The Contested Materialities of Writing in Digital Environments:
Implications for Writing Development

Doreen Starke-Meyerring
McGill University

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Technologies have always been central to questions of writing and writing development. As Haas (1996) observed, "whether it is the stylus of the ancients, the pen and ink of the medieval scribe, a toddler's fat crayons, or a new Powerbook, technology makes writing possible" (p. xi). In this way, as Haas notes, "writing *is* technology" (p. xi) and as such, it is material. This material existence of writing through and as material artifacts is also deeply intertwined with, enables, and constrains the ways in which writing works to assemble, orchestrate, and organize human activity in communities, institutions, organizations, and societies (e.g., Bazerman and Prior, 2004; 2005; Paré, 2002; 2005; Devitt, 2004; Artemeva and Freedman, 2006; Coe et al, 2002; Schryer, 1993; Smart, 2007)—what writing development researchers have also referred to as the socio-economic materialities[1] of writing (e.g., Devitt et al, 2003; Devitt, 2004; DeVoss and Porter, 2006; Horner, 2001; Wysocki et al., 2004), the established regularized and normalized social practices, institutional arrangements, power structures, hierarchies, ways of material and cultural production, and their regulation in human collectives. Deeply intertwined, particular technologies and infrastructure constellations, for example, enable or constrain writing and the human activities it organizes, which in turn shape the design, use, and regulation of these technologies. As a result, a rupture or shift in one material aspect of writing is deeply implicated in the other. As Haas (1996) puts it, such shifts involve "questions of truth, knowledge, and power" (p. 5).

For the past few hundred years, the socio-economic materialities of writing have been shaped largely around print technologies. As such, these materialities have become settled into a somewhat stabilized equilibrium of regularized and normalized practices with laws and rules regulating diverse interests in the materialities of print technologies, for example, interests in who owns and controls access to publishing and print technologies, who owns written work, when such work can be shared with whom and under what conditions (e.g., freely or for a fee), to what extent writers are able to draw and build on existing work in creating new work, and under what conditions people write, such as the extent to which their communication is subject to surveillance and accordingly to various forms of censorship, including self-censorship.

With the emergence of digital network technologies, most notably the internet with its myriad technologies, writing increasingly takes place in digital environments. These environments take on a dizzying array of shapes, ranging from web sites to blogs, wikis, so-called social-networking sites such as Facebook or MySpace, immersive virtual

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[1] I use the term materialities in the plural sense to reflect the many ways in which writing is material, for as Horner (2001) alerts us, "no representation of teaching or writing can exhaust the full range of their materiality" (xix). At the same time, the pluralized term reflects the diverse and locally situated nature of these materialities in particular writing spaces, societies, institutions, classrooms, and more, as well as their situatedness within complex networks of local and global policy interactions. The pluralized term is therefore meant to reflect the complex ways in which the particular shape and constellations of these materialities are locally situated, assembled, and negotiated—shaping and being shaped by diverse locally situated and globally networked policies.

environments such as Second Life, peer-to-peer file sharing sites such as BitTorrent, photo or video sharing sites such as Flickr and Youtube, peer-produced news sites such as Digg.com, bookmark sharing sites such as Del.icio.us, and many more. What unites and distinguishes these digital writing environments from those in print is their materiality—their existence through the hardware and software that shape their design or what Lessig (2006) calls "architecture." While digital writing spaces are coded in diverse ways, they all exist in and through digital technologies, and as such they enable, constrain, challenge, reproduce, or question established practices, social orders, and hierarchies rooted in print materialities while also offering alternative practices and social orders to those established around print.

As a result, digital writing environments are highly contested in all sectors of society—in public, workplace, and education settings, as any even cursory glance at the major headlines in any news venue will reveal. Almost on a daily basis, we read about citizens and activists being monitored or even arrested, employees being fired, or students being sued by content industries over their use of digital files, or being disciplined over their use of blogs, social networking sites, wikis, and other digital writing spaces. For example, news stories report about Wikipedia being banned from writing assignments in entire university departments (Cohen, 2007), about students protesting privacy invading features of corporate-sponsored digital writing spaces (Story and Stone, 2007; Calore, 2006), or about students protesting the ways in which digital technologies, such as plagiarism detection software, have been used by institutions to police their writing (CBC News, 2004; Glod, 2006). Such stories of contestation and conflict surrounding emerging digital materialities of writing abound, indicating that the ways in which we understand these changed materialities of writing has deep implications both for writing development and for organizations, institutions, and societies at large.

For students, teachers, and researchers of writing, this contestation also begs some principal and highly consequential questions: How do materialities of writing change in digital environments, how are divergent interests in these changes negotiated, and what consequences do these changes have for the socio-economic materialities of writing—for how writing organizes human activity and how writing as a social practice is regulated? And most importantly, what are the implications of these changes for writing development?

To address these questions, this chapter first draws on critical theories of technologies to conceptualize digital network technologies as emerging materialities of writing. As the chapter shows, a critical understanding of technologies is vital to the study and teaching of writing in digital environments not only because these environments exist in and through digital technologies, but also because such an understanding allows researchers, teachers, and students of writing to analyze the contestation surrounding digital writing environments and to participate in the decision making processes around the technologies that will impact writing development as well as our organizations, institutions, and societies in important ways. The chapter then outlines vital ways in which these materialities of writing undergo change and contestation, focusing on three interrelated struggles that permeate all digital writing spaces and that have particularly significant implications for writing development:

the extent to which digital writing spaces will allow for equal access; the extent to which writers will be able to share and draw on each other's work; and the extent to which digital writing spaces will be characterized by surveillance, monitoring, and policing or by designs that facilitate the voicing of dissent and participation in democratic decision making. The chapter concludes with implications of these struggles over the materialities of writing in digital environments for writing development, specifically for what we might call pedagogies for critical engagement (e.g., Bazerman, 2007; Devoss, Cushman, and Grabill, 2005; DeVoss and Porter, 2006; Hawisher and Selfe, 1999; Hicks and Grabill, 2005; Selber, 2004; Wysocki et al., 2004) that allow students to question, analyze, and engage in robust deliberation about the digital writing spaces they inhabit to participate in shaping their design, use, and regulation.

Conceptualizing Digital Technologies as Emerging Materialities of Writing
Central to examining emerging materialities of writing in digital environments is a critical understanding of technologies—that is an understanding of technologies not as neutral tools, but rather as highly political and therefore contested dynamic material artifacts or systems of artifacts, whose design, use, and regulation are deeply implicated in reproducing, challenging, or reshaping existing social practices and orders (e.g., Benkler, 2006; Feenberg, 2002; Longford 2005; Winner, 1986). As Winner (1986) noted, "the things we call 'technologies' are ways of building order in our world" (p. 28), which function "similar to legislative acts" (p. 29). Longford (2005) similarly calls attention to the regulatory or (re-)ordering force of technologies, calling them silent or "unacknowledged legislators" (p. 72). As such, technologies always enable or constrain, privilege or marginalize certain social practices and interests at the cost of others, thus offering "a framework of activity, a field of play" (Feenberg, 2002: 82) that is highly contested because it presents alternative ways of ordering the activities and rights of different groups.

As Feng and Feenberg (2008) emphasize, a critical perspective examines technologies in the context of larger socio-economic and political values, practices, and power relations that surround the emergence, design, use, and regulation of technologies. From this perspective, technologies are best thought of not as "a thing in the ordinary sense of the term, but an 'ambivalent' process of development suspended between different possibilities" (Feenberg, 2002: 15). Most importantly, as Feenberg (2002) stresses, "technology is not a destiny but a scene of struggle. It is a social battlefield, … in which civilizational alternatives contend" (p. 15). This critical conceptualization of technologies as highly political scenes of struggle among diverse interests in their shape, use, and regulation is particular pertinent to digital technologies, given their high malleability as they are constantly being coded and recoded, designed, and redesigned and thus constantly (re-) order social practices and arrangements. Constantly in flux, the materialities of writing in digital environments—more so than those of print—are subject to incessant contestation.

Grounded in a critical understanding of technologies, digital writing spaces, then, are scenes of struggle over the shape of these environments—of their digital materialities—as well as over the ways in which these digital materialities will enable, support, undermine, or question established socio-economic materialities of writing, that is the existing

regularized and normalized practices, social orders, and the laws or rules regulating diverse interests in these practices and orders. They are scenes of struggle over the ways in which digital technologies encode social practices and orders and whose interests these practices and orders reproduce or challenge. These struggles, therefore, evolve around a central question: To what extent will digital writing environments enable alternative practices and social orders, or to what extent will they be contested, re-designed, or regulated to reproduce established practices, norms, and orders that sustain dominant established interests (Bazerman, 2007; Feenberg, 2002; Zuboff, 1988)? In other words, in whose interests will emerging materialities of writing in digital environments be shaped and regulated?

To be sure, the responses to this question depend on the unique situatedness of each writing space—be that an online course management system, a wiki, or a so-called social networking site—the work it accomplishes, the purposes for which it has been sponsored, the discursive practices and expectations participants bring to the space and the ways in which the digital code that inscribes the space enables, supports, constrains, or undermines those purposes and practices (Starke-Meyerring, 2008). Nevertheless, there are numerous struggles over the shape of the materialities of writing in digital environments that cut across and permeate all digital writing spaces and therefore have particularly significant implications for writing development. Of these, three are particularly foundational for the ways in which the materialities of writing in digital environment will take shape. They will serve here to illustrate the ways in which the materialities of writing in digital environments are contested: the struggle over equal access as a precondition to writing in digital environments, the struggle over ownership and the sharing of digital files, and the struggle over privacy and surveillance in digital writing spaces.

The Struggle over Equal Access as a Precondition to Writing in Digital Environments
Access to digital network technologies has long been considered central to writing and writing development. Early on, researchers noted, for example, the reduced access to computers, bandwidth, and digital infrastructure by marginalized groups and by people in marginalized regions of the world (e.g., Grabill, 2003; Knobel, 2006; Moran, 1999; Porter, 1998; Powell, 2007; Selfe, 1999; Selfe and Hawisher, 2004). Accordingly, these researchers have called on writing development researchers and teachers to study and engage in policy development around issues of access and the bridging of digital divides. Moran (1999), for example, called attention to the need for a research and teaching agenda to address issues socio-economic inequalities in access to technologies. Selfe (1999) urged teachers and researchers of writing to pay attention to national technology literacy agendas, warning that these agendas reproduce and exacerbate existing inequalities based on race and poverty. Grabill (2003) focused specifically on issues of class as a critical factor in access to technologies for writing. Selfe and Hawisher (2004) provided rich descriptions of the various cultural, economic, social, and other factors that influence the development of "literate lives" in the digital age.

Moreover, researchers have paid particular attention to the ways in which interfaces and larger infrastructures enable and constrain what students are able to write and learn in

educational institutions (e.g., DeVoss, Cushman, Grabill, 2005; Porter, 1998; Powell, 2007), as well as in communities such as in community literacy centers (e.g., Grabill, 2007). This work has conceptualized access as a range of issues, with Porter (1998), for example, connecting issues of infrastructures, literacy practices, and community practices and Powell (2007) arguing for a conceptualization of access as practice, deeply rooted in what literacy practices are valued in local communities. Access then has been richly theorized as involving social practices around local technological interfaces and infrastructures that enable and constrain who gets to develop what kinds of literacies for what purpose and hence can participate in what ways in collective community endeavors.

Yet, beyond local infrastructures and literacy practices, there is also a fundamental way in which access is coded into digital network technologies—a way that perhaps most profoundly distinguishes the materialities of writing in digital environments from all other materialities of writing and communication, including those of mass media and broadcasting, a way that also has significant implications for writing and writing development. While traditional technologies of writing and communication were highly centralized and regulated by governments or a few large corporate media conglomerates, with access to publishing or broadcasting opportunities tightly controlled, digital network technologies, specifically the internet, have provided a decentralized communication infrastructure for millions of writers and have thus had what Benkler (2006) calls a vital "corrective effect" on the failures of mass communication to provide a robust interactive public sphere. Accordingly, established communication technologies, with their tight control over access to publication or broadcasting technologies, privileged, for example, the discourse of an energy company or of the government's environmental protection agency, while that of citizens, environmental activists, or civil society organizations was more difficult to access, especially without being framed in the interests of those who controlled and sponsored established communication technologies. In short, what was published and accessible for democratic deliberation and large-scale opportunities for participation in such deliberation was highly selected and controlled.

In contrast, digital network technologies in their current design allow writers to access the corporate web site, the government's environmental protection agency web site, the mainstream media environmental news report, the environmentalist's blog, the mass email from the environmental civil society organization with the same ease—at roughly the same speed. Moreover, all writers participating in digital network communication, given the same connection speed or bandwidth, can reach diverse and large audiences at the same speed as businesses or organizations can. The implications are far reaching both for individual writers and for society as a whole. For the first time in human history, culture becomes, in Benkler's (2006) words, "writable" by the masses, with digital network technologies providing instant publishing opportunities beyond corporate or government controlled cultural production. Accordingly, writers now also have access to, can draw on, and engage multiple audiences or even co-authors representing more diverse perspectives, and they can produce writing and participate in collaborative initiatives—from knowledge making in such collaborative enterprises as Wikipedia to online activism, without access to a publishing house or broadcasting opportunities controlled by a media conglomerate. Most

importantly, as Benkler (2006) points out, digital network technologies have enabled individuals to "monitor and disrupt the use of mass-media power, as well as organize for political action," and they have allowed individuals to create "political salience for matters of public interest" (p. 220).

This aspect of the materialities of digital writing spaces has been enabled by a particular design of network technologies—that of packet switching guided by a principle called "net neutrality" (Bailey, 2006; Benkler, 2006; Geist, 2008; Trans-Atlantic Consumer Dialog, 2008). Packets are the small pieces of digital information into which emails and other information traveling through digital networks are broken down to be reassembled at their point of destination. According to the principle of net neutrality, the flow of these packets in the network was designed in such a way that they would all be treated equally in the sense that they would be sent via the most efficient routes to their destination computer. This was true regardless of what the information in these packets was and independent of how much money someone paid, a principle according to which nobody's packets were to be blocked, slowed, accelerated, or otherwise shaped (Bailey, 2006; Benkler, 2006; Geist, 2008; Trans-Atlantic Consumer Dialog, 2008).

As a critical perspective of technologies as scenes of social struggle would suggest, though, this fundamental principle of emerging digital materialities of writing is being contested. Internet Service Providers (ISPs) in numerous countries have begun to change the principle of net neutrality in favor of what they call "traffic shaping" (Bailey, 2006; Benkler, 2006; Geist, 2008; Trans-Atlantic Consumer Dialog, 2008). Traffic shaping software makes it possible for Internet Service Providers to slow packets such as those of file sharing or internet telephony services that might compete with their own fee-based services (Geist, 2006), or to block access to the web site of union workers during a labor dispute (Geist, 2006). In addition to advancing the interests and services of ISPs, traffic shaping also has considerable commercial profit potential for network providers if, for example, large companies, would need to outbid each other for whose site would be more easily accessible on a given network. At the same time, access to blogs or emails by citizens and activists, and others with limited financial resources, may be slowed down considerably, ultimately reshaping digital networking technologies and thus the materialities of digital writing spaces back into established largely centralized and controlled social orders—here in the form of a two-tiered internet.

Traffic shaping software illustrates the legislative or reordering nature of technology very visibly. If network providers are allowed the power to determine what will be accessible and in what ways, the implications for writing as well as for the kinds of societies that will be possible are more than dramatic. Traffic shaping would seriously stifle citizen participation in democratic deliberation and social activism on the web. It would also control and reduce the access writers have to existing knowledge and cultural production to critique, to continue building and innovating, and to advance knowledge. Functioning as a silent legislator, traffic shaping software, along with legislative inaction in many countries (Trans-Atlantic Consumer Dialog, 2008), is the equivalent of legislated censorship such as that frequently reported in countries such as China or Iran. The difference is, however, that

such traditional legislation is subject to much debate in the media, while the legislative function of digital technologies in the interests of certain groups remains silent, with the shift toward traffic shaping having been rated as the most underreported, but significant 2007 news item by Project Censored (2007).

Although these forms of access encoded into the design of digital network technologies have received less attention by writing development researchers, for students, teachers, and researchers of writing, much depends on how the struggle over this aspect of emerging digital materialities of writing—net neutrality—is going to play out: It will determine what kinds of voices and resources writers will be able to access, draw on, and engage with in their writing, and the extent to which writers can build on existing knowledge and culture for learning, knowledge-making, and innovation. As such, this struggle is also a primary indication of how contested emerging digital materialities of writing are and how deeply implicated these materialities are in how participatory and democratic societies will be. Most importantly, perhaps, the example of traffic shaping software as a silent legislator regulating digital materialities of writing, shows that technologies—and therefore the materialities of the writing spaces students, teachers, citizens, and others inhabit—are not neutral or somehow necessarily predetermined, but rather reflect competing interests and values in a larger social struggle over control of these materialities. While issues of access encoded in materialities of digital networks are perhaps the most central large-scale struggle over the digital materialities of writing, these questions are closely linked to another important struggle—that over questions of intellectual property and sharing.

The struggle over intellectual property and sharing in digital environments
Whether writing collaboratively or individually, writers depend on the ability to draw on, critique, and build on each other's work to create new knowledge, cultural products, and innovation (e.g., Benkler, 2006; Howard, 1999; 2007; Lessig, 2004, 2006; Litman, 2001; Porter and DeVoss, 2006). As they generate ideas through inherently social processes of invention (e.g., Bruffee, 1984; Brandt, 1990; DeVoss and Porter, 2006; Howard, 1999, 2007; Lauer, 2004; LeFevre, 1987; Lunsford, 1999; Lunsford and West, 1996; Porter, 1998; Porter and DeVoss, 2006) or shape their work through other inherently social writing processes, for instance in producing a multimedia presentation, writers must be able to draw on and share text, music, image, or video files. The processes, practices, and regulations governing the ownership of files, the ease with which they can be shared, and the ease with which they can be accessed are questioned and changed dramatically by emerging materialities of writing in digital environments, compared to those in print environments.

Most importantly, print materialities made it difficult for writers to publish and distribute their work widely and thus gave rise to industries whose business models evolved around the packaging, distribution, sale, and marketing of knowledge and cultural products, for example, in the form of journals, books, CDs, or DVDs. These industries depended on the materialities of print, specifically on the ways in which these materialities constrained the copying and distribution of files, along with regulation in the form of copyright legislation, to secure exclusive rights to the distribution of these products, with minimal exceptions for

so-called fair use or fair dealing (Courant-Rife, 2007) in such products for the purpose of learning, cultural critique, and innovation. The materialities of writing in digital environments, however, undermine such print-based business models by allowing for easy copying, sharing, publishing, and distribution of files (e.g., Bazerman, 2007; Benkler, 2006; deVoss and Porter, 2006; Lessig, 2004; 2006; Litman, 2001). In Benkler's (2006) words, digital network technologies "make some behaviors [here the business models of publishing rooted in print materialities] obsolete by increasing the efficacy of directly competitive strategies [here the ease of sharing and distributing files enabled by digital technologies]" (p. 18).

On the one hand, these changed materialities of writing offer new opportunities for writers to research existing work, access files, compare and engage diverse perspectives, consider and build on more work than ever possible before, and therefore ultimately to have at their disposal previously unimagined resources for knowledge making, cultural production, innovation, and engagement in public discourse and deliberation. In particular, so called peer-to-peer file sharing software and services, such as Napster, Grokster, BitTorrent, Gnutella, KaZaA, and many others have provided writers with easy ways to share, access, and trade each other's files on a massive, unlimited scale (Benkler, 2006; DeVoss and Porter, 2006; Geist, 2005; Lessig, 2004, 2006; Logie, 2003, 2007; Selber, 2006).

By facilitating access to such a multitude of work as well by facilitating networked interaction, this aspect of the emerging materialities of writing in digital environments has also given rise to new ways of writing—and new relationships between writers and readers, with authorship as more "distributed and shared" (Porter and DeVoss, 2006) and boundaries between writers and readers blurring. DeVoss and Porter (2006), for example, see the rise and struggle over Napster as a sign of what they call a "new 'digital ethic' of text use and file distribution that runs counter to the usual expectations that have governed the sharing and use of print texts" (p. 179). This new digital ethic, they argue, shapes how students interact with texts—digital, print, or otherwise—and how they understand the contexts in which they write and the practices that constitute these contexts. The new digital ethic, as DeVoss and Porter emphasize, therefore also requires attention to pedagogies and policies, such as plagiarism policies, which largely emerged around print materialities with their specific socio-economic practices, regulations, and orders designed to privilege intellectual property for profitable distribution over sharing and practices of fair use and fair dealing.

As Howard (1999, 2007) has shown, writing policies, especially plagiarism policies, are rooted in the development of intellectual property practices and regulations in the 18th century that favored the economic interests of emerging publishers and booksellers in intellectual property opportunities enabled by the printing press. As such, plagiarism policies tend to reflect Romantic notions of originality and authorship, imagining writers as lone original creative geniuses devoid of any intertextual embeddness and somehow immune of the deeply social nature of invention (e.g., DeVoss and Porter, 2006; Howard, 1999, 2007; Lunsford, 1999; Porter, 1998). Rarely does institutional understanding and regulation of writing consider the increasingly shared textual practices that characterize

digital materialities of writing, which allow "both readers and writers … ready access to the same texts" (Howard, 2007: 5), let alone the new digital ethic of file sharing that DeVoss and Porter (2006) describe.

The ease and new ethic of sharing in digital environments has also given rise to different forms of writing such as remixes or assemblages (e.g., DeVoss and Porter, 2006; Porter and DeVoss, 2006; Johnson-Eilola, 2005; Johnson-Eilola and Selber, 2007) similar to practices of remixing in music, architecture, and popular culture (Johnson-Eilola, 2005). Remixing, according to Porter and DeVoss (2006), for example, "is how individual writers and communities build common values; it is how composers achieve persuasive, creative, and parodic effects." Similarly, Johnson-Eilola and Selber (2007) emphasize an understanding of digital texts as assemblages, which they define as "texts built primarily and explicitly from existing texts in order to solve a writing or communication problem in a new context" (p. 381). These assemblages, the authors emphasize, are not merely unoriginal derivatives of previous work; hence, they should not be valued less than traditional print-based texts with particular print-based forms of citation and quotation usage. However, re-mixes and assemblages often run into policies such as plagiarism policies rooted in print materialities and designed to reinforce related socio-economic practices of text usage and intellectual property practices (e.g., Howard, 1999; 2007, Porter and DeVoss, 2006; Johnson-Eilola and Selber, 2007).

Again, as a critical understanding of technologies suggests, this aspect of emerging digital materialities of writing is highly contested, not only by attribution practices and policies rooted in print-based intellectual property practices of academic institutions, but especially by industries whose business models have traditionally evolved around the materialities of print and their regulation in support of such business models (Benkler, 2006; DeVoss and Porter, 2006; Willinsky, 2006; Lessig, 2004, 2006; Litman, 2001; Logie, 2006). To protect their established business models, these industries have worked to reshape emerging materialities of writing in digital environments in numerous ways. For example, they have successfully lobbied for international treaties, such as the World Trade Organization agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) and treaties by the United Nation's World Intellectual Property Organization (WIPO), as well as national legislation to pursue their interests in re-shaping the use, design, and regulation of digital environments in the interests of their established print-based business models (Benkler, 2006; Courant-Rife, 2007; Lessig, 2004, 2006; Litman, 2001; Logie, 2006; Murray, 2005; Reyman, 2006); filed thousands of lawsuits against providers and users of file sharing software and services as well as against individuals and universities to outlaw, close down, or co-opt file sharing services and to claim multi-billion dollar damages from individuals and institutions (e.g., Benkler, 2006; DeVoss and Porter, 2006; Lessig, 2004, 2006); launched massive so-called education campaigns to criminalize the file-sharing practices of tens of millions of citizens, including legitimate file sharing practices, such as sampling of files, the sharing of files that are out of print, or the sharing of files that are in the public domain and are no longer restricted by copyright (Geist, 2005; Lessig, 2006); contracted with private file-sharing investigation companies; technically attacked file sharing sites with so-called decoy or fake files, spoofing software to misdirect file sharers,

interdiction to prevent access to files, or swarming to spoil or slow downloads (e.g., MediaSentry and MediaDefender); and re-shaped digital technologies by means of so-called digital rights management software (DRM) designed to control or lock down files—software these industries have also successfully lobbied to have legally protected against circumvention by users (Bailey, 2006; Benkler, 2006; Lessig, 2004, 2006; Litman, 2001).

These struggles over this aspect of the materialities of writing in digital environments—the ease of copying and sharing—have been financially and discursively very intense, with billions of dollars invested in protecting and expanding established business models rooted in a print-based materialities of knowledge and cultural production. This aspect of emerging digital materialities of writing has also been the most widely studied by writing development researchers for their implications for writing development. For example, researchers have examined the need for emphasizing and teaching an ethic of fair use (Porter and DeVoss; 2006; DeVoss and Porter, 2006; Courant-Rife, 2007); the need for reconsidering policies governing writing, specifically institutional plagiarism policies (e.g., Johnson-Eilola and Selber, 2007; De-Voss and Porter, 2006; Howard, 1999, 2007; Marsh, 2004; Valentine, 2006), or the need for paying attention to technology legislation and its implications for the ways in which teachers and students can access and share materials for learning in online classes (e.g., Logie, 2006; Reyman, 2006). Hence, only one example, that of DRM software, may suffice here to illustrate the ways in which established print-based socio-economic practices of regulating ownership and sharing, including print-based business models of publication and content distribution, are not only reinforced through legislation, but directly reinscribed into the digital code as "silent legislator" and thus into the materialities of writing in digital environments.

Digital Rights Management (DRM) software refers to digital mechanisms for monitoring and restricting access to digital files and controlling the rights individuals have in using their legally purchased content, such as an e-book, a movie, CD, MP3 file, or software program after the point of purchase (Bailey, 2006; Benkler, 2006; Lessig, 2006; Litman, 2001). DRM technologies are essentially attempts to re-shape emerging digital materialities of writing to constrain their potential for the copying and sharing of files—in other words, to bend digital technologies back into the functionalities of print-based technologies and thus to protect print-based business models. To provide only one example, Adobe e-books software controls how readers can interact with a book, for example, how many pages can be copied or printed within what time frame, whether pages can be copied or printed at all, or whether a book can be read aloud, which is, for example, a vital function for visually impaired readers who need screen reading software to access a book. Often, these digital locks restrict access to works for writers well beyond restrictions imposed by print materalities or print-based legislation, which for example, easily allows for a print book to be read aloud. Sometimes, these digital locks even restrict access to works that are in the public domain (Bailey, 2006; Benkler, 2006; Lessig, 2006; Litman, 2001). Similar to traffic shaping software, DRM software functions as a silent legislator regulating what writers and readers can or cannot do, what they can or cannot use. Furthermore, to prevent users from circumventing such digital locks, content industries have successfully lobbied legislators to impose fines and imprisonment (e.g., through the Digital Millennium Copyright

Act (1998) in the United States) on those who try to circumvent DRM software.

Ensuring exclusive rights to the distribution of knowledge and cultural products was, of course, the hallmark of publishing business models rooted in print-based materialities not only in the cultural industry, but also in academic publishing, although the production of academic knowledge is often publicly funded. As Willinsky (2005) puts it, print-based business models of academic publishing have been characterized "by a rather perverse property relation, in which the last investor in the research production chain—consisting of university, researcher, funding agency, and publisher—owns the resulting work outright through a very small investment in relation to the work's overall cost and value" (n. p.). Here again, the materiality of writing in digital environments undermines print-based publishing models, allowing researchers to pursue what Willinsky (2006) calls the principle of open access, the responsibility inherent in research "to extend the circulation of such work as far as possible and ideally to all who are interested in it and all who might profit by it" (p. 5).

The potential of open-access research to inform the work of policy makers and professionals in education, medicine, and other sectors of the economy worldwide, especially in marginalized and under resourced regions, is unprecedented (Willinsky, 2006; Porter and DeVoss, 2006). Accordingly, some governments, for example, the government of the United States, recently signed into law a bill requiring publications resulting from government funded health care research to be submitted for open access in the PubMed Central online repository (Ratliff, 2008). Like other ways in which digital network technologies question the socio-economic materialities of writing, the potential for open-access publishing is highly contested in particular by the multi-billion dollar academic publishing industry (Dotinga, 2007), which has already hired an aggressive Public Relations company to undermine the open-access movement (Giles, 2007).

For academic writing, then, the way in which the struggle over the materialities of writing in digital environments plays out has particular significance for the extent to which knowledge is accessible not only to students in classrooms, but for innovation and economic development worldwide. Like the struggle over equal access to digital writing environments, the struggle over ownership, sharing, and open access to knowledge is another important indication of the extent to which the contestation over the shape of digital environments and the kinds of writing practices they will enable or constrain is implicated in the kinds of societies and institutions we will inhabit and what individuals, organizations, and societies will be able to accomplish. Both of these major struggles—over access and ownership—are also intricately related to a third major struggle over emerging materialities of writing in digital environments—that over privacy and surveillance, a struggle whose outcomes are no less consequential for individual writers, teachers, and researchers as well as for societies at large.

The Struggle over Privacy and Surveillance in Digital Writing Spaces
A third and closely related vital battle over the materialities of writing in digital environments rages over the extent to which digital writing spaces are monitored and

surveilled—be that to monitor and curtail political dissent, to monitor the use of intellectual property, or for other political or economic purposes (e.g., Agre and Rotenberg, 1998; Etzioni, 2000; George, 2004; Gurak, 1997; Lessig, 2005, 2006; Markel, 2005; Solove, 2004; Solove and Rotenberg, 2003; Starke-Meyerring and Gurak, 2007; Starke-Meyerring, Burk, and Gurak, 2004). Although questions of privacy and surveillance in digital writing spaces have received considerably less attention from writing development researchers than have questions of intellectual property, the struggles over privacy and surveillance are intimately related to those over access, intellectual property, and sharing. On the one hand, the reshaping of digital network technologies into large distributed surveillance spaces accompanies the fundamental shifts toward a decentralized nature of communication outside previous government and corporate media control. Given the increased space for dissenting voices to emerge and organize, the surge in digital surveillance can be likened to the surge in censorship, control, and other disciplinary mechanisms described by Eisenstein (1979) in conjunction with the printing press. Moreover, much surveillance is linked to the battle over ownership and sharing of what used to be tightly controlled intellectual property, with surveillance of intellectual property usage playing a central role in DRM and other property control strategies.

Attention to issues of privacy and surveillance is much needed in writing development research, however, because emerging materialities of writing in digital environments fundamentally change the extent to which writing and social interactions become subject to surveillance. More than ever before, the interactions of writers as well as their written products become personal data, while at the same time, writers are losing their rights to control their personal data—to control who can access, manipulate, mix and match it under what conditions, for what purpose, and for whose benefit. In contrast to writing in print-based environments or even to interaction through other communication technologies such as telephones, emerging materialities of writing in digital environments have been shaped dramatically to facilitate massive surveillance with significant consequences for individuals, organizations, and society as a whole (e.g., Starke-Meyerring and Gurak, 2007; Starke-Meyerring, Gurak, and Burk, 2004).

First, data can now be shared, copied, searched, mined, mixed, matched, aggregated, or manipulated in previously unknown ways at unprecedented speeds for use and sale worldwide (Agre and Rotenberg, 1998; Etzioni, 2000; George, 2004; Gurak, 1997; Lessig, 2005, 2006; Markel, 2005; Starke-Meyerring and Gurak, 2007; Starke-Meyerring, Burk, and Gurak, 2004), resulting in multiple digital compilations of a writer's persona (Solove, 2004; Solove and Rotenberg, 2003) or "digital persona" for different purposes, given the many institutional and business needs for such data. Personal data are of interest, for example, to businesses seeking information about customers—for example, to develop targeted offerings and pricing strategies that discriminate based on the socio-economic status of customers online—or about employees—for example, to make hiring and promotion decisions. Aside from the usual e-commerce and marketing industries, the insurance industry, for example, also has a great need for personal data to determine risks and insurance rates as has the banking and credit industry to determine mortgage and lending rates. In addition, law enforcement, national security, and other government

agencies have similarly strong needs for such data. With Microsoft and Google entering the business of collecting and storing personal medical and DNA data (Kawamoto, 2007), the extent of such data collection promises to be unlimited. In fact, an entire industry has emerged devoted to the lucrative business of collecting, aggregating, matching, mining, and selling personal data to businesses, banks, law enforcement, and government agencies. In short, written interactions and products in digital environments become data with audiences and purposes writers may find difficult to imagine.

Second, digital materialities of writing have been shaped such that written interactions and texts tend to be often difficult to remove by their writers as their access to the servers on which the records of these interactions and texts reside is limited, and digital writing spaces are often designed to make the removal of accounts or texts difficult, which allows for maximum data collection and mining. Lessig (2006) provides the example of Google's Gmail and its email delete button, which allows only for incremental deletion of emails, maximizing opportunities for data collection and mining. Likewise, users of social networking sites, such as Facebook, have reported difficulties removing their accounts (Aspan, 2008). Even if users are able to close their accounts and remove their content, "the Company may retain archived copies" (Facebook, Terms of Use, Nov 15, 2007). As a result, data can be compiled over time and texts produced by teenage writers can remain accessible to unanticipated readers for many years to come.

Third, digital materialities of writing tend to be designed in such a way that data collection practices remain concealed to writers. Often, digital writing spaces and the policies regulating their use tend make it difficult for writers to realize when and for what purposes their interactions and texts are collected, manipulated, or transferred as data (Agre and Rotenberg, 1998; Etzioni, 2000; George, 2004; Gurak, 1997; Lessig, 2005, 2006; Markel, 2005; Starke-Meyerring and Gurak, 2007; Starke-Meyerring, Burk, and Gurak, 2004). The concealed nature of data collection is inscribed in the digital code in the form of cookies, web bugs, spyware, obscure internet browser options; enticed by ostensibly free offerings in the form of screensavers, cell phone ring tones, email or social networking services; and secured by obscure and tedious privacy policies or terms of use policies, which are designed to serve the interests of maximum data collection (Markel, 2005).

These changed materialities of writing with their increased potential for massive inconspicuous data collection have wide ranging consequences not only for individuals, but also for society as a whole. Mark Poster (1990), for example, labeled digital network technologies a "superpanopticon," invoking Foucault's (1977) key insight that societies have been moving from predominantly disciplinary control mechanisms to surveillance mechanisms, where the mechanisms of who is collecting data on whom, for what purpose, under what conditions, and with what legitimation becomes a critical element in power relations. And as Foucault demonstrated persuasively, omnipresent surveillance has important consequences for society as a whole when self-discipline and self-censorship in the face of omnipresent surveillance threaten to stifle public dissent and robust deliberation, which, of course, are vital to democratic decision making. Digital technologies, however, go far beyond Foucault's panopticon. In contrast to the panopticon, they provide

decentralized opportunities for inconspicuous, but distributed, networked, and therefore ubiquitous surveillance (Lessig, 2005; Poster, 1990). As a critical perspective of technologies as scenes of social struggle would suggest, though, digital technologies do not simply accidentally support this kind of materiality of writing. Digital technologies do not by necessity enable inconspicuous omnipresent data collection. Instead, many of the data collection technologies that now characterize the internet, such as cookies, for example, were not part of the original design of the internet, but were developed to serve commercial and government interests in data collection (Lessig, 2005). As Bazerman (2007) observes, it is "large economic stakes along with the complexity, stability and power of …[existing] social systems" around which technologies tend to be designed or to be "bent."

Implications for Writing Development
Viewed through the lens of critical theories of technology, digital network technologies do not simply provide a new neutral medium into which writing practices simply travel. Rather, these technologies encode, enable, and constrain digital materialities of writing, which in various ways reproduce, compete with, challenge, question, or reshape those of print, along with its regularized and normalized socio-economic materialities—that is the social practices, modes of production, rules, laws, orders, and expectations that evolved around print materialities. In Benkler's (2006) words, these technologies—digital or print, through their design, use, and regulation, enable and constrain "who gets to say what to whom, and who decides" (p. 392) as well as under what conditions, and with what consequences to themselves, others, and society as a whole. As such, digital writing spaces are "scenes of struggle" (Feenberg, 2002), with competing interests vying over their shape and the kinds of socio-economic materialities that will be enabled or constrained. Each struggle outlined in this chapter illustrates the ways in which the economic interests of incumbent industries invested in print materialities so far have attempted to reshape or regulate digital technologies in ways that maintain and expand established print-based business models, or in the case of net neutrality and privacy, to reshape digital technologies to allow for new ways of ensuring profits, control, and surveillance. The changes in the materialities of writing in digital environments, the contestation surrounding these changes, and their consequences for writers and societies at large suggest at least two important implications for the study and teaching of writing: 1) the need for the active engagement of writing teachers and researchers in the design, use, and regulation of digital writing environments as well as for research attention to the socio-economic materialities of writing in digital environments, and 2) the need for reconsidering writing pedagogies and policies in educational institutions.

1) Implications for Policy Engagement and Research Attention to the Materialities of Writing in Digital Environments
Researchers and teachers of writing have direct stakes in the outcomes of these struggles over the materialities of writing in digital environments because these outcomes have significant implications for writing development, e.g., what student writers, citizens, and others will be able to access, build on, what kind of knowledge they will be able to make, to what extent they will be able to participate in cultural production, in social activism, under what conditions, and with what consequences to themselves and society. Most importantly,

as the examples of the contested nature of the materialities of writing in digital environments discussed in this chapter illustrate, the struggle over these materialities is deeply implicated in larger social struggles over digital technologies as ways of reordering socio-economic practices with deep implications for societies—for how democratic, participatory, open, and collaborative they will be.

Not surprisingly, with the materialities of our core practice—writing—suspended between "civilizational alternatives" (Feenberg, 2002), writing studies researchers have increasingly urged teachers of writing to attend to this political nature of the socio-economic materialities of writing and to become actively engaged in the deliberation of digital technology design, use, and policy at all levels (e.g., Courant-Rife, 2007; DeVoss, Cushman, and Grabill, 2005; DeVoss and Porter, 2006; Howard, 1999, 2007; Logie, 2006; Moran, 1999; Reyman, 2006; Selber, 2004; Selfe, 1999). The difficulty here is, of course, the ways in which technologies, including writing, as mundane, everyday material systems of getting work done—as seemingly neutral tools or means to an end, remain silent and invisible—we might say, "hidden in plain view," as do the struggles that unfold over their design, use, and regulation. As Haas (1996) notes, for example, "it is precisely because technology is such an integral part of writing that it is often overlooked. As is often the case, what is ubiquitous becomes transparent" (p. xi). And as Feenberg (2002, 2006) has emphasized, the dominant discursive regime of technological instrumentalism—of a simplified view of technologies as mere means to an end—keeps the political nature of technologies hidden. Accordingly, as writing development researchers (e.g., Grabill, 2003; DeVoss, Cushman, and Grabill, 2005; Wysocki, 2004) have stressed, an important task researchers and teachers face is to make their highly contested nature as enabling or constraining social orders visible.

At the same time, to support this critical engagement, writing development researchers must increasingly pay attention to the socio-economic materialities of writing, (e.g., DeVoss, Cushman, and Grabill, 2005; DeVoss and Porter, 2006; Haas, 1996; Horner, 2001; Selber, 2006). As print materialities of writing had settled into a somewhat stabilized equilibrium, with fewer opportunities for the constant re-coding that characterizes digital technologies, writing development research has tended to focus less on those materialities and the ways in which they enable or constrain socio-economic materialities, but has instead focused more on students, teachers, and classrooms. As Selber (2006) notes, for example, much research on writing and technologies has "tended to focus more on students, teachers, classrooms, and writing programs and less on the larger contexts within which people and programs are situated" (p. 2). While issues of intellectual property, fair use, and file sharing have already received considerable attention, issues of how access and privacy or surveillance are inscribed in the code and the implications these materialities have for writing and writing development have received less attention. Yet, in all of these areas, writing teachers need more research analyzing the competing interests at work in shaping such spaces and examining the consequences particular designs, pedagogies, and policies for writing in digital environments, e.g., such as mechanisms of access or surveillance encoded in digital technologies, plagiarism policies, or the use of plagiarism policing

software, have for writers, the work they do, their ability to learn and develop as writers, and their participation in democratic deliberation and decision making.

2) Implications for Reconsidering Writing Pedagogies and Policies
As the analysis of key struggles over digital network technologies as emerging materialities of writing has shown, these technologies are never neutral, but rather contested scenes of struggle over how established socio-economic materialities of writing—social orders, practices, and hierarchies are to be reproduced, challenged, or questioned. Writing development in digital environments therefore calls for what we might term pedagogies for critical engagement—pedagogies that allow students to critically analyze and engage in the design, use, and regulation of the digital writing spaces they inhabit (e.g., Bazerman, 2007; Devoss, Cushman, and Grabill, 2005; DeVoss and Porter, 2006; Hawisher and Selfe, 1999; Hicks and Grabill, 2005; Selber, 2004; Wysocki et al., 2004). Most importantly, pedagogies for critical engagement in digital writing spaces call for critical analysis and participation as well as for the reconsideration of established writing pedagogies, policies, and infrastuctures from a critical perspective.

Fostering Critical Analysis and Engagement in Digital Writing Spaces
First, perhaps most importantly, pedagogies for critical engagement create opportunities in writing classes for critical analysis of the writing spaces in which the students participate. As Bazerman (2007) urges, "Beyond providing students with facility in design tools and multi-media rhetoric, teachers of rhetoric need to provide students with analytic tools to understand the changing locations and informational richness of encounters they will be creating, the larger knowledge, social, and activity environments that surround the particular encounter and activity spaces they are working in, and the ways in which communications will mediate transformed work, citizenship, and personal relations" (n. p.). Critical analysis here does not mean "saying negative things" or uncovering "hidden truths." Rather, drawing on critical theories of technologies (e.g., Benkler, 2006; Feenberg, 2002; Winner, 1986; Longford, 2005) as well as discourse (e.g., Fairclough, 2003; Coe et al., 2002; Lemke, 1995; Paré, 2002; 2005), critical analysis involves asking critical questions about the design, use, and regulation of digital writing spaces similar to the kinds of questions students learn to ask about discourse. For example, what rhetorical work is to be accomplished in a given writing space, for whom, how, and why? Who sponsors a digital writing space (Brandt and Clinton, 2002) and why? Whose interests are being enabled or constrained and how by the design, use, and regulation of the space? How are these interests advanced or marginalized discursively? What social practices and orders are being reproduced, challenged, or contested? For instance, how are practices of access, intellectual property, and surveillance encoded, regulated, and advanced discursively in digital writing spaces as well as in the technologies through which students interact with them (e.g., browser software, institutional network services, ISP networks)? What opportunities for participation in shaping the design, use, or regulation of digital writing spaces are available to writers or can be mobilized?

To be sure, students are deeply and in many cases critically engaged in the immediate digital writing spaces in which they participate. For example, students in Facebook quickly

mobilized free online petition software and set up a protest blog called "savefacebook.org" when the company introduced blatantly privacy-invading features, such as mini-feeds or beacons that advertised their activities in the site (through mini-feeds) as well as all their purchases in partnering e-commerce sites (through so-called beacons) to all their "friends," (Calore, 2006; Story and Stone, 2007). Nevertheless, examining and engaging in the politics over the socio-economic materialities of a digital writing space, especially from a critical perspective—that is, a perspective that examines these spaces in the context of larger socio-economic power struggles—is a more challenging task. For example, discussions around the personal and societal implications of business models that require site participants to grant a company such as Facebook "an irrevocable, perpetual, non-exclusive, transferable, fully paid, worldwide license (with the right to sublicense) to use, copy, publicly perform, publicly display, reformat, translate, excerpt (in whole or in part) and distribute such User Content for any purpose, commercial, advertising, or otherwise" (Facebook, Terms of Use, Nov 15, 2007) remain rare as does engagement in larger (national or international) debates and struggles for access, fair use and sharing, or privacy. No doubt, critical awareness of and engagement in these struggles is a challenging task, especially as writers transition from more stabilized print materialities to the constantly contested materialities of digital writing environments, which are, after all, "hidden in plain view." As Longford (2005) notes, "the politics of [technology] has seldom hit the radar screens of average internet users and citizens" (p. 82).

Furthermore, as writing development researchers have stressed, pedagogies for writing in digital environments must not stop with analysis, but must also support students in developing the literacy practices needed to engage productively in robust deliberation in digital environments in order to participate in shaping the design, use, and regulation of digital writing spaces and the emerging social practices, orders, and interests these enable, constrain, question, challenge, or reproduce. Selber (2004), for example, advocates a heuristic for thinking about digital literacies as functional, critical, and rhetorical (productive). Similarly, Wysocki (2004), emphasizes that like analysis, "the production—crafting—of new media texts is equally important, too, for it is how we produce and can see our own possible positions within the broad and materially different communication challenges where we all now move and work with others" (p. 22).

Rooted in a critical understanding of digital writing spaces as scenes of struggle over alternative social orders, pedagogies for critical engagement, then, can also help teachers and program directors reconsider the kinds of graduates they envision from their courses and programs. Will these be passive, docile users, "skilled in the use of technologies," participating in embattled terrain, unknowingly facilitating interests they may not even be aware of, or will they be able to critically assess the ways in which digital network technologies reproduce, challenge, or question established orders and contribute to the democratic deliberation, shaping, and regulation of these technologies and the socio-economic materialities they enable or constrain?

Re-considering Writing Pedagogies, Policies, and Infrastructures from Critical Perspectives of Digital Technologies as Emerging Materialities of Writing

A critical understanding of digital technologies as emerging contested materialities of writing that compete with established materialities of print calls for writing pedagogies and policies that help students critically assess, negotiate, and engage in these competing socio-economic materialities of writing. Working from a critical perspective, teachers and researchers of writing ask to what extent established pedagogies and institutional policies regulating writing reproduce the values, practices, assumptions, or notions of authorship rooted in print materialities, possibly ignoring the ways in which digital materialities enable, constrain, or challenge pedagogies rooted in assumptions about writing and authorship shaped by print materialities. In other words, what kinds of materialities of writing are being privileged or marginalized in writing pedagogies and policies? In whose interests? To what extent do established pedagogies and policies simply reinforce and discipline students into established practices, with students caught between alternative materialities? Perhaps most importantly, what kinds of resources are available to support teachers and students of writing in examining and negotiating the complex ways in which writing, along with the social orders it assembles, is enabled or constrained in different materialities?

To draw on one of the news examples mentioned at the beginning of the chapter, that of banning Wikipedia from assignments, pedagogies for critical engagement here would, for example, ask what reading and writing practices rooted in what materialities are assumed and valued? Why would, for example, the history of a contested region or figure be valued more if created by a single author (or a small group of authors) with particular epistemological and ideological commitments and verified by a few peer reviewers with perhaps similar commitments? Why would that history be valued less if it reflected the negotiated diverse epistemological commitments and knowledge practices of Wikipedia participants with diverse lived experiences? What might students learn by comparing the histories, and their underlying epistemologies, produced in socio-economic materialities of writing invested in print (e.g., here in the form of peer review) and those of a wiki space? What are the consequences for writing development of simply reinforcing the practices of established materialities and banning those of emerging materialities?

Similarly, plagiarism policies require critical scrutiny for the extent to which they reproduce and reinforce established practices and assumptions rooted in print materialities, such as Romantic notions of authorship as solitary genius and restrictions on sharing and knowledge production established in print materialities (Howard, 1999, 2007). Unfortunately, as writing development researchers and specifically the CCCC Caucus on Intellectual Property (2008) have noted, at a time when resources for writing development become a high-stakes necessity to support writing teachers, students, and institutions in negotiating competing materialities of writing and to ensure the active participation of students as citizens and professionals in the shaping of these materialities, large amounts of such resources have been spent on commercial solutions, such as plagiarism policing services, to monitor and discipline students back into established practices and orders of print materialities, with considerable damage to writing development. As Howard (2008) notes, for example, such services do not work to do what they purport to do as they do not attend to the complexity of what is referred to as plagiarism, such as the local, disciplinary,

or institutional situatedness of citation and other intertextual practices; practices of paraphrasing without citation; or the construction of citations. More importantly, Howard notes that these services needlessly criminalize students as inherently guilty of academic dishonesty and commercialize their work as ongoing resources for the profits of such services, contributing to a learning atmosphere that puts trust between students and teachers, and thus writing development, at risk.

In contrast, pedagogies for critical engagement would see institutions, teachers, and students working together to reconsider writing policies in light of competing materialities of writing. Rather than simply reinforcing one set of materialities over the other and disciplining students into adhering and valuing the practices associated with one over the other, pedagogies for critical engagement would examine the ways in which different materialities enable or constrain writing as a knowledge making practice, with consequences for who is included and who can say what to whom. Simply reinforcing one over the other deprives students of vital opportunities for critical engagement. Instead, considering writing in digital environments from a critical perspective, institutions would put writing pedagogies first and provide students and teachers with appropriate development resources for negotiating and participating in this revolutionary shift in the materialities of writing.

Accordingly, pedagogies for critical engagement also entail what DeVoss, Cushman, and Grabill (2005) call a "productive and activist understanding of infrastructure" (p. 22). As the authors argue, teachers of writing in digital environments are uniquely positioned to make vital contributions to the deliberation and shaping of infrastructures for writing in digital environments at their institutions. Writing teachers, the authors note, have a vital role to play in shaping "rhetorically, technically, and institutionally—what is possible for our students to write and learn" (p. 37).

To return to the guiding question posed at the beginning of this chapter—how materalities of writing change in digital environments, what consequences these changes have for how writing works to organize human activity, and what implications we might draw for writing development, this chapter has emphasized the important role of a critical perspective in studying and teaching writing in digital environments. Viewed through the lens of critical theories of technology, digital writing spaces are "scenes of struggle" (Feenberg, 2002), with competing interests vying over their shape and the kinds of socio-economic materialities that will be reproduced, challenged, or questioned. The outcomes of these struggles have far-reaching consequences not only for individual students, teachers, and researchers of writing, but also for institutions, organizations, and societies at large. Accordingly, as the chapter has shown, as they write and teach writing in digital environments, what students, teachers, and researchers of writing participate in— knowingly or unknowingly—is nothing less than a historic struggle over the shape of the societies, institutions, and communities we will inhabit. Teachers and researchers of writing find themselves at the forefront of these struggles as they help writers develop the critical acumen to analyze what is at stake and the technological-rhetorical sophistication to

participate in the shaping and regulation of the digital writing spaces, communities, and societies we will inhabit.

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