



## Technological dramas: A meta-discourse heuristic for critical literacy<sup>☆</sup>

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### Abstract

This article discusses and illustrates a meta-discourse heuristic that can be used to illuminate the politics of technology in higher education. Although the field tends to focus on developing critically literate students, teachers new to teaching writing with computers need more than primary theoretical sources in order to conceptualize the political nature of academic computing and its administrative and pedagogical contexts. The heuristic comes from the activist work of Bryan Pfaffenberger, who provided an ideal–typical model of the way power circulates in technological settings. I show how computers and writing specialists can apply this heuristic to their daily interactions with technology in the academy. The heuristic could be used in teacher preparation courses or in faculty development programs. It could also be used in advanced undergraduate courses; however, I do not discuss how to employ the heuristic with students.

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### 1. Introduction

Critical literacy has received an enormous amount of attention from computers and writing specialists, immersed as we are in social approaches to understanding language and language use. Although there are different strands of critical literacy, it is safe to say that critical approaches first recognize and then challenge the values of the status quo. Instead of reproducing the existing social and political order, which functional modes of literacy tend to do, critical approaches strive to both expose biases and provide an assemblage of cultural practices that,

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<sup>☆</sup> I borrow the phrase “technological dramas” from the work of Bryan Pfaffenberger (1992), who used it to characterize at least some of the dynamics involved in the construction and reconstruction of technological politics.

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in a democratic spirit, might lead to the production of positive social change. Paulo Freire and Donaldo Macedo (1987) argued that “a person is literate to the extent that he or she is able to use language for social and political reconstruction” (p. 159). This assertion identifies common ground shared by critical approaches, especially in light of the fact that functional approaches to literacy characteristically construct literacy as a neutral enterprise that simply serves the utilitarian requirements of a technological society.

Teachers who espouse critical approaches, then, are generally interested in preparing students to be social critics rather than indoctrinated consumers of material culture. However, many teachers themselves have not been adequately prepared to think critically about computers. One approach to educating such teachers is to engage them in some of the numerous useful activities that have been developed for students. These involve, for example, technology narratives and journals (Duffelmeyer, 2000; Latterell, 2002), micro-ethnographies (Blair, 1996), interface re-designs (Selfe & Selfe, 1994), and other reflective activities (see LeCourt, 1998; Selber, 1997; Strasma, 2001). In this article, I step back from such activities in order to offer a meta-discourse that is conceptual in nature, one that provides a theoretical toolbox for understanding the politics of technology. My discussion is divided into two parts. The first part explains what meta-discourse heuristics are and why they are valuable. The second part introduces and illustrates a specific meta-discourse heuristic that can illuminate the politics of technology in higher education. Because this heuristic is not as rhetorically sensitive as it might be, and in order to make it more meaningful to computers and writing specialists, I combine the heuristic with four contexts that significantly shape computer-based artifacts and activities in university settings: design cultures, use contexts, institutional forces, and popular representations.

## 2. The function and power of meta-discourse heuristics

One fruitful way in which to encourage critical literacy is through the pedagogical apparatus of meta-discourse heuristics. Let me deal with heuristics first and meta-discourses second. From the Greek term *heuriskein*, meaning to discover or find, heuristics are problem-solving strategies that can guide writers as they attempt to formulate possible responses to a writing or communication problem. As opposed to algorithmic approaches, which are precisely defined and structured, heuristic approaches provide a suggestive framework that can help writers systematically probe the contingencies and dynamics of author-to-readers intention structures, including the rhetorical situation. Whereas algorithmic approaches set down fixed rules for organizing an argument, for instance, heuristic approaches help writers determine the most effective organizational pattern given the particulars and complexities of a specific communication situation. An example would be inventional schemes from classical rhetoric that involve common or special topics (*topoi*). More contemporary examples of heuristics include the dramatistic pentad of act, scene, agent, agency, and purpose (Burke, 1945), the tagmemic perspectives of particle, wave, and field (Young, Becker, & Pike, 1970), and the more ideologically inflected schemes of social-process theorists whose approaches go beyond the textual and rhetorical level to the discursive level, encouraging us to interrogate more fully the character and function of institutions, subjectivities, cultural values, and social values (McComiskey,

2000). Of course, there are also examples that come from computers and writing contexts: Kathleen Blake Yancey (2003) provided a heuristic for planning electronic discussion assignments; Dickie Selfe (2003) discussed the PAR system (preparation, activity, reflection), which is useful for both planning and assessing technological projects; and Nicholas C. Burbules (2002) offered a design heuristic for investigating patterns of activity in web sites. Heuristics like these have long been a staple of writing and communication instruction. In fact, Lester Faigley (1986) noted that some of the earliest researchers in composition studies, including Janet Emig, were motivated by an attention to heuristics in cognitive psychology. And while two of these early researchers, Janice Lauer (1970) and Ann Berthoff (1971), engaged in a spirited debate over particular heuristic procedures, neither one questioned their overall efficacy as aids for writers, only the disciplinary domains from which heuristics should be appropriated.

The types of heuristics I am especially interested in are those that provide a meta-discourse that can focus teacher attention in a decidedly politicized fashion. Such heuristics invite us to approach an artifact with inquiries about it that are different from the ones directly imagined by author-to-readers intention structures, making available an oppositional discourse that can be used to critique a dominant discourse, a factor that is crucial to any critical literacy program, as sociolinguist James Gee has indicated. Gee (1990) distinguished between primary discourses, which are unconsciously acquired in familial-like settings, and secondary discourses, which are consciously learned in schools and other highly formalized institutions that regulate language use and behavior in ways that tend to maintain the social and political order. There is a distinct advantage for those whose primary discourses are well-matched to the secondary discourses they are being asked to develop and control. And when this situation goes unacknowledged—and it often does—harm can come to those who have acquired nonmainstream discourses.

But there is also a critical aspect to secondary discourses that can function more consciously as a form of power and liberation. Gee maintains that learned literacies can be liberating if they include meta-discourses that can be used to critique the ways in which other discourses “constitute us as persons and situate us in society (and thus liberating literacies can reconstitute and resituate us)” (p. 153). For Gee, literacy is emancipatory when it encourages people to put multiple discourses in conversation with each other, that is, to critique one discourse with another, in order to develop critical analytical capacities. As he explains, “Meta-knowledge is power because it leads to the ability to manipulate, to analyze, to resist while advancing” (p. 148). This meta-knowledge consists of learned (versus acquired) insights into the ideology in dominant discourses. Such insights, according to Gee, can enable people to become more attuned to the violent aspects of literacy, as Elspeth Stuckey (1991) put it, and as a consequence become more compassionate and sympathetic participants in the discourses that invariably shape the world around them.

There are various meta-discourse heuristics that can help develop critical meta-knowledge about a technological artifact and its contexts. One can rather easily imagine investigative frameworks drawn from any number of useful theoretical locations, including feminist theory, critical race theory, cultural studies, science studies, postcolonial theory, postmodernism, disability studies, radical pedagogy, and the like. The heuristic I offer here comes from the work of Bryan Pfaffenberger (1992), who theorized at least one way in which power can circulate in technological contexts. Although postmodernism is deeply suspicious of grand narratives that attempt to provide encompassing explanations, James Berlin (1996) made the case for

contingent metanarratives, for “heuristic” methods of proceeding that “provide connections while never determining in advance exactly what those connections will be” (p. 74). In this vein, Pfaffenberger offered a contingent metanarrative that can help teachers make some sense, however provisional and partial, of an enormously complex and complicated landscape: the politics of technology in higher education. His theory is not meant to be a universal or definitive explanation, only one plausible and informative account of the technological construction and reconstruction of political power.

### **3. Technological dramas as a meta-discourse heuristic**

Before explaining Pfaffenberger’s (1992) theory and turning it toward the objective of clarifying the politics of technology, I should spell out more completely the approach I am using. The computing infrastructure of a university affords ready access to the discourses that are connected to conventional technological practices in higher education, and these are some of the dominant discourses that teachers can interrogate via heuristics that provide oppositional meta-discourses. These are especially important discourses to question, however, because they help to structure the daily interactions between users and computers in academic settings. I will offer examples of how this structuring can occur in a number of different contexts—in the interactions between teachers, students, and the larger university; in the interactions that occur in classroom settings; and in the interactions that are involved in preparing teachers. On the face of it, a computing infrastructure might not appear to be the most inspired choice. After all, it is a fairly obvious choice, as well as one that could seem less than imaginative if the scope of an infrastructure is defined primarily in technical terms. Although there is a good deal to consider when investigating the politics of hardware and software artifacts, this critical task can and should be taken to another level of sophistication and insight by broadening the investigatory scope to include the entire complex of artifacts, activities, and forces that constitute a technical system.

Theorists often encourage us to think of technologies as systems rather than things (Borgmann, 1984; Feenberg, 1991; Foucault, 1979; Winner, 1986). This encouragement stems from the realization that culture, politics, economics, and social institutions have all become inexorably intertwined with technology, producing an overdetermined milieu in which its directions, uses, and representations can potentially be shaped by a wide range of factors. Consider something as basic as a course web site. One could study its interface and undoubtedly produce an instructive political critique. However, in order to characterize the political dimensions in a more accurate and robust manner, additional questions would need to be posed and pursued: Is the site affiliated with officially sanctioned initiatives? Are there institutional rules for site design? Are there systems in place to support site development, and if so, what is their influence over design tasks? What is the nature of the use context? Does work on the site count toward tenure and promotion, and if so, exactly how? Is there an institutional stance on the site as a piece of intellectual property? And so forth. The answers to these questions and others like them help to characterize technology as a systemic formation constituted by discourses embedded in social, political, historical, and material relations. This characterization departs in significant ways from mechanical and atomistic perspectives that depict technology as a discrete, self-directed, and highly neutral phenomenon.

Pfaffenberger (1992) presented a theoretical narrative that supplies one map of a political dynamic in technological systems composed of various discourses, actors, and contexts. There are three elements in this narrative: technological regularization, technological adjustment, and technological reconstitution. The narrative begins on the production side of the equation with technological regularization, as designers invariably shape artifacts and activities in ways that affect the distribution of power in a social formation. But Pfaffenberger is quick to point out that the raw force of technical features is ultimately not enough to provoke the continued actions of users. In his words, “An artifact’s political affordances are inherently susceptible to multiple interpretations. For this reason, an affordance cannot be sustained socially in the absence of symbolic discourse that regulates the interpretation” (p. 284). Thus, the hegemonic key to compliance is not only an artifact embodied in political terms, but the myths and rituals that can naturalize—and reinforce—the concomitant ideologies. The narrative continues in the realm of computer users who if dissatisfied engage in various transformative activities that endeavor to alter the social contexts or features of technologies. Technological adjustment strategies attempt to make artifacts more tolerable to those whose identities have been adversely signified while technological reconstitution strategies openly challenge established technical systems. Such strategies, if they are to be successful, must exploit the ambiguities inherent in technological regularization. Metaphorically speaking, Pfaffenberger called his narrative a “technological drama” in order to highlight “the performative nature of technological ‘statements’ and ‘counterstatements,’ which involve the creation of scenes (contexts) in which actors (designers, artifacts, users) play out their fabricated roles with regard to a set of envisioned purposes (and before an audience)”; and to stress “that the discourse involved is not the argumentative and academic discourse of a text but the symbolic media of myth (in which skepticism is suspended) and ritual (in which human actions are mythically patterned in controlled social spaces)” (p. 286).

There are discernable power moves associated with each element in the narrative. These moves are characterized by an oppositional meta-discourse that is rather elaborate on the surface, but one that is well worth the intellectual investment for teachers because it holds much explanatory power. Let me briefly illustrate how the narrative works and introduce some of its critical meta-discourse. Pfaffenberger (1992) offered a typology of eleven regularization strategies that can be detected in, or clearly associated with, technological innovations (see Table 1, which lists the strategies in his own words). These innovations, in the form of artifacts, activities, systems, or processes, fabricate sociotechnological contexts which are projected into everyday social worlds that are crucial to the achievement of constructed political aims. In other words, to achieve its intended purposes, a technology must be located in an environment that is sympathetic to its politics. The typology clarifies this reliance and provides a meta-discourse that identifies biases, belief systems, and political blind spots.

Let me illustrate one of the regularization strategies listed in Table 1. Polarization is a power move whereby “different versions of essentially the same artifact are created for no reason other than to reflect and to reinforce race, class, gender, or achievement categories” (Pfaffenberger, 1992, p. 293). An example would be <[www.girlhoo.com](http://www.girlhoo.com)>, a thematic search engine that arranges information in patterns that sustain social stereotypes. In structure and style it unabashedly imitates Yahoo, perhaps the most popular of all the search services, but this apparent infringement of intellectual property is not an instance of polarization (I say apparent

Table 1  
The power moves associated with technological regularization

Stage	Power moves
Technological regularization	<p><b>Exclusion:</b> Access to the technology and its social context is denied to persons who fit into certain race, class, gender, or achievement categories.</p> <p><b>Deflection:</b> The technology provides compensatory goods or services to people in an attempt to deflect attention away from what is really going on.</p> <p><b>Differential Incorporation:</b> The technology is structured so that people of different social categories are incorporated into it in ways that reflect and attempt to reinforce their status.</p> <p><b>Compartmentalization:</b> Access to the technology and its benefits is in principle open to all, but access is rigidly structured to keep some persons at arm's length.</p> <p><b>Segregation:</b> Access to the technology and its benefits is in principle open to all, but it is so expensive or difficult to obtain that few can enjoy it.</p> <p><b>Centralization:</b> Access to the technology and its benefits is in principle open to all, but the system is constructed so that users have little autonomy and so that significant decisions are reserved for central management.</p> <p><b>Standardization:</b> Access to the technology and its benefits is in principle open to all, but at the price of conformity to zealously maintained system standards and rules of procedure, which diminish local autonomy and marginalize local culture.</p> <p><b>Polarization:</b> Different versions of essentially the same artifact are created for no reason other than to reflect and to reinforce race, class, gender, or achievement categories.</p> <p><b>Marginalization:</b> Inferior versions of an artifact are expressly created for or distributed to persons within subordinate race, class, gender, or achievement categories.</p> <p><b>Delegation:</b> A technical feature of an artifact is deliberately designed to make up for presumed moral deficiencies in its users and is actively projected into the social contexts of use.</p> <p><b>Disavowal:</b> An artifact that is specifically developed for menial or poorly compensated occupations is actively avoided or rejected by those of higher status, thus reinforcing the status distinctions.</p>

because it could be argued, weakly in my opinion, that *Girlhoo* is a critical commentary on the male-oriented structure of Yahoo). Rather, the issue is that the organized content tends to shore up essentialist notions of women. Feminist scholars warn about representations that totalize women as homogenous, unconflicted, or unified subjects (Flax, 1990). But the White, middle-class orientation of *Girlhoo* does just that, for its links sex-type social and intellectual activities in ways that cast women into largely traditional roles. Users of *Girlhoo* happen upon no shortage of pointers to sites about beauty, fashion, Prozac, relationships, breast implants, and the like. One of the more comprehensive site areas focuses on the kitchen. It is true that more serious search engines can be found that cover different strands of feminism, careers in science, medical research, activist groups, and influential women in politics and history. However, regressive sites like *Girlhoo*, which are abundant, reflect and reinforce gendered perspectives that can be read as detrimental to women.

But computers users are not utterly defenseless in repressive situations. As Pfaffenberger (1992) explained, “it would be wrong to view even a highly successful regularization strategy as a total victory for its political promoters: Most regularization efforts fail to suppress redressive social processes” (p. 297). “The nature of regularization,” Pfaffenberger continued, “is that it creates areas of inconsistency, ambiguity, interpretive flexibility, and outright contradiction” (p. 297). There are various redressive social processes that could be used to address the politics of Girlhoo. For example, one might position this search engine as an artifact to be examined rather than as a tool to be used. Such a discursive maneuver resituates Girlhoo in metaphorical terms that open up valuable pedagogical spaces for critical reflection. Another tactic, this one more ambitious, would strive to equalize the stereotypes. Girlhoo includes a function that lets users recommend new items for its indices; thus, users could be encouraged to suggest, on a regular basis, sites that characterize women in more productive ways. The secret to the success of this operation would be the free-market trope that consumer preferences should drive the directions of the Internet.

Pfaffenberger (1992) organized such potential user reactions into two categories: technological adjustment and technological reconstitution (see Table 2, which lists the categories in his own words). Technological adjustment mobilizes either discursive or mechanical approaches in order to make artifacts more tolerable to those whose identities have been adversely signified. There are three possible moves in this area: countersignification, counterappropriation, and counterdelegation. These moves challenge technological regularization in that they attempt to neutralize the undesirable aspects of useful artifacts. Technological adjustment, however, is something of an indirect tactic because it does not openly challenge established technical systems. In contrast, technological reconstitution represents a more aggressive response, although one must be wary of reintegration efforts, conservative attempts to co-opt artifacts once they have been reconstituted. In a successful occurrence of technological reconstitution, computer users create counterartifacts that displace the politics of technological regularization. Technological reconstitution is produced by acts of antisignification, which either reverse or

Table 2

The power moves associated with technological adjustment and reconstitution

Stage	Power moves
Technological Adjustment	<p><b>Countersignification:</b> Computer users surreptitiously substitute cultural narratives that undermine or contradict the processes of technological regularization.</p> <p><b>Counterappropriation:</b> Computer users reinterpret dominant discourses in an attempt to alter patterns of technological access and control.</p> <p><b>Counterdelegation:</b> Computer users engage in micropolitical acts of modification that adapt technologies to users.</p>
Technological Reconstitution	<p><b>Antisignification:</b> Computer users create counterartifacts that displace the politics of technological regularization.</p> <p><b>Reintegration:</b> Counterartifacts are co-opted and brought back into the controlled space of regularization.</p>

negate the dominant discourse. The categories of technological adjustment and technological reconstitution organize interpretive strategies of resistance and, in the process, provide a second meta-discourse, one that models responses to the dominant discourses that have become associated with conventional technological practices.

Toward the end of his theory explication, Pfaffenberger is apprehensive about processes of “designification” in which technologies “become taken for granted, routine, and part of the natural attitude of everyday life” (p. 309). Some argue persuasively that the present transition from print to computer-mediated communication provides a vantage point from which to reconsider commonsensical assumptions and practices (Joyce, 1995; Spender, 1995). That may be true, but for many teachers, computers have already become designified as neutral tools that are not subject to question except in the most obvious of circumstances, such as computer failure. For these teachers, meta-discourse heuristics can provide conceptual lenses with which to magnify and clarify the politics of technology. One approach is to use Pfaffenberger’s theory as a meta-discourse heuristic, asking teachers to consider the ways in which power can circulate in the computing infrastructures on campus. Several contexts guide this exploration down a rhetorically sensitive path, which is to say that teachers should be encouraged to see the computing infrastructures as constituted by at least four closely related, and sometimes indistinguishable, contexts: design cultures, use settings, institutional forces, and popular representations.

### *3.1. Design cultures*

The design cultures context refers to the practices and perspectives of the people who are responsible for designing and maintaining a computing infrastructure. These people include those who design hardware devices, local- and wide-area networks, software programs, desktop configurations, physical spaces, policies and procedures, pedagogical activities, and more. Teachers of writing and communication have been increasingly active designers and maintainers of many different aspects of computing infrastructures, and our own practices and perspectives should not be seen as immune to political critique. However, the dominant discourses do not come from English departments, not by any stretch of the most fertile imagination. They come from commercial software vendors, centers for academic computing, science and technology disciplines, and institutionalized computer literacy initiatives that concentrate on the workings of software programs and hardware devices. By and large, the dominant discourses can be characterized as well-intentioned but not particularly critical, especially when it comes to the effects and implications of design cultures.

Teachers have varying levels of access to these dominant discourses. The most immediate and direct way in is through the technological artifacts of a design culture, which reflect and instantiate its assumptions, attitudes, and values. (This is not to say that design determines use, only that design encourages uses in certain directions that can be resisted by critically conscious individuals or altered by social forces.) I realize that the most expedient path is not always the most instructive or interesting one. Indeed, analyzing an artifact apart from its design culture cannot illuminate that culture in the same way that a more triangulated approach can, one that, for example, includes interviewing designers and studying the disciplinary discourses that influence their projects. Such approaches are certainly feasible in institutions that develop or modify software for faculty member and student use or that are truly serious about

participatory design practices that involve the university community. But the technological artifacts themselves can serve as a sufficient means of access because the other contexts cover use settings, institutional forces, and popular representations, which also illuminate factors that shape the political aspects of a computing infrastructure.

If teachers are asked to use Pfaffenberger's (1992) theory as a meta-discourse heuristic to explore the politics of design cultures, there are numerous and varied analyses of a computing infrastructure that could be produced. I have already presented one sample analysis that involves a gendered search engine and the regularization strategy of polarization. And there is no doubt that similar artifactual analyses could be done that focus on race, class, or achievement categories, all of which are visibly linked to issues of access. Indeed, in the United States, the gap between the haves and have-nots has widened significantly since the advent of personal computers; inevitably, access to computers still too often is limited among impoverished citizens. Consequently, studies of the digital divide consistently report that upper- and middle-class families tend to own up-to-date computers and subscribe to online services; wealthier school districts tend to have equipment and pedagogical support structures that are less available to poorer ones; schools in the suburbs tend to have more computers per student than their urban counterparts; and employees who are able to use computers tend to earn more than those in similar jobs who cannot (Ratan, 1995). On college campuses, there is a significant Black–White technology gap that has been correlated with the economic conditions of academic institutions (Kreuzer, 1993), and women continue to be discouraged disproportionately by activities in computer-related disciplines that stress aggression, domination, and competition (Turkle & Papert, 1990). I am not suggesting that this troubling state of affairs has been brought about solely by the politics of design cultures, only that these politics are implicated with crucial issues of access, a fact that can help teachers focus their critical analyses of computing infrastructures.

But let me provide a second sample analysis; this one involves the regularization strategy of delegation and the politics of pedagogy as a course subject matter. Delegation is a power move whereby a “technical feature of an artifact is deliberately designed to make up for presumed moral deficiencies in its users and is actively projected into the social contexts of use” (Pfaffenberger, 1992, p. 293). To clarify the concept of delegation, Pfaffenberger discussed the feature on photocopy machines that resets the copy number to zero after a job has been run, so that subsequent users will not inadvertently make unwanted copies. The presumed moral deficiency is a lack of consideration for others. In the context of computers, a feature that attends to this flaw is the time-out mechanism for dial-in modem access, which disconnects users after a reasonable period of inactivity in order to allow others a chance to connect to the network. Additional safeguards that readily come to mind protect against intentional breaches of privacy and security. Examples of the unprincipled behavior I allude to here include disclosures of personal information to unauthorized individuals, network intrusions that corrupt intellectual work, and impersonations of one user by another, often with the intent to harass or distribute offensive materials. Users clearly value the design steps taken to ensure an adequate level of protection from such immoral, not to mention illegal, activities, even if the steps involve minor inconveniences. Nevertheless, there are examples of delegation that teachers may be less than sanguine about.

I personally struggle with surveillance tools in distance education that presume a lack of commitment to, and faith in, students. Plagiarism is a problem deeply rooted in higher edu-

cation that should be contemplated, especially in view of the argument that plagiarism as it is conventionally understood relies on gendered metaphors of authorship that reinforce social prejudices (Howard, 2000). But the software environments involved in plagiarism cases can also encourage pedagogical styles based on control and fear. In popular platforms for the delivery of distance courses, teachers can monitor student actions in ways not possible in other contexts. The program I use, for example, tracks the number of times a lesson has been accessed and the average amount of time students spent on it. Moreover, for each student, it tracks access times, site hits, and the number of documents that have been opened and posted; the program then rank-orders the students based on this dubious data. I realize that, if contextualized, descriptive statistics such as these could be helpful to teachers, especially if the patterns suggest pedagogical improvements. Yet I also know that surveillance often substitutes for compassion, content knowledge, and engagement. In her ethnographies on the nature of computerized workplaces, Shoshana Zuboff (1988) studied the corrosive effects of modernization on employee behavior. One of the disturbing things she noticed is that, as computers monitor work activity in seemingly benign modes, human beings are measured in a realtime, nonstop fashion. That is, computers monitor not just the work, but the worker. Indeed, in the case of distance education, computers provide permanent time studies that not only collect data but also pace and discipline students.

What redressive social processes might be imagined in response to this situation? One example would be a counterdelegation move in support of actual adjustments, albeit modest ones, to the established technical system. These adjustments, as Pfaffenberger (1992) put it, can “thwart a delegation strategy by disarming, muting, or otherwise suppressing the operation of a technical delegate” (p. 303). “A technical delegate,” Pfaffenberger explained, “is a technical feature that seeks to compensate for the moral deficiencies of users by technical means” (p. 303). In other words, counterdelegation moves, which can involve a certain amount of technical expertise, are micropolitical acts of modification that adapt technologies to users. In my example, I questioned surveillance functions in distance education that presume a lack of commitment to, and faith in, students. Yet, in the application I use, students could easily thwart these functions. Indeed, my recommendation would be to use the course URL as a home page location, so that each time the web browser is started, for whatever purpose—educational or personal—a site hit is automatically registered for the course; this default setting could be remapped weekly to register hits for individual lessons. On a discursive level, such a feat of counterdelegation finds support in the Orwellian narrative that users are dehumanized when they are programmed into conformity to the logic of computer systems.

Search engines and distance education environments are just two aspects of a computing infrastructure that can illuminate the politics of design cultures. Other aspects should be somewhat self-evident if one considers, for example, the design responsibilities that have been assigned to a center for academic computing. But the distance education sample analysis is an especially interesting one because it requires teachers to amplify the politics of pedagogy. Students do not typically have access to tracking functions and tracking data, which exist in most distance education environments in one form or another. As a matter of fact, many students do not even realize that their educational activities are being monitored by the system. So in order to critically analyze these surveillance measures students must be alerted to them as well as granted access to them, a process that requires teachers to share certain online privileges. This

gesture of solidarity shows students that teachers themselves can and should be critical of the artifacts they employ.

### 3.2. *Use settings*

The use settings context refers to the more immediate environments that help to situate and constitute a computing infrastructure, such as courses, computer classroom spaces, and curricular requirements. Although a design culture and its non-neutral artifacts make up one influential context, this is hardly the only context that determines how computing infrastructures get developed and used on university campuses. In a real sense, then, a computing infrastructure encompasses a much larger territory, one infrequently investigated by teachers of writing and communication. Patricia Sullivan and James Porter (1997) critiqued a set of essays in computers and composition that they consider to be driven too theoretically by decontextualized research practices. One of these essays is a prominent article on the politics of computer interfaces by Cynthia Selfe and Richard Selfe. Sullivan and Porter questioned their definition of the interface as only the “visual and physical features of the computer,” arguing instead that “it’s hard to make judgments about the hegemony of the technology itself (as formalized, abstracted system) without examining the situated interactions between technology and users” (p. 135). In asserting that users must often adopt the values of interface designers who are overwhelmingly White, middle-class, and male, the worry here is that Selfe and Selfe attributed too much agency to the computing infrastructure. That is, its politics tend to override all other forces and factors.

A similar kind of critique was launched by Clay Spinuzzi (2001), who argued that inquiry into technological artifacts routinely “bleaches out the very things that make us human: culture, society, history, interpretation” (p. 42). Spinuzzi conducted a study of four decades worth of writing and communication activities surrounding a traffic accident location and analysis system at the Iowa Department of Transportation. Drawing on constructivist and genre theory, he showed how uses of this particular system were governed not only by its built-in features but also by a dynamic activity network that included various actors, communities, noncomputer tools, and objectives. Particularly fascinating is his discussion of how users interacted with the system in ways that were unintended by its designers. Thus, Spinuzzi foregrounded a matrix of cultural–historical forces that influenced the direction and appropriation of a technological artifact in one nonacademic site.

But what about academic sites? How might use contexts be characterized in terms that are meaningful to computers and writing specialists? One example comes from a study I conducted of the forces that shape how hypertext gets treated in technical writing programs (Selber, 1997). Although hypertext has become a standard component of computing infrastructures, as might be expected, its purposes and instantiations diverge widely across specific settings. In the seven sites I studied, hypertext was variously influenced by instructional objectives, the roles teachers assumed in classroom settings, the perspectives that informed pedagogical practices, other classroom materials, the types of academic departments that housed the programs, and the curricular requirements of the programs and their methodological and theoretical perspectives. Although such influences have rarely been articulated as an aspect of computing infrastructures, they in fact help to mediate interactions between users and computers in ways that are significant.

Other characterizations could be offered, but the point is that traditional descriptions of computing infrastructures often fail to represent settings of use. I suspect this has something to do with the prevailing impulse to define technology from an instrument-centered perspective, which encourages a focus on designing artifacts to solve educational problems, without attention to the social forces that affect (and are affected by) technological matters. However, as Carolyn Marvin (1988) reminded us in her historical study of electric communication in the late nineteenth century, technologies “are not fixed natural objects; they have no natural edges. They are constructed complexes of habits, beliefs, and procedures embedded in elaborate cultural codes of communication” (p. 8). Thus, computing infrastructures comprise much more than design cultures and their necessarily political artifacts. Computing infrastructures are always-already part of a much larger ecology that involves a variety of socially constituted systems, all of which interact in dynamic and often unpredictable ways to construct an expanded infrastructure shaping possible instructional futures.

In use contexts, the dominant discourses associated with computer policies, computer classroom designs, and curricular requirements provide easily accessible examples. Although there are other discourses that could be examined, these areas are particularly illuminating because their discourses are public and affect academic life on a daily basis. In fact, the three examples offered here represent actual situations in which contexts of use contributed to a heightened sense of marginalization among different constituencies in an academic community. The regularization strategy in operation is differential incorporation, whereby a “technology is structured so that people of different social categories are incorporated into it in ways that reflect and attempt to reinforce their status” (Pfaffenberger, 1992, p. 292).

The first situation occurred several years ago and concerned the amount of server space allocated to students, staff, and faculty members. By default, all students and staff were given two megabytes of space for their web sites, while faculty were supplied with three times as many megabytes. Although additional server space was available to students, they were charged for it unless a faculty member was prepared to underwrite a multimedia project that was educational in scope. But the twist is that student accounts remained active for six months after graduation; in contrast, the accounts of faculty and staff were closed upon termination of employment. Thus, the clear message was that computer users were extended professional courtesies only when those users were in a position to contribute to the institution. The second situation involved a paraplegic student in one of my courses whose needs were not accommodated by the computer classrooms in which English instructors taught. The university was committed to the assistance of persons with disabilities—a pledge required under federal nondiscrimination laws—and technical support and equipment were available, but only in specialized labs that could not be reserved for regular class sessions. So each period this student was reminded of her second-class citizenship, as she contended with an already atypical instructional setup (a crowded computer classroom) without the benefit of a raised table for her wheelchair, an oversized monitor, or a document holder to position papers upright at a workable angle. The third situation occurred in the context of academic advising activities. For years I encouraged students to enroll in upper-division courses on the design of computer-based instructional systems, to help them prepare for jobs as practitioners of technical writing. Yet such courses often had math prerequisites that precluded the enrollment of English majors, even though the courses did not draw on math in a central way. The prerequisites, in essence, served as social filters that established an arbitrary

relationship between calculus and the design of human–computer interfaces. Philip Davis and Reuben Hersh (1986) noticed a similar situation in MBA programs: Calculus is not used extensively by business persons, executives, or entrepreneurs, but business schools often have a calculus requirement because it boosts prestige and cuts down on the number of applicants. So in each of these examples—policies on server space, computer classroom designs, and prerequisites for computer-oriented classes—the resources of an institution gravitated in the direction of power and privilege.

As a responsive move, countersignification suggests redressive social processes that can be used to address the regularization strategy of differential incorporation. In this move, the focus is on the dominant discourses that help to engender the politics instantiated in computers by design cultures. Users, in acts of countersignification, surreptitiously substitute cultural narratives that undermine or contradict the processes of technological regularization. This discourse substitution resituates artifacts in networks of social relations that elevate the status of those individuals or practices that have been diminished. According to Pfaffenberger (1992), “Countersignification gives people a way to live within the system without suffering unhealthy losses of self-esteem. In this sense, it is a form of accommodation to regularization” (p. 301). To clarify, it is a form of accommodation in that users work in oppositional ways within an existing infrastructure as opposed to creating or seeking out an alternative infrastructure. In my illustration of differential incorporation, I used three examples to demonstrate that use contexts can structure technologies so that people of different social categories are incorporated into them in ways that reflect and attempt to reinforce their status. Yet, in each of these instances, interpretations could be generated through problem-posing approaches to rearticulate the stigmatized perspectives of users.

In the first example, the unequal distribution of server space might be construed not in the context of instructional design and policy, but in the coarse realities of capital campaigns in which universities must leverage technological resources in order to establish financial support. Such an intellectual exchange can be accomplished if people are encouraged to see educational institutions as demystified businesses, something that is not much of a stretch for several reasons, including the fact that education has been too often conceived of as a goal-oriented business transaction. How are computing infrastructures funded on a campus? Are there different levels of access to them that result, at least in part, from the economic models in place? In what ways does technology relate to fundraising efforts? (And just why do so many universities now provide students with free email for life?) Such problem-posing questions take into account the economic contexts of education, asking how teacher and student subjectivity is constructed by the dominant discourses associated with technological regularization. In the second example, students with disabilities can be made to feel inadequate because their personal situations do not accommodate standardized technical designs, or, in contrast, an emphasis can be placed on attitudes toward disabled people and the injustices perpetuated through ignorance and insensitivity. In my course, this emphasis emerged from an atmosphere of courage fostered by a paraplegic student who not only challenged normative assumptions about computing infrastructures but also dispelled widespread misconceptions about the disabled. The problem-posing approach involved our enthusiasm as a class about hearing her stories of discrimination and using them as the basis for an unplanned project on the politics of adaptive computing on campus. In the third example, arbitrary prerequisites for computer classes could be parsed

as yet another instance of institutional practices that stratify disciplines in terms of power, resources, and status. Despite persuasive arguments in English studies that posit the relevance of a liberal education in a digital age, students and teachers are perpetually subjected to negative stereotypes that construct the humanities as soft (“feminine”) subjects and the sciences as hard (“masculine”) ones. But these stereotypes, which demoralize students and teachers, could be denaturalized with discourses that foreground stratification systems and the social processes by which inequalities are produced, legitimated, and maintained in university settings. What contributes to the establishment and perpetuation of disciplinary pecking orders? Why might certain school subjects be considered gendered? How are curricula and their prerequisites established on a campus? Such problem-posing questions take into account the hierarchical character of educational sites, asking how teacher and student subjectivity is constructed by the dominant discourses associated with technological regularization. Although there are other strategies of technological adjustment, countersignification is a good example for teachers of writing and communication because it makes the most of the constitutive powers of language.

Like design cultures, use contexts contain dominant discourses that influence the activities associated with using a computing infrastructure. Computer policies, computer classroom designs, and curricular requirements are just three areas that can bring these discourses to critical light. But such areas are particularly meaningful examples in that many teachers have had to deal with them over and over again. Although familiarity can make it difficult to see political aspects, familiarity coupled with meta-discourse heuristics can allow teachers to more fully imagine the politics of a use context and possible responses that are productive.

### 3.3. *Institutional forces*

If the context of use settings refers to the more immediate environments that help to situate and constitute a computing infrastructure, the context of institutional forces refers to the less immediate factors that still have roots in university settings, such as those related to centralized resources, tenure and promotion policies, and academic–corporate alliances. This less–more distinction can be rather fuzzy at times, in large part because institutional forces often have a measurable impact on use settings. Moreover, although I tend to concentrate on those things operating from “above” the department level, there are plenty of examples that confound this division. For instance, many faculty consider tenure and promotion to be institutionally driven processes, yet (needless to say) a department and its personnel are crucial to any specific case. But the point is that there are larger forces that impinge upon computing infrastructures in a direct and immediate fashion, and that teachers should be aware of such forces.

Although Pfaffenberger (1992) discussed centralization and standardization as regularization strategies, they can provide insight into the nature of institutional forces, which do not always have negative consequences but should be watched closely if teachers are to understand the issues. Let me deal with centralization first and standardization second. Will computers serve to centralize control or redistribute power in productive ways? This question is not new, yet it persists because there is so much at stake in the answer. And the answer depends on who you ask and on the circumstances under which computers are used. To be sure, ample evidence exists to substantiate either outlook, sometimes even in the same context. For example, Internet applications legitimize the need for academic computer centers that can manage individualistic

resources for different kinds of departments with diverse goals and constituencies. Hypermedia programs encourage users to navigate delimited databases in an idiosyncratic fashion. And peer-reviewed journals provide online forums in which readers can publish unmoderated commentaries on officially sanctioned discourses. In each of these instances, then, there are elements of centralization and decentralization that are in tension with each other.

Herbert Simon (1980) discussed the consequences of computers for centralization and decentralization in organizations. He noted the inclination to characterize centralization pejoratively and decentralization positively and cautioned against this binary opposition. Centralization, Simon argued, is commonly equated with bureaucracy or authoritarianism while decentralization is equated with autonomy, self-determination, or self-actualization. But the truth of the matter is that certain functions of centralization can be helpful. At my institution, for example, the computer classrooms are maintained by central administrators who seek organized input from academic units on the pedagogical directions that should be taken. The challenge for the English department is to capitalize on the economies of scale in ways that enable us to protect our principal interests. This involves priorities and a series of calculated tradeoffs, such as working with a computing infrastructure that is not always perfectly tailored to meet the needs of writing and communication courses. However, I would prefer to cope with an imperfect situation if its resolution requires a faculty-member effort that is disproportionate to the payoff. To put it another way, on occasion it makes more sense to draw on institutionalized resources and structures than to expend the time and energy required to create better alternatives.

Still, centralization practices often consolidate control away from those who are supposed to be empowered by computers, and this consolidation becomes all the more problematic when such practices crisscross institutional levels. The classic struggle is with a computer center that attempts to hold sway over individual departments. I have witnessed situations in which teachers were not permitted to install registered shareware programs because autocratic procedures of operation defined the job of configuring computing infrastructures as the territory of computer technicians. But I have also watched in astonishment as teachers who claim to be radical educators made unilateral decisions about departmental software programs, controlled the distribution of student email messages, and reined in character privileges in MOO spaces. Because the centralization of power can be furthered with computers, teachers should be on the lookout for conduct that is antithetical to the goal of equal access to technological infrastructures that have been designed and managed in a participatory manner.

Like centralization, the standardization of computing infrastructures can be advantageous to users. Imagine an educational institution in which no standards exist for the exchange of digital information, or the more likely scenario of multiple standards that have not been reconciled. In either case, it could be laborious, if not impossible, simply to share a data file or pass a message or collaborate online in other ways; moreover, users would have to master divergent systems in order to be productive. In addition, having a wide variety of systems increases costs and requires nimble technical personnel who can solve an array of quirky interoperational puzzles. Although any one of these headaches might compel a user to plead for standardization, there can be downsides to this measure that should not go unnoticed. In fact, there are cogent reasons for teachers to be involved in the process of standards creation.

Lin Brown (1993) outlined the difficulties of standardizing computing infrastructures for large-scale institutions like educational institutions. These difficulties include a shaky foun-

dation of research upon which to base standards decisions, the politics of standards creation, and the potential for standards to stifle innovation. Brown addressed computer engineers, but her concerns are salient in the context of access. As to research upon which to base standards decisions, researchers have surely just started to understand computers as a location for literacy education, one that is difficult to describe because rapid technological change frustrates both longitudinal studies and generalized conclusions. For this reason, teachers should push for adaptable institutional standards until more durable observations have been amassed that account for the disparate literacy experiences of students. The politics of standards creation concerns the potential for conflicts of interest. Standards should typically be developed in interdisciplinary committees in which the intellectual commitments of English departments are openly represented, not by omnipotent technical faculty who have direct ties to private enterprises. Although this sounds utterly reasonable, institutional standards can evolve out of exclusive academic–corporate alliances, such as technology transfer projects that incubate specialized applications. Finally, the tension between standards and innovation should not be ignored. If software controls how computers operate, it also, as journalists [Jim Nesbitt and Jim Barnett \(2002\)](#) reported, “channels the way people think, write and do work in ways that stifle creativity and groundbreaking thought” (para 3). The familiar argument these journalists offer is that a singular machine setup limits the imagination because alternative perspectives are not represented. That is why some teachers in standardized situations have developed redressive social processes to help students arrive at writing and communication practices that are genuinely meaningful. One of my own strategies is to standardize document specifications, particularly file formats (output), but not process approaches. As a result, students can conveniently share work that has been created in individual ways.

Using [Pfaffenberger’s \(1992\)](#) theory to illuminate the politics of institutional forces, it is not hard to see dominant discourses that shape the computing infrastructures on a campus. Indeed, my students have pointed out a clever regularization strategy in which a campus-wide technology program “provides compensatory goods and services in an attempt to deflect attention away from what is really going on” (p. 292). The Penn State/Microsoft Program, which in various configurations partners Microsoft with an enormous number of educational institutions, provides students and departments at Penn State with brand-new software that they can use freely for academic purposes. To participate, students can initiate contact with the Microcomputer Center on campus in order to obtain the software once the university establishes their eligibility (students are eligible if they are continuously enrolled Penn State students who own a computer and who have paid all tuition and other charges, plus an Information Technology Fee of \$160 per semester). Students either download the software from a secure server or borrow installable CDs from a lending library on campus. If a student has a WINDOWS-based computer, for example, the software includes the latest version of the WINDOWS operating system; the latest version of OFFICE PRO, which contains EXCEL (spreadsheet), WORD (word processor), POWERPOINT (presentation), PUBLISHER (desktop publishing), ACCESS (database), OUTLOOK (email and information management), and SMALL BUSINESS TOOLS (business and customer management); the latest version of VISUAL STUDIO PROFESSIONAL, which contains a suite of development applications (e.g., VISUAL C++, VISUAL FOXPRO, VISUAL INTERDEV); and the latest version of FRONTPAGE, for HTML development. The upside of the Penn State/Microsoft Program is incontrovertible: At educational resale costs, the free software still amounts to a

windfall of well over \$500; teachers can make reasonably safe assumptions about software access on and off university grounds; and extensive tutorials and workshops have been built up with centralized resources to educate and support teachers and students.

However, campus-wide enthusiasm has masked potentially dangerous dimensions of the program. From one point of view, it is nothing but an abundantly fertile seedbed that Microsoft has planted to grow its installed consumer base. But in fact, as Jonathan Sterne (2000) noted, teachers can unwittingly contribute to the success of deflection strategies. He argued that “Instead of carrying a neutral valence or even a positive one, the very idea of computer literacy is conflicted at its core: While educators clearly intended computer literacy as the ability to control machines, the language of literacy can easily degenerate into the project of creating consumer populations for communication technologies” (p. 192). This train of thought might resonate with distance education students, who are excluded from the program, I suspect, because they are typically profiled as already networked and unusually motivated. Furthermore, the program begins to erode the oversight teachers should have in instructional settings. If Microsoft systems are used to manage administrative data at Penn State, they have also become the default selection in pedagogical undertakings. But, as Stephen Doheny-Farina (1996) argued, users—not employers or technicians—should define their own relationships to computing infrastructures. He is worried about privacy rights, yet other issues are also at stake. I admit that, if consulted, in all likelihood I would recommend Microsoft OFFICE as a productive suite of applications for students in writing and communication courses, although FRONTPAGE as an HTML development environment can be astonishingly cryptic and unfriendly to nonMicrosoft web browsers. Nevertheless, the point is that teachers who have expertise that is useful to the critical evaluation of literacy technologies should not be expected to simply adapt to whatever political deals have been struck by the power structures of increasingly corporate universities. To some extent, the Penn State/Microsoft Program has been a real boon, but it abates reasonable critique of the on-going commodification of higher education.

In response, counterappropriation provides redressive social processes that can be used to address the regularization strategy of deflection. If countersignification substitutes discursive contexts, counterappropriation reinterprets dominant discourses in an attempt to alter patterns of technological access and control. How might such an effort develop? Pfaffenberger (1992) offered an example by recalling the cultural history of aviation. Early popular images characterized flight as a fundamentally masculine endeavor in which chivalrous pilots took innumerable (and interesting) personal risks. Needless to say, such a perilous representation did not instill confidence when air transport became available to the general public, a fact exploited by female pilots who were eager to shed their gendered roles. In a move of counterappropriation, the airline industry welcomed traditional feminine stereotypes that could convince the masses that flying was neither difficult nor dangerous. However, as Pfaffenberger pointed out, counterappropriation often “rejects only some of the negative status implications of regularization. It accepts others to the extent that properly reinterpreted, they can legitimate access to artifacts” (p. 302). That is, while feminine stereotypes enabled female pilots to have access to airplanes, such stereotypes paradoxically limited their professional opportunities.

Not surprisingly, the cultural history of computers exhibits parallel patterns of counterappropriation. As computers emerged out of specialized research sites, highly scientific and technical

images were not amenable to the establishment of computers as mundane artifacts that could be centralized and standardized in institutional settings. Thus, the computer industry acknowledged and even encouraged representations that announced computers as usable machines that could be mastered by ordinary people. The tool metaphor helps teachers become involved because it constructs computers in ways that highlight instructional philosophies and activities. But this metaphor also restricts teachers because its neutral dimensions insist that teachers do not need to know about the design issues associated with computing infrastructures, which are considered to be the domain of impartial technologists. This situation presents many questions to reflect on: Who controls the computing infrastructures in an educational institution? In what ways do academic–corporate alliances contribute to patterns of centralization and standardization? And who really profits from these patterns? In the context of counterappropriation, such problem-posing questions invite teachers to consider dominant institutional discourses and how they might be reinterpreted in order to alter patterns of technological access and control. In the case of the Penn State/Microsoft Program, one option would be to reinterpret the design of computing infrastructures as a pedagogical rather than technical task, one that includes student perspectives. Although the early mythos of academic computing presented infrastructure design as an inherently technical activity, this construction has slowly begun to give way to institutional calls for teacher participation. The objective for teachers is to exploit these calls in ways that help to create a new mythos that expresses a connection between infrastructure designs, pedagogical actions, and institutional forces.

As both concepts and practices, centralization and standardization can lead toward an increased awareness of the politics of institutional forces. Academic–corporate alliances are convenient sites within which to reflect on such forces, although centralization and standardization should be considered potential starting points and not the only choices. There are certainly other choices that can shed light on the institutional forces that affect computing infrastructures and user access to them. For example, faculty members could be asked to contemplate the working conditions of part-time and nontenure track instructors, who are often the recipients of outdated computer equipment and who are often prioritized toward the bottom of rank-ordered lists for maintenance and pedagogical support. There are obviously huge differences in status among teachers, but certain groups of teachers can have even less access to computers than students do. So status is another avenue into the realm of institutional politics. Still other avenues are suggested by the additional power moves associated with technological regularization.

### *3.4. Popular representations*

This context refers to representations in the public imagination that contribute on some level to the ways in which computing infrastructures get constructed and employed. By representations I mean those images, narratives, and tropes that have insinuated their way into our collective subconscious, usually through the mass media. Although attitudes toward computer technologies can be ambivalent and complex, the popular representations that have been woven into the fabric of Western culture play no small part in helping to establish and define the dominant discourses that prevail in university settings. This is hardly news to those teachers who ask their students to critically analyze the often unhealthy and unrealistic ideas fed to them through the diet of popular culture messages. Still, some of these messages can be rather

subtle and do not always produce easily recognized effects on computing infrastructures. So let me provide an example to clarify the content and scope of this context.

In the months before and after the first copies of WINDOWS 95, WINDOWS 2000, and WINDOWS XP were released, Microsoft and its major operating systems received an enormous amount of media attention. In fact, few events associated with the computer industry have been so ambitiously covered in evening news reports and weekly magazines, not to mention the energetic conversations on the Internet among educators and academic administrators relying in central ways on computer technologies to support their work. At least two dominant topics emerged from these different conversations. The first one related to technical issues and included the following kinds of concerns: Is the new operating system sufficiently stable? If so, should I adopt it? What are the benefits? Is the new operating system compatible with my current software programs, or will I need to purchase new programs to take advantage of its features? If I use the new operating system, can I still exchange files and collaborate easily with people running an older operating system? These concerns, of course, are extremely critical in any work environment: Even a minor upgrade in a single software application, let alone a major upgrade in operating systems reported to contain some millions of lines of computer code, can wreak havoc on well-established tasks and procedures, creating more problems than improvements for computer users. In addition, when WINDOWS 95 was released it was important to consider the mechanics of an operating system claiming to support true 32-bit architecture, particularly for those teachers interested in multimedia development.

The second topic that emerged related to business ethics and the law. In this case, the questions revolved around antitrust issues: Is Microsoft too big? Does it have a monopoly on the operating system market for personal computers? Is Microsoft engaged in anti-competitive practices? If so, what should the government do about it? And, in terms of government actions, what is in the best interest of the public? These thorny questions deserve attention—protecting free market competition is one partial way to encourage technological innovation in the computer industry. Moreover, with the vast majority of computers today running Microsoft operating systems (some estimate that 9 out of 10 personal computers use a version of WINDOWS), it is important to protect what little diversity exists in how human–computer interactions get represented in online environments. Indeed, because computer users are an increasingly diverse group in both intellectual and cultural terms, software should support different ways of knowing and learning.

These two areas—technical and ethical—were debated and discussed in great detail in the popular media, as they should have been. The people selling and supporting the updated operating systems touted their new features and the ways these features might make computer users more productive, while those taking more critical positions scrutinized the business practices of Microsoft, both in general and in terms of how Microsoft brought these particular products to the marketplace. From an educational perspective, however, noticeably absent from the conversations about how WINDOWS operating systems would revolutionize teaching, learning, working, and knowing (no one ever accused Bill Gates of being unambitious) were considerations of the larger forces and factors that might make such a revolution possible. Even among most critical participants in the discussion, for example, there was little to no mention of the cultural and pedagogical assumptions informing the software, of the challenges in creating professional and institutional environments that encourage teachers to move their

classes online, of the difficulties in devising computer-based course assignments that meet the instructional goals of educational programs, of the literacies that online environments tend to privilege, or of the results of actual online learning experiences. For all the talk of bits and bytes and unfair business tactics, a number of really tough questions were ignored, leaving the public and the profession with a distorted view of what is required in human terms if computers are going to productively support everyday teaching and learning activities.

The point of this example is that the discussions surrounding the release of major WINDOWS operating systems rehearse almost exactly the same discourse, one that encourages users to think that computer technologies—all on their own—can bring about meaningful educational change. This common progress narrative typifies the types of popular representations that have been consistently interpreted in Western societies as the gospel truth. There is no shortage of popular representations that attribute to computers an impressive array of essential causal powers, nor is there much of a sustained effort in educational settings to paint a more complicated picture. However, what is particularly noteworthy about this example is the subtle way in which it works. The focus on antitrust law is meant to bring a critical perspective to the situation, serving as a corrective to functional discussions that concentrate on technical arguments and explanations. This is not a problem in and of itself, but such a focus can serve a kind of metonymic function by which the whole complex of critical issues comes to be represented exclusively by certain narrow aspects of it. Which is to say that the dominant discourse effectively defines away the more intractable issues, building the meaning of the whole from the perception of a particular part. This is a dangerous (if prevalent) ideological condition because it occludes the social and pedagogical dimensions of computing infrastructures.

To get to the heart of the matter, teachers should reflect on the popular representations that are implicated with technological regularization. Issues of access can provide an effective gateway because so many representations construct computing infrastructures as intrinsically democratic spaces that will most assuredly bring about positive social change, especially for those segments of the population that have been historically disenfranchised. Although access narratives have foregrounded the initial obstacles to capital equipment acquisition and, to a lesser extent, the open-ended costs of periodic upgrades and repairs, certain regularization strategies remind us that technological access can be successfully restricted in a number of less obvious ways. The regularization strategy considered here is segregation, whereby “access to the technology and its benefits is in principle open to all, but it is so expensive or difficult to obtain in social terms that few can really enjoy it” (Pfaffenberger, 1992, p. 292).

Decades ago, Intel chairman Gordon Moore accurately predicted the exponential growth in computer power that users prize today. According to Moore’s Law, the computational power of a chip doubles every 18–24 months, which is to say that the standard university computer now contains a microprocessor that can undoubtedly handle the usual work of students and teachers in writing and communication courses. This multiplication of capacity has been accompanied by a steady decrease in the cost of hardware and software, a rhythm that signals an end to prohibitive computer prices. Media commentators and others point to these parallel trends as evidence that universal access will soon be achieved, that it is only a matter of time before the public as a whole can profit equally from computers. But the flaw in this narrative is that the social requirements for access have not been factored in, and these can be costly and hard to secure. Indeed, it is both expensive and difficult, for example, to provide access to

meaningful educational opportunities and to people who understand how to use computers effectively.

This fact can be driven home if one considers the dominant approach to systems analysis and possible responses to it. On university campuses, one important responsibility of a systems analyst is to recommend technological infrastructures that are suitable for students and teachers. As Rob Kling (1992) noted in his research on computerization, the dominant approach is inspired by “discrete-entity” narratives (p. 369) in which an emphasis is placed on the development of technical relationships. In these narratives—examples of which can be found easily in popular culture messages—computer resources are represented as individual pieces of equipment, applications, or techniques that can be seamlessly integrated into the ways we live and work. The unstated assumption is that computers, which are considered to be value-neutral devices, can be understood independently of larger social structures and forces. When as Speaker of the House Newt Gingrich (cited in Moss, 1995) quipped that a tax credit for laptop computers should be given to the poorest of North Americans, his proposal did not include support for peripherals, phone lines, or Internet services, let alone educational opportunities that might untangle the knotty features of computing infrastructures. According to Gingrich’s paradigmatic example of a discrete-entity narrative, the one-time purchase of computers should be enough to rescue the digital underclass.

Discrete-entity narratives and the systems analysis processes they encourage can be addressed with the responsive move of technological reconstitution. As I have mentioned already, this move typically represents a more aggressive reaction than technological adjustment and its strategies of countersignification, counterappropriation, and counterdelegation—three strategies that offer effective ways to minimize the detrimental aspects of computer technologies and contexts. In successful acts of technological reconstitution, computer users create actual counterartifacts that displace the politics of technological regularization. Technological reconstitution represents a more aggressive reaction, and as a result, people should be wary of potential reintegration efforts, which are conservative attempts to co-opt artifacts once they have been reconstituted.

Pfaffengerger (1992) discussed the development of online bibliographic databases as a clear-cut instance of technological reconstitution. He explained that in the 1950s and 1960s rebellious librarians created online databases in response to “what they saw as the unscientific, unsystematic, and technically conservative ethos of librarianship” (p. 306). What is more, these librarians called themselves “documentation specialists” or “information scientists” and, besides that, collaborated across educational institutions and with the private sector. The first thing to note in this example is that the insurgent nature of technological reconstitution is produced by acts of antisignification, which either reverse or negate the dominant discourse. If traditional library practices were unscientific, unsystematic, and conservative, online databases would be the exact opposite: scientific, systematic, and flexible. However, strategies of reconstitution hinge on the creation of countercontexts and even counterregularization strategies to enable them. For this reason, in addition to the online databases, the rebellious librarians also created new job titles, partnerships, and narratives that touted databases as enormously progressive educational technologies.

In the context of processes that determine suitable computing infrastructures, hypertext-like or web narratives suggest possible responses that recognize the need for social resources. In fact,

hypertext itself could be regarded as an example of technological reconstitution. The hallmark of essays on hypertext is an argument that mobilizes the logic of antisignification: Books are static, linear, hierarchical, author-centered, and dialogic, while hypertexts are dynamic, nonlinear, nonhierarchical, reader-centered, and polylogic. This oppositional discourse has cultivated ideological rhetorics of liberation, which in turn have prompted a flurry of hypertext programs, courses, claims, and theories. Web models of systems analysis mobilize the logic of antisignification in similar ways. Kling (1992) noted that “web models view computer-based systems as complex social objects whose architecture and use are shaped by the social relations between influential participants, the infrastructure that supports them, and the history of commitments” (p. 373). So if discrete-entity models focus on technical relationships, web models focus on human relationships and the ways in which computer uses are constrained by the availability of social resources, which are neither unlimited nor inexpensive, especially in academic settings.

In teacher preparation courses or in faculty development programs, this contrast could become the basis for a critical literacy project. Because technological reconstitution produces counterartifacts that displace the politics of technological regularization, one might ask new teachers to design a social process that can be used to determine suitable computing infrastructures for students in a writing course. For example, new teachers might design a process that requires them to interview more experienced computer and composition teachers from around the country in order to learn about their pedagogical support structures (or lack thereof). This project not only stresses that technologies are more than physical artifacts but also defines systems analysis as a humanistic activity that requires a considerable measure of disciplinary knowledge. Although most universities have well-established processes for determining the efficacy of computing infrastructures, as might be expected these often echo discrete-entity narratives in that they focus on technical relationships. However, such processes, whether they be codified or in some way understood, provide the contrast needed to call to mind the logic of antisignification. What types of social versus technical resources do students need in order to be successful? What about teachers? And are there popular representations that might be exploited to support more socially based models of computerization? Teachers can use these problem-posing questions as a guide to design a social process for systems analysis. On the whole, they should discover that if computers have diminished in price, the social resources required to ensure equitable access can be steep, not only fiscally but also politically (especially in terms of the cultural capital required to establish technological literacy as an accepted intellectual currency in departments of English).

A final point is that counterartifacts can be co-opted in reactionary moves of reintegration, a conserving dynamic in technological reconstitution that should be emphasized. The intent of reintegration, as Pfaffenberger (1992) made clear, is to “gain control over these artifacts by bringing them back into the controlled and ordered space of regularization and then performing technical modifications that blunt their revolutionary potential” (p. 307). In the earlier example of online bibliographic databases, the response of the traditional librarians was to exercise their control over institutional resources, so that the database design process could not proceed without them. Once involved in the design process, the librarians, who were worried that the online databases would either deskill or replace them, negotiated technical features that preserved their primary expertise in subject classification systems. The end result was

a human–computer interface that could not be employed systematically without the skills of traditional librarians.

Likewise, one can imagine reactionary moves of reintegration in the context of systems analysis processes. A successful move can be found in processes that give primary attention to social rather than technical dimensions, yet buy into egalitarian narratives of empowerment and enfranchisement that overpromise the effects of computer technologies. Such processes construct computing infrastructures not as value-neutral spaces but as intrinsically democratic spaces, an equally deterministic account that minimizes the need for social resources. For if the popular MCI advertisement is correct—that there are only “minds” in cyberspace—then power and authority are no longer complexly determined by a wide range of social, political, institutional, and technological forces, but by the degree to which ideas—pure ideas—are accepted or not accepted in the marketplace or schoolplace (two environments, incidentally, that are also often constructed as intrinsically democratic spaces). The concept of reintegration functions as a counterweight to such progress narratives because it reminds teachers that power continuously circulates in the contested and highly political territory of computing infrastructures.

This context should resonate with the many teachers who consider popular representations to be an area of great consequence for students. As with the other contexts, this one contributes dominant discourses that have an effect on the activities associated with using a computing infrastructure. But a distinction is that this effect can be more difficult for teachers to see because of the perceived distance between representations in the public imagination and decisions made in the context of locally operated facilities. This is one reason why the responsive move of technological reconstitution is particularly valuable here: In order to produce counterartifacts that displace the politics of technological regularization, teachers must be able to make concrete connections that implicate popular representations. Systems analysis is one site in which we can more easily make such connections, in large part because of the discrete-entity narratives that discourage an attention to the social resources that computer users need in order to be successful.

#### 4. Conclusion

Michael Joyce (1995) argued that “Technology aspires toward transparency. Insofar as that aspiration intends to hide its failings, technology, like any unacknowledged representation of power, endangers learning” (p. 65). Teachers who are critically literate are alert to the fact that computers can be dangerous, although their attentiveness is neither superficial nor unfocused. To put it another way, teachers should be able to recognize and articulate the ways in which power circulates in technological contexts. The approach this article offers encourages the use of heuristics that can help teachers develop a meta-discourse for political critique, one that illuminates the dominant discourses associated with design cultures, use contexts, institutional forces, and popular representations—four contexts that centrally shape computer-based activities in educational settings. But while this approach is effective, I should underscore that it is only one method of critical analysis, and therefore inescapably restricted in perspective. Hence, one task for the profession is to develop a full-scale assortment of meta-discourse heuristics with a critical bent.

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