework and a call to action. As a theoretical framework, it is fundamentally *socio*-technical. The authors take pains to broaden the meaning of "technology" so that it includes "more than just the ability to use computers and other machines" and involves "understanding of the factors involved in the creation and development of technology [as well as] issues of risk, safety, cost-effectiveness, standards, and tradeoffs, all interwoven [...] [and] exquisitely [...] socio-technological" (Bugliarello 2000: 83–4).

The unfortunate choice of the term "literacy" suggested goals commensurate with primary or secondary education rather than the sophisticated set of capabilities that the TL advocates sought to develop. Yet, TL differed significantly from PUS. Its primary advocates were engineers and engineering institutions (rather than scientists and scientific institutions). Crucially, it recognized the potential for adverse consequences of technological innovation and established a seemingly permanent shift in the discourse about public understanding of science: the goal of avoiding or minimizing the negative consequences of technological development in addition to optimizing technology's positive contribution to human well-being. Also, unlike PUS, technological literacy appealed to democratic ideals and assumed a defensive rather than an institution-building posture. It attempted to create a sense of urgency about defending democracy and maintaining optimism about the future. It was also quite concerned with the "invisibility" of technology and the lack of appreciation for engineers that logically followed from that invisibility.

Technological literacy as presented and advocated in *Technically Speaking* is far more than the basic skill sets associated with literacy. It is, rather, a multidimensional integration of knowledge, capabilities, and ways of acting and thinking. To flesh out the TL concept in detail, the committee created a list of the "Characteristics of a Technologically Literate Citizen" (figure 1), the title of which captures one of the most important features of the TL approach: a focus on the characteristics of *individuals* as opposed to systems that would motivate and facilitate participation.

Figure 1: Reproduced from (National Academy 2002: 17)



BOX 1-1 Characteristics of a Technologically Literate Citizen

Knowledge

- Recognizes the pervasiveness of technology in everyday life.
- Understands basic engineering concepts and terms, such as systems, constraints, and trade-offs.
- Is familiar with the nature and limitations of the engineering design process.
- Knows some of the ways technology shapes human history and people shape technology.
- Knows that all technologies entail risk, some that can be anticipated and some that cannot.
- Appreciates that the development and use of technology involve trade-offs and a balance of costs and benefits.
- Understands that technology reflects the values and culture of society.

Ways of Thinking and Acting

- Asks pertinent questions, of self and others, regarding the benefits and risks of technologies.
- Seeks information about new technologies.
- Participates, when appropriate, in decisions about the development and use of technology.

Capabilities

- Has a range of hands-on skills, such as using a computer for word processing and surfing the Internet and operating a variety of home and office appliances.
- Can identify and fix simple mechanical or technological problems at home or work.
- Can apply basic mathematical concepts related to probability, scale, and estimation to make informed judgments about technological risks and benefits.

These are ambitious goals, a fact that the Committee recognized. Despite substantial investment by the NAE and NSF, the technological literacy movement never gained an institutional foothold. TL has not been able to find a place in the disciplinary structures of higher education and has been disadvantaged by its association with rote learning and K-12 educational systems – and its lack of proximity to meaningful action.

Technological Citizenship

While TL sought to strengthen democracy by producing technologically literate individuals/citizens, it had nothing to say about democratic institutions or spaces in which TL would be applied. Instead of the hierarchical relationship consisting of expert guardians and non-expert “laypeople,” Frankenfeld’s (1992) concept of “technological citizenship” (TC) situates individuals as equals within systems of democratic deliberation. In this comprehensive framework, experts and non-experts participate equally in the governance of technology, especially the management of risk.

Unlike TL, which was the product of numerous individuals and institutions, TC was the work of one person, Philip Frankenfeld. In a 2001 op-ed in the *New York Times*, he urged Americans to follow Ray Kurzweil’s advice to “start decoupling the most centralized and potentially catastrophic systems in energy, banking and travel and on the Web,” advice that was clearly not heeded. The most extensive publication on technological citizenship is an article that Frankenfeld published in

Science, Technology, and Human Values in 1992, titled "Technological Citizenship: A Normative Framework for Risk Studies." The expressed purpose of the article is to define "a constitution for a technological society and a form of technological citizenship (TC) within [...] [a] *technological polity* whose boundaries are defined by the impacts of a technology or of technology in general" (1992: 459, original emphasis). Frankenfeld's constitution emphasizes that technological citizens have both rights and duties (Table 1).

Table 1: Adapted from Frankenfeld (1992: 465 and 473)

The Rights and Obligations of Technological Citizenship	
Rights	**Obligations**
Right to understandable information	Obligation to learn and use knowledge
Right to participation in processes of approval, veto, and discussion of introduction of new technology	Obligation to participate actively in deliberation about technology development and governance
Right to safeguards of informed of consent	Obligation to think critically about information provided by experts and to be aware of one's own perceptual biases
Right to limitation of total amount of endangerment	Obligation to think holistically about technological systems and consider those remotely affected

Like the advocates of TL, Frankenfeld emphasizes the need to optimize the social benefits of technological innovation while also minimizing its dehumanizing potential. As he aptly puts the goal, "With TC we seek not to kill the technology goose that lays the golden eggs but merely to housebreak it. We seek to comport the technology goose and technological dynamism with the civil requirements of our household" (1992: 463). The calls for technological literacy and citizenship appear to have developed independently, despite the overlap in their goals and assumptions. Neither seems to have had significant impact on the problem of engaging democratic citizens in deliberation about science and technology. Despite the large amounts of detail and sophistication that Frankenfeld's analysis incorporates, it fails to answer the question: what if citizens aren't motivated by anything other than fear or self-interest?

Engaged Citizenship as More Than Fear and Self-Interest

> […] [P]eople find the relevance or usability of scientific knowledge chronically problematic, partly because their social agency is chronically uncertain […] This diffidence may then be manifested, misleadingly, as simply ignorance or resistance.
>
> Brian Wynne (2005: 378–9)

Moral responsibility is a laudable goal for citizen engagement in policy-making; however, research shows that citizens' perception of technology as risky and harmful more often drives them to interact with experts. collective meaning-making practices. For social and environmental justice movements motivated by fear and distrust, public discourse is hampered by an overemphasis on citizens becoming more "expert-like" rather than experts embracing alternative forms of experiential knowledge. Ideally, scientific modes of reasoning are balanced with values-oriented assessment where shared meaning-making is an obligation all stakeholders share. Alternative models of governance and activism do exist, particularly when technoscientific systems are reinterpreted as unnecessarily harmful or risk is unjustly distributed. This section explores models of engaged, motivated citizenship that contextualize less hierarchical governing practices and alternatives to expert driven policy making.

Experts' tend to assume pervasive deficits in citizens' scientific and technological understanding. This has been called into question by instances in which citizens reshape expert communities' knowledge creation practices. These interventions have been documented in health (e.g., [Epstein 1995; Rose 2009]), environmental risk assessment (Wynne 2002), and discourses of progress and responsibility (Fortun 2001). These interventions Diverge from Frankenfeld because they suggest that citizens' underlying motivation to acquire expertise does not come through a sense of duty, but rather a need to protect oneself or one's community from very real, direct threats. Under these circumstances, experts are confronted with new conceptual, cultural, and empirical realities advanced by motivated advocacy communities, thereby broadening the notion of expertise and appropriate engagement (Fischer 2003).

Achieving citizen participation in science and technology policy-making requires alternative epistemological practices that redraw the boundaries of who has credible knowledge and demand an "opening up" of our commitments to a particularly sociotechnical orientation (Stirling 2008). Often, this requires new institutions capable of realigning entire research agendas (Frickel et al. 2010) and developing new civic (Miller 2008) and data centric (Milan and Velden 2016) epistemologies capable of considering questions of identity, authority, and accountability. Wynne (2002) shows how public intervention in technological governance can become alienated by privileging expert knowledge in policy discussions, while Ottinger (Ottinger 2013) shows how battles over environmental and social injustice are subverted by technocratic risk assessment, political marginalization, and the substantial work needed to achieve true informed consent about technological hazards. Ottinger argues that the turn to data-driven activism can exclude or devalue experiential knowledge. In addition, data complexity can outstrip activists' abilities to interpret data without long-term expert support (Mah 2017). There remains a question of how the successes of risk-driven data activism translate to less controversial, mundane civic activities.

One example of citizenship manifesting itself in digital forums raises the question of how to blend data activism with emerging political strategies of online citizens. Coleman, Gibson, and Schneeberger (2012) suggest that a new paradigm of citizens as consultants has emerged. While governments have always vacillated between acting for citizens and asking citizens directly about policy decisions, the ease of internet-based communication promotes more direct engagement. Here, digital citizens, or 'E-citizens,' often become actively involved in planning processes and consultation when communities are placed at risk. While representing possibilities for activism, the authors rightly worry about the labor, time and education burdens to participate; the assumption that citizens are primarily representing their economic self-interests rather than collective ownership of risks and benefits; and public participation as mere tokenism.

If open data symbolizes transparency and efficiency, the question remains how to build the necessary participation and collaboration pillars of open government. Even where the technological components are present, citizens often resist participating due to a sense of mistrust (Wirtz and Birkmeyer 2015). Kligler-Velinchik (2017) argues that typical notions of political engagement, particularly among youth, need reconsideration because participatory forms of digital communication create "alternative citizenship models." Needed are new mechanisms to determine how citizens identify themselves as political actors and to blend online and offline civic engagement. Summarizing one strand of this scholarship on engaged citizenship, Kligler-Velinchik (2017: 1896) writes, "As political skills and resources expand, citizens are dissatisfied with the limited political influence of voting and prefer activities that are direct, citizen-initiated, and less constrained."

When successful, these new forms of democratic engagements help us see what is possible from motivated citizens and the challenges of integrating new epistemologies and deliberative institutions. The following section demonstrates how care becomes a valuable conceptual framing for how to bridge risk-based motivation from citizen science campaigns with internet-based forums for emerging civil discourse.

Knowledge and Data as Care

> We invite all citizens, regardless of age, technological savvy, or background to join us for [Civic Innovation Day] […] Participants will learn more about a public problem, brainstorm how technology can be used as a solution, and even develop a prototype solution. It should be a lot of fun.
>
> Lucas Ames, in a press release from the nonprofit Smart Cville (Ames 2017b)

To overcome the limitations of democratic engagement based on knowledge acquisition (PUS and TL), duty (TC), or risk perception, we propose thinking about citizenship and governance as *care*. The theory of the ethics of care encompasses Frankenfeld's radical ideas about assimilation and rights and duties while also framing democracy as something that individuals *care about* and, as a result, *care for* as an expression of affect for oneself and community as well as responsibility to the same. Like parents' care for children in the sense of everyday maintenance motivated by affective attachment (as well as social and legal responsibility), this view frames citizens as caregivers for government and, reciprocally, government as a caregiver for citizens. Both parties must be open to understanding one another despite differences in perspectives and abilities. Affective caring is a powerful motivator; thus, framing citizenship as reciprocal care with government can inform more effective ways for citizens and governments to work collaboratively. As Ames notes above, perhaps solving social problems "should be a lot of fun" – particularly if citizens perceive their efforts as being respected and integrated as starting points for public deliberation rather than only as critique of existing policy.

In brief, ethics of care is attentive to meeting the needs of those we take responsibility for, valuing emotion as component of moral behavior, emphasizing relations and context, and collapsing the boundaries separating public and private ethics (Held 2005: 9–13). This emphasis matches feminist epistemologies about the importance of identity, power, and affect in the arrangements of knowledge production and technological interventions (e.g., [Forsythe 2001; Puig de la Bellacasa 2011; Magnet 2011]). An ethics of care emphasizes the collective's negotiated success and well-being, as well as individuals' role in sustaining it. This framing of engagement diverges from what Haraway (2016: 49–50), echoing Eileen Crist, argues are "managerial, technocratic, market-and-profit besotted, modernizing, and human-exceptionalist business-as-usual commitments" that limit our capacity to imagine or pursue alternatives to the status quo or form alliances with those who cause us confusion, revulsion, or resistance." The idea of ethics of care belongs primarily to the fields of philosophy (Held 2016), political science (Tronto 1993), and science and technology studies (Groves 2015).

Maria Puig de la Bellacasa prefers "care" over Bruno Latour's notion of "concern" because "one can make oneself concerned, but 'to care' more strongly directs us to a notion of material doing" (2011: 90). In her argument, constructing and maintaining sociotechnical systems is already a matter of concern about how 'we' are affected. The continued operation of the systems, however, needs a stronger orientation to daily maintenance and an ethical obligation to ensure that those providing the labor of maintenance, particularly of neglected or marginalized things, are valued. Concerned citizens might care enough to oppose specific policies or gather together to make known perceived risks. However, investing labor into domains that are future-oriented, long-term, and potentially ambiguous, such as analyzing civic data, is a challenge that requires forming collective skills, practices, and institutions that enable us to care together.

There are a few instances in which scholars associate ethics of care with data, citizenship, and governance. Baker and Karasi (2018) harness care ethics to interrogate their own participation in data management practices in two ecology field sites. They emphasize the importance of designing the study, analysis, and data preservation with community partners, who were data allies rather than laypersons using defined protocols with researchers' tools. The team referred to data "stewardship" rather than data management to "capture the sense of long-term responsibility for well-being of the land. By analogy, the aim with the event [EcoRiver Community Workshop] was to convey long-term commitment and responsibility for data care" (Baker and Karasti 2018: 6). Introducing care ethics into the project required a team of researchers with experience supporting community partnerships along with funding resources to maintain long term partnerships. Zegura, DiSalvo and Meng (2018) describe their community centered data science research as an example of how data science might move from efficiency to social good as the framing for intervention. Understanding affordable housing became a collaboration of extracting existing government generated data, historical information from residents, and the generation of new data by community members. Creating the latter two data sources was a "family affair" that could only occur due to the earned credibility and preexisting knowledge of the data allies, in this case community members who drew upon their experiences living within marginalized areas of the city. The early feelings of success in incorporating care in this project's data collection and curation dissipated when new undergraduate student researchers arrived to visualize the data. The visualization team's distance from the hard-fought data wrangling process made them skeptical about the data's quality and confused by the database's complexity. They problematically valued scientifically valid data more than the data that "balances empirical conditions with aspirations for how to live together" (Zegura, DiSalvo, and Meng 2018, 8).

Making duty and care converge is one possible benefit of thinking about governance and knowledge-making through an ethics of care. "Care ethics [...] is linked to social justice because it blurs the line perceived in conventional ethical thought between the public and the private, and effectively removes the distinction between what is moral and what is political" (Campbell 2013: 117, drawing on Tronto 1993). Instead of defining a citizen as someone ethically obligated to work for policy-making, ethics of care presents a citizen as someone who *wants* to contribute to policy as a form of care for oneself and one's community. We adopt Puig de la Bellacasa's claim that "thinking of matters of fact as matters of care […] can be a speculative commitment to think about how things would be different if they generated care" (2011: 96). In the next section, we draw on a case study of Charlottesville's open data movement to imagine how citizen engagement and knowledge production with data would be different if it were based on care.

Open Charlottesville: Imagining Caring Citizens and Government

> Government should not be a black box that comes to the public when it needs something or wants to present an outcome […] It should be a much more dynamic conversation.
> 2016–2018 Charlottesville Mayor Michael Signer (Suarez 2017)

> Where is the wisdom we have lost in knowledge?
> Where is the knowledge we have lost in information?
> T. S. Eliot, Choruses from The Rock (1934: 7)

Digital citizenship projects like Open Charlottesville have goals that ethics of care can help achieve: two-way communication between government and citizens, public participation in policy-making, and inclusion of historically marginalized groups, such as low-income residents and residents of color. Analysis of the discourse around Open Charlottesville reveals a significant disconnect between the social goals of the project and the technological means provided by the data portal. The goals themselves seem unquestionably good, and the technological resource (an open data portal) appears to be efficient and potentially able to create a conversation between the public and government. As the quote from Signer above illustrates, the portal and the data it makes available *could* facilitate creative problem definition and agenda setting. On the other hand, as Eliot points out in *The Rock,* transforming the data/information the portal provides into knowledge – and knowledge into wise policy – are far from straightforward processes.

Eighteen months after the August 2017 launch of the open data portal, Open Charlottesville is not a success story in digital citizenship, but rather an ongoing assemblage of groups, technologies, and democratic ideals that may yet morph into a new, more participatory form of governance. We argue that applying ethics of care to digital citizenship projects such as Open Charlottesville reveals both the unrealistic assumptions that advocates of such projects make about citizen capability and motivation and the underlying tensions and unanswered questions about what city government can be expected to do and how priorities for investment and action get established. The discussion below summarizes the goals and assumptions of the three major stakeholder groups associated with Open Charlottesville: (1) elected officials, such as the mayor and city council members; (2) city staff, including the leaders and employees of data-producing departments such as fire and sustainability, as well as information technology; and (3) citizens, a heterogeneous group that includes but is not limited to local data advocates. How these three groups talk about their visions for this open data project reflects their desire to reform the city's governance to include agenda-setting originating from citizens as well as elected officials.

The Goals of Open Charlottesville as Articulated by All Stakeholders Are Compatible with an Ethics of Care

All three groups believe that citizens should draw from their own experiences to identify social problems and inspire ideas for improving the community. In this framework, care for one's own well-being translates into care for the collective's well-being as personal experiences are situated as shared public concerns through data-centered narratives. For example, Jessica Otey, CWIT's first Vice President, told one training session's attendees that she had gone to newly-elected mayor Michael Signer's first public "office hours" in February 2016 to complain that she had had a tough time finding a sample election ballot online. She had suggested open data as one way to improve "citizen to city" communication, as well as to define a permanent legacy for the mayor. Signer was convinced that Otey's vision of open data aligned with his four areas of concern: innovation, infrastructure, governance, and reconciliation. He convened a group of elected city councilors, city staff, and local advocates to investigate what an open data policy for the city might look like. Supportive city councilors and staff saw an open data policy as an important step toward transparency as well as a way to circumvent the labor burden of Freedom of Information Act (FOIA) requests for the datasets by proactively making them public. On the other hand, opponents, who were primarily staff, worried about open data as a threat to citizens' confidentiality and about the criticism of government practices that the data might inspire. It is also likely that the already overburdened staff feared that the labor of creating and maintaining an online open data portal, which has never been given a budget, would fall to them, which is exactly what happened.

The phrases "citizen to city" communication (Otey) and "a much more dynamic conversation" (Signer, quoted at the start of this section) reflect Frankenfeld's arguments for reforming entire institutions of governance based on a critique that the government is too top-down, with too few opportunities for residents to identify problems and work with the government to resolve them. The goal as articulated by Otey is for government to be responsive and informative, "like Pizza Tracker. It turns a transaction into a relationship." Pizza Tracker is Domino Pizza's online order dashboard, which updates every few seconds to show whether the pizza you ordered is being assembled, baked, or delivered. While comparing governance to ordering fast food may seem comical, Otey meant it seriously. Her personal experience showed that that there should be a way to track citizens' requests to the city to enable follow-up if there is no response. However, Pizza Tracker lacks a way for customers to comment on their pending order. Otey seems to want a more sustained communication channel, as a “relationship,” between city and citizen. In this model, government should expand beyond people submitting votes and requests and receiving services, much as Signer’s critique of the “black box” of known inputs and outputs prevents citizens from participating in the inner workings of city government.

A relationship-based exchange rather than an impersonal “transaction” could foster Frankenfeld’s idea of assimilation for citizens, which in turn could generate care. One successful example of creating new relational practices is the collaboration in the 1980s among HIV/AIDS patients, the gay community, scientists, and government to design new models of clinical research that addressed patients’ needs as well as scientists’ and regulators’ (Epstein 1995). To achieve this complex feat, all the groups had to care about their goals enough to advocate for them and care about each other enough to learn about others’ priorities, thereby enabling a system in which they collectively cared for (i.e., designed and operated) the sociotechnical assemblage of clinical trials.

Most Stakeholders Seem to Assume the Existence of Technologically Literate, Motivated Citizens and “Black-Box” the Process of Transforming Data into Knowledge

Although all stakeholders shared the broad goals discussed in the previous section, neither city officials nor staff saw the recruitment or training of technologically literate, motivated citizens as a task they needed to undertake. For officials and staff, caring for citizens means creating opportunities for grassroots activism by inviting the public to access the city’s data. It does not mean entering into an online discussion or data exchange, which they consider not their responsibility. Instead, in officials’ and staff’s public presentations about the portal and our interviews with one city councilor and staff from three city departments, they all portrayed citizen engagement as a beneficial *side effect* of the portal’s main functions: transparency and easier information dissemination, such as reducing the internal hassle of fulfilling FOIA requests. Officials and staff thus primarily value the portal for disseminating information from city to citizen (which also makes their jobs easier).

Similarly, officials and staff do not believe that they should train citizens to analyze data. This contradicts the top-down educational approach of PUS and TL, and matches TC’s “obligation” for individual citizens to learn about relevant issues. When we asked a staffer at a training event whether the city planned to teach the public how to use the portal, he answered, “It’s not for novices.” He recommended that “novices” visit an online community-run public forum, CVille Slack, to ask for help from other residents or consult training resources posted on other cities’ portals, thereby delegating that work away from city staff.

Another staffer added that the portal is “the first step” and he hopes community groups will offer training, as Smart Cville has. Other officials and staff told us emphatically that training users and coordinating between users are not the city’s responsibility. They expect users or community groups to provide those social connections and opportunities for education. The city government wants to care for citizens by providing outputs of information and policies, without necessarily involving citizens in the processes of producing those outputs. This may be a misalignment between staff’s, officials’, and citizens’ expectations of reciprocal care, in that residents and officials expect collaboration while staff must protect themselves from overwork.

As governments leverage our networked society and information and communication infrastructures to collect and transmit data cheaply, emerging open data projects show parallels to the rhetoric of openness and engagement from earlier science and technology citizenship discourses. Yet, Sieber and Johnson (2015) review several models of open data and find that a “customer-centric view of open data is unidirectional and transactional, missing much of the potential for data to act as a conduit for citizen engagement with government and direct input to decision making.” This approach matches the discourse of Charlottesville’s city staff, who use as metrics for engagement the number of IP addresses accessing datasets and the number of visualizations and apps created with the data. But operating democratic engagement as a form of transactional *quid pro quo* undermines opportunities for new relational and knowledge-making practices that are more time-consuming and, in then-Mayor Signer’s words, “more horizontal,” i.e., less hierarchical.

All three groups want to achieve good policy and a better community, a process in which they all believe citizens should be listened to. Despite staff’s relative disinterest in encouraging public collaboration, one staffer said hopefully, “Smart people can do smart things” with the data. This expectation resembles TL’s emphasis on a list of skills and “ways of thinking and acting” that characterize technologically literate citizens (National Academy 2002: 17, box 1-1). Of course, these characteristics, which include “asks pertinent questions,” “seeks information,” and “has a range of hands-on skills” (National Academy 2002: 17, box 1-1), do not belong to all citizens nor are they sufficient in themselves to inspire citizens to care about or for government or its data. Furthermore, officials and staff believe that citizens need a personal, individualized reason to care about and for government. That affective motivation cannot come from government, they believe, but must originate with each citizen to be authentic. This view celebrates free will, while also freeing the government of any responsibility to appeal to citizens’ interests or to try to recruit them as data carers. We worry that this belief expects too much of citizens’ knowledge about open data, in terms of technical analytical expertise as well as the simpler notion that analyzing open data is a form of caring for government and community.

One example of a data project, built by Lucas Ames (the founder of Smart CVille), sheds light on how local advocates understand the purpose of open data as a platform for achieving individual and community benefit. Ames laid a spatial dataset of bike rack locations from the portal over a city map using ArcGIS, creating an address-searchable map of bike rack locations around Charlottesville (Ames 2017a). He hoped to encourage the citizens of Charlottesville to bike more by alleviating the problem of finding the nearest rack while also illustrating the racks' geographic distribution, as evidence to support citizens' requests for bike racks in underserved locations. This simple interactive map aligns with officials', staff's, and advocates' belief that open data provides citizens with a way to make more convincing calls to the city for social change. As an epistemological intervention, the app offers knowledge for users about city infrastructure while highlighting community needs that may have been invisible to policymakers.

For Ames, the gold standard of open data portals is widespread use to investigate social problems, but "we're a ways from there now." Data advocates generally portray the goal of building better relationships (and more care) between government and citizens as desirable but distant. This distance is accurate, due to barriers such as resistance to online engagement, lack of internet access, and/or lack of expertise in data analytics. Previous open initiatives, such as the Libre and Open Source software movements, highlight the importance of socioeconomic context and diversity of stakeholders. As O'Donnell (2007) notes about the open source community, the idea of "open"-ness can obscure social exclusion as those mostly likely to participate are those with spare time and resources to explore data as a hobby or those whose employers want them to serve as representatives to local technological initiatives. Open data therefore seems an unlikely remedy for Signer's goal of community "reconciliation" with Charlottesville's long history of slavery, segregation, and racial and class inequities.

All three groups struggle to assess the success of open data in Charlottesville. Officials and staff are generally proud of the open data policy, because it achieves their primary goal of transparency and reducing FOIA bureaucracy. Advocates, while grateful for the existence of the policy and the portal, tend to be frustrated by the messy, poorly organized data; the lack of "data dictionaries" that explain each dataset's cryptic, department-specific labels; and the difficulty of communicating questions and results back to the government. Perhaps because of the technical and epistemic barriers to data analytics and the government's hands-off approach to training, Charlottesville's data portal has received relatively consistent but low numbers of users. From its peak in September 2017 (when local nonprofits and the city held multiple training events) of about 800 users, there were only about 400 users in November 2018. These numbers don't reveal who the users are or what they do with the 84 available datasets. Zuiderwijk & Janssen's (2014) review found that this situation is common, in that open data projects are typically evaluated with quantitative assessment tools that don't capture social effects (e.g., by only measuring the number of open datasets and how often they are downloaded).

Whether citizens' use of open data can create new forms of knowledge-making or solve social problems is as yet unanswered by available assessment methods. This situation echoes PUS advocates' problematic attempts to quantify learning.

To address these gaps, training session leaders in Charlottesville beg attendees to share stories of what they learn from or build with the data, such as smartphone applications and data visualizations. Advocates hope that these qualitative data can demonstrate the portal's social impact as well as inspire new users. But advocates typically portray these data stories as stopgap measures, useful only until there are enough users to produce quantitative "real" trends. We wonder if valuing individuals' experiences of living in the community as credible knowledge alongside their data-driven stories might broaden participation in digital citizenship projects, by making interactions between government and citizens more personal, relatable, and concrete, thereby encouraging both sides to care.

Discussions about Limited Resources and Authority of Staff to Set Agenda Reflect Confusion about the Role of Government – and of All Stakeholders More Generally

Many of the statements by both staff and elected officials cite limited resources as a major constraint on what city government can do and attribute the limited resources to the relatively small size of the City of Charlottesville. One example of the way staff concerns relate to limited resources is their skepticism about citizens sharing community-collected datasets alongside the city's datasets. Staff fear that receiving and assessing the accuracy of community-collected data would make additional work and potentially undermine the credibility of the data portal. Staff certainly care about citizens and work hard to care for them, but their resistance to being responsible for fostering citizen-city communication may reflect an underlying belief that the collection and curation of community-produced data are not appropriate activities for city government.

City staff and officials value how "smart" people (by which they mean people who have data analysis skills) might produce useful data-based conclusions that initiate policy changes, particularly in departments with limited resources. Without complaints or requests from citizens, staff and officials have little leverage to propose change or demand resources to address a problem. They hope that the open data portal will encourage citizens to examine the city's status quo more closely and thereby identify problems and offer suggestions to guide policymaking. The city thus assumes that citizens' communication of their concerns (as a form of caring about their community) helps government better advocate for (i.e., care for) citizens.

Empowering citizens to make their concerns data-based by drawing on the city's open data could make these concerns more compelling to officials and staff, and therefore more actionable. However, citizens may resist the assumption that their experiences can be captured by the city's data. For example, we heard attendees at public training events ask whether the portal could improve affordable housing in the city, or, strikingly, whether it could prevent future violent white supremacist rallies like the one that rocked Charlottesville just five days before the portal launched in August 2017. The juxtaposition of the rally's discriminatory, exclusionary rhetoric with the portal's celebration of openness and inclusion was jarring, as was the simultaneity of violent street protests with calls for online civic engagement. Public concerns about racism, free speech, and social justice were widespread in open data events, reflecting both optimism in the power of data to inspire social change as well as skepticism that a mere spreadsheet could possibly encapsulate citizens' recent and historical trauma and marginalization. Clearly, conceptualizing democracy as care requires renegotiating the rights, duties, and commitments between citizens and government. These negotiations must be local, inclusive, and participatory to be successful. Charlottesville continues to struggle with this difficult transition, and it remains to be seen what form digital citizenship might take in our city.

Conclusion: Care Comes First

We consider digital citizenship to encompass the full range of interactions between citizens, government, and digital technologies. This approach makes it easier to see that recent theories about the interactions between technology and citizenship in fact are continuations of earlier efforts to democratize technoscience. The eighteenth-century American conception of democracy assumed an actively involved and educated populace, which perhaps seemed more plausible because it only included property-owning white men. Digital citizenship through projects like open data portals maintain an assumption of citizens taking on the duty of educating themselves. Similarly, nineteenth-century British efforts to unify society in support of research used new institutions to disseminate scientific knowledge and impress the public with it. This movement required impressive collaboration – and care – to build a community that respects science and invests in learning about it. Advocates of data, science, and technology across centuries might find the sublime in technoscience as inspiration enough, but they tend to forget the long-term caring for community that enabled their education and profession to thrive.

Later, this labor of learning became a duty for citizens to perform, as described by the movement for technological literacy. But there is little explanation for why someone should bother to acquire the many essential components of a technologically literate citizen (see figure 1). At the same time, Frankenfeld argued for the need to construct new systems that shape people into technological citizens, who can fulfill their right and duty to critique technological policy and material realities of our often-coercive built environment. But the moral duty of contributing to government is not sufficient to inspire citizens to perform active engagement. Instead, individuals need to want to practice technological citizenship.

The perspective of the ethics of care takes us beyond technological literacy and its assumption that providing citizens with open data is sufficient to achieve social improvement and that citizens are responsible for learning what to do with data. The difference lies in the framework that ethics of care offers for understanding why citizens might willingly contribute their labor to govern science, technology, and society. By focusing on affect, relationships, and identity, the ethics of care offers insight into how individuals decide to support their communities (or not). Ethics of care also diverges from contemporary success stories whereby the public alters expert knowledge and the practices of policy-making. (Wynne 1995, 2002), (Rose 2009), and Ottinger (2013) find engaged citizens' primary motivation to be fear and self-protection, while the ethics of care highlights broader emotional motivations, such as a desire to maintain or improve one's lifestyle and that of one's community. Understanding science and technology helps citizens understand our sociotechnical world, but it is not the key element that binds us together. Care – as an emotion and an action – is.

By applying the lens of ethics of care to Charlottesville's attempt to use online datasets to engage the public in governance, we see potential reasons for why the portal has yielded low usage and few success stories. First, the data predate people's concerns; you must work with what is online rather than ask questions and then collect data to answer them. Users can request that the city post specific datasets, but there is no guarantee that they will or that those datasets exist. Thus, the design of the portal does not place people's experiences and interests first. More importantly, data in itself seems insufficient to inspire citizens to use it, as compared with their own lived experiences. Perhaps data is too abstract, too technical, or too disassociated from stories and lives to inspire caring. How then might we make the portal worthy of care? How might we connect it more clearly to people's experiences and values?

One way would be to add narratives of success, i.e., social problems that people have investigated and addressed using open data. Other portals, such as the EU's, the USA's, and Philadelphia's, contain these stories. Charlottesville's data advocates regularly request that users report how they have used the data, reflecting a desire to share such stories to justify the portal's existence and inspire other users. Another approach would be for the city (or other groups) to post specific projects for people to work on, as the nonprofit Code for America does. Then users would have a starting point for using the portal while also feeling helpful, thereby framing their labor as a service that the government or community requested. The city's refusal to post such requests matches their demand for "grassroots" projects, but we worry that this approach may make users feel that their work is motivated by their own benefit more than by the community's benefit, thus losing the affective appeal of caring about and for others.

The moral and epistemic demands of citizenship seem to be growing, such as the expectation that people will learn to analyze data to identify and address social problems in their communities. For Charlottesville, like any city, inviting citizens to participate in data-driven policy-making is not enough to actually inspire their engagement. Education and moral duty are important factors in citizens' democratic participation, as we've seen, and they can be harnessed more effectively and more powerfully as part of the commitment and work of care.

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