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Reimagining the Functional Side of Computer Literacy

Although computer literacy amounts to a complex set of interconnected capacities, teachers of writing and communication have tended to ignore functional issues, which are crucial to many aspects of online work. This essay reimagines the functional side of computer literacy, arguing for an approach that is both effective and professionally responsible.

It is certainly no news to report that a great many colleges and universities are beginning to embrace requirements for computer literacy. The University of Texas at Arlington, Old Dominion University, the University of the Virgin Islands, Marshall University, Utah State University, the University of Louisville, Houston Baptist University, Georgetown College (in Kentucky), and Westminster College—these are just some of the schools that are now requiring students to become computer literate, in response to the urgings of corporate employers and academic accrediting agencies. Florida State University is typical in the way it defines computer literacy: Since 1998, Florida State has had a clearly articulated policy requiring all undergraduate students to demonstrate basic familiarity with computer hardware, operating systems, and file

concepts; a working knowledge of a word processor, spreadsheet, and database program; and an ability to use the World Wide Web and e-mail (see http://lit.cs.fsu.edu). These requirements are matched by similar requirements at other schools. In an interview on National Public Radio, Ken Baldauf, the computer literacy czar at Florida State, declared that the goal of this policy is to develop in students "the application skills that businesses are looking for." Although students could, in theory, take an approved course in the English department that complicates and expands on such a goal, the department does not offer one. In fact, when I contacted Wendy Bishop, a professor of rhetoric and composition at Florida State, about her university's computer literacy requirement, she was unaware of it. For this lack of awareness, the English department and Bishop should not be condemned. Rather, this situation merely illustrates the fact that faculty in English departments are rarely (if ever) consulted in institutional matters of computer literacy.

For that matter, computer literacy is a vexing and ongoing problem even for those teachers of writing and communication who are aware of and interested in computer literacy. Indeed, for more than two decades the discipline has attempted to make some sense—in social, political, historical, professional, pedagogical, and functional terms—of computers not as computational machines but as literacy environments, environments that leave very few activities, individuals, or structures entirely unaffected. As might be expected, the shape of this conversation about computers and literacy has shifted over time, usually reflecting more general views on composition studies and its theoretical directions. In the 1980s, for example, teachers of writing and communication wondered whether word-processing programs could make students better writers—and how (see Hawisher). In keeping with process-oriented research, teachers focused on the ways in which computers might aid prewriting and revising activities (Flinn; LeBlanc; Parris; Strickland; Weiss). In the 1990s, discussions about hypertext echoed within the social turn of the discipline, as researchers considered how richly networked texts might confound the very idea of literacy itself (Snyder; Bolter, *Writing Space*; Johnson-Eilola, *Nostalgic Angels*). Especially vigorous in the last decade or so have been discussions of critical literacy, in part because the agenda of technology education often amounts to little more than indoctrination into the value systems of the dominant computer culture—systems that could be characterized as well-intentioned but not particularly self-reflexive, especially when it comes to the effects and implications of technological designs. In their recent efforts to provide students with an appropriate and worthwhile education, teachers of writing

and communication have understandably focused on critical concerns instead of functional concerns, pursuing questions such as the following: What is lost as well as gained in a digital age? Who profits from particular technological arrangements? Who is left behind and for what reasons in technological settings? And, in those settings, what is privileged in terms of literacy and learning and cultural capital? These questions are appropriate for humanists—even indispensable in that they can serve as a corrective to popular misconceptions about the role of technology in society.[1] However, all too often critical approaches simply replace one kind of literacy with another; attentive to crucial questions of power and social justice, these approaches fail to expose students to the wide array of literacies they will need in order to participate fully and productively in the technological dimensions of their professional and personal lives. They fail, in other words, to attend to such functional concerns as managing online environments, participating in online activities, and dealing with technical problems. A more complete approach to computer literacy, then, would be more additive than substitutive: Students need both functional and critical literacies (as well as other types of literacies like the rhetorical and visual literacies involved in Web site design and production).

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Although computer literacy amounts to a set of interconnected capacities (Kellner; Selfe; Sullivan), teachers of writing and communication are not used to thinking about functional literacy in positive ways. Functional literacy has been reduced to a simple nuts-and-bolts matter, to a fairly basic skill based on mastery of technique. As Glynda Hull explains, functional approaches that equate literacy with basic skills "suggest literate abilities that are 'basic' in the sense of being simple and fundamental, involving the decoding or encoding of brief texts within a structured task or carrying out elementary addition and subtraction calculations" (663). This view understands functional literacy in much the same manner that current-traditional rhetoric understood written texts: not as socially or rhetorically embedded but as expressions of grammar, style, and form, all of which could be learned in prescriptive and decontextualized ways.[2] Moreover, functional literacy has been equated with a multitude of flawed practices and perspectives that undermine responsible educational objectives: Critics have argued that limited approaches to teaching functional skills overlook cultural contexts (Street), focus on vocational requirements (Knoblauch), and reinforce social norms and values (Giroux). In

considering the purposes and settings of literacy, critics have denounced functionalist approaches (oftentimes with justice) for supporting and maintaining the economic, cultural, and political status quo and for domesticating and dehumanizing students.

Such criticisms should certainly not be dismissed, particularly in a digital age where competency is so frequently understood and measured in mechanical terms. Although programming is no longer the central task of computer users, recent attempts at defining the functional side of computer literacy have often been decidedly uninspired, if not harmful. Most such attempts straightforwardly cover the technical aspects of software applications, hardware components, and operating systems (see, for example, Baker; Barger; Capron; Dougherty; Reiss; McGowan and Cornwell). Under this rubric, discrete, short-term goals can be met, but the drawbacks keep technical approaches from becoming a viable instructional strategy. "Literacy," as Sylvia Scribner reminds us, "has neither a static nor a universal essence" (72), yet the hallmark of functional literacy as it has been traditionally mapped out in technology settings is a focus on highly specific, stabilized skill sets detached from particular social contexts. Critics rightly reject this focus as myopic and irresponsible, even damaging.

Critics of the shortcomings of functional literacy are, all too often, accurate in their assessments, at least as far as those assessments go. For functional literacy often becomes a blunt tool with which ruling classes create minimally skilled workers. However, to paint functional literacy with the broad brush of repression misses the fact that functional literacy is a necessary if not sufficient condition of all other forms of literacy. But the potential exists for an alternative perspective. In fact, visions of functional literacy have not always been so disturbing.

For example, Kenneth Levine traces the linkages that have been established between "literacy" and "functional" since World War II, when these two terms first became routinely conjoined; and although he focuses primarily on numerous defects, his brief history reveals some unexpected positives. According to the history, the first authoritative publication on functional literacy to reach an international audience was William Scott Gray's 1956 survey of writing and reading conducted for UNESCO, the principal organization for international literacy efforts after World War II. In Gray's survey, functional literacy was not associated with work or any particular setting. As Levine explains, the survey "emphasized that the content of [functional literacy] training should reflect the needs and motivations of the groups served, and should aim for a

self-sustaining standard—one which permits pupils to make independent use of what they have learned without further help from an instructor" (253). Thus, functional literacy, in this early articulation, was conceived as the ability not only to write and read on a minimal, survival-oriented level but also to construct new meaning through literate practices. This "original humanist strategy" (254), it should be noted, "was intentionally relativistic, allowing for different thresholds of literacy in various societies" (253). Gray's pluralistic formulation granted access to a culture, but in the "noblest and widest sense" (255).

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But in political and diplomatic contexts, the abstract nature of Gray's definition was exploited, as various literacy campaigns appropriated the idea of functional literacy to justify the expense of adult training programs. People inevitably linked functional literacy with literacy for work, especially with concrete training in technological skills, because such a commonsense linkage capitalized on the economic benefits that could be derived from investments in literacy initiatives. Once this linkage was established, the social dimensions of literacy began to fade from sanctioned discussions, and it was only a matter of time before functional literacy became synonymous with a narrowly conceived job-related literacy. The inevitable next step in this regression was for people to devise various schemes for assessing literacy to satisfy sponsoring agencies. As Levine notes, however, in order to use the indicators so important to economic analysis, literacy needed to be treated as an entirely objective matter in which skills are gained through a developmental process that is universal. Such a psychometric testing paradigm assumed that if skills were clearly defined, they could be accurately measured (Cook-Gumperz). This assumption, in turn, transformed literacy into a cognitive skill considered to be socially neutral. And because functional literacy involved, by definition, the ability to do small, measurable things, it often stood in for more complex forms of literacy.

Although it has been increasingly tied to issues in labor productivity, functional literacy as Gray initially defined it was not pedagogically or ethically suspect, nor did it have prescriptive overtones. Moreover, others have attempted to conceptualize functional literacy constructively and to measure the positive benefits it offers to a culture. For instance, Colin Lankshear has explained that in Greek thought the concept of goodness was typically affiliated with the notion of function, which was extended to the ideal of living the good life: "On

this view, for literacy to be functional is for it to enhance the uniquely human potential of every person to create the world of men and women, which is the world of culture and history" (16). Indeed, for teachers of writing and communication, constructing a workable functional literacy is crucial for several reasons. First, in order to achieve educational goals in academic settings, students must be able to control technological resources, a task that requires certain knowledge, skills, and attitudes. Second, in order to evaluate the efficacy of computers, students (as well as teachers and administrators) must be able to understand the ways in which writing and communication activities are organized in online environments. Third, in order to compete for rewarding work in a digital age, students must be able to demonstrate technological proficiency because computer literacy requirements in recent years have increased dramatically for all job levels; this is especially important for people in the many sectors of the U.S. population who are systematically discouraged from using computers in K–12 schooling. Fourth, in order to enact change, students must have access to the language of the powerful, including the discourse of technology. Although these reasons justify a functional approach as one component of a computer multiliteracies program, the approach should not be universalizing or totalizing in design.

So just what would a productive approach include, one that resurfaces functional literacy in a more complex, social way? A cursory response is that functional computer literacy should include the skills associated with writing and communication processes as teachers have come to understand them in a digital age. However, there is no definitive list of requirements that will satisfy all students and all teachers in every conceivable situation. Thus, it is more useful to think about parameters that might help programs and teachers begin to develop their own emphases. Because performance is at issue here, I propose five such parameters—educational goals, social conventions, specialized discourses, management activities, and technological impasses—as distinguishing qualities of a functionally literate student. I illustrate these parameters with examples of students working in composition and communication classrooms that require online writing, research, and interaction. To reiterate, my discussion is concerned with aspects of computer use that affect communication.

Educational goals

A functionally literate student uses computers effectively to achieve educational goals. He or she learns to situate mechanical skills in a pedagogical con-

text, one that is consistent with a needs-driven approach to literacy according to which users invariably focus on what is important to them (Kay). In other words, teachers of writing and communication "attend to the categories of meaning that students bring to the classroom" (Aronowitz and Giroux 52). They create curricular spaces in which the interests of students are considered to be a legitimate focus of academic study. In being mindful of what is important to students, however, I do not cast off the expertise that teachers have to offer. Indeed, the parameter tends to accommodate the values of the discipline.

But what requires elaboration is not disciplinary preferences. Instead, the adverb *effectively* is key because it qualifies computer use in ways that are central to a functional approach. To start, teachers should bear in mind the categories that Thomas Barker uses to sort out the shifts in learning that software can demand. Relying on the pioneering research of Shoshana Zuboff, Barker derives contrasting characteristics of computer-mediated users and empowered users. Unable to manage change, computer-mediated users suffer the detrimental effects of technology. For these individuals, computers have become an alienating force that introduces a number of debilitating personal challenges. Computer-mediated users, for example, find themselves increasingly isolated and engulfed in information. They perform poorly in remotely supervised situations (e.g., distance learning). Moreover, they are puzzled by the levels of abstraction associated with operating computers and thus are likely to be deskilled or disempowered in technological contexts. In contrast, empowered users have an altogether different relationship with technology. Although continuously challenged, they integrate computers more productively and cope reasonably well in dynamic environments. Unlike computer-mediated users, functionally literate users confront skill demands, collaborate online, and explore instructional opportunities. In other words, they employ computers in order to further their educational goals.

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A variety of factors encourage empowerment, but controlling a computer enables effective use. Controlling a computer means that a student has the ability to harness the power of technology in an increasingly systematic way. Such an ability can be acquired by students if pedagogical activities stress three areas: understanding what computers are generally good at, using advanced software features that are often ignored, and customizing interfaces. These

areas can be scaffolded to interrelate technology with specific educational goals.

Although the practical limitations of computers have been discussed across the curriculum (Burns; Kemp; Poster; Weizenbaum; Bolter, *Turing's Man*), what teachers have learned from research rarely trickles down to the level of literacy instruction. It should not be surprising then that students often believe computers can solve ill-defined problems that require interpretation, anticipation, judgment, intuition, creativity, novelty, or improvisation or that are steeped in ambiguity. But technology is not clever enough to do so, despite the claims in certain camps of the artificial intelligence community. Computers are driven by formal systems of rules and procedures and thus are particularly good at information-processing tasks that benefit from speed, accuracy, reliability, efficiency, repetition, and control (Walker; Johnson et al.). They are less good, for example, at providing advice about writing, guiding research activities, and evaluating student texts. Although certain fields lend themselves to computer treatment (e.g., mathematics), online writing and communication activities demand rhetorical interventions. A functionally literate student is alert to the limitations of technology and the circumstances in which human awareness is required.

One way to make this point clear is to have students consider the textual analyses produced by grammar checkers, a technology that has been closely scrutinized by the computers and writing community since at least the early 1980s. Alex Vernon recounts the disciplinary debate over grammar checkers and extends it by providing a thoughtful discussion of the expanded functionalities that have become embedded in the word-processing programs students use today. After pointing out the possibilities and limitations of these functionalities, Vernon offers two reasons why teachers should incorporate grammar checkers into writing instruction: the checkers can catalyze interesting discussions about language conventions and usage authority, and they can help students improve their revising and editing skills (344). Another reason, however, is that the analyses of grammar checkers can help illustrate the things computers are not particularly good at. For example, in my classes I ask students to run a grammar checker on a professional document that is peppered with passive constructions. The program flags numerous instances of passive voice and invariably suggests to students that they turn the passive constructions into active constructions. Although computers can offer this type of rule-driven, nonrhetorical advice in a steady fashion, it is not helpful to students unless they first understand the situations in which passive construc-

tions might be appropriate or effective. Which is to point out that machines cannot make rhetorical and ethical decisions about the location of action and agency in sentence structures.

If computers favor certain types of tasks, the really powerful software features applicable to the educational goals of students should be identified and exploited. Yet too often this happens infrequently or haphazardly if at all. I am reminded of a trade book published in 1992 by Robin Williams, a graphic designer. In *The PC Is Not a Typewriter*, she offered a pragmatic style manual for creating professional-looking documents on a personal computer. Desktop publishing was the focus, and a series of straightforward concepts allowed users to produce relatively sophisticated visual designs on a printed page. But Williams did more than just help users improve typographic quality. Her discussion emerged from an evolutionary perspective that challenged users to abandon typewriter rules and to consider the effects of computer technologies on document design and production. So why do so many students today still operate the computer like a glorified typewriter? In part because teachers often implicitly or explicitly dismiss student experiments with genres and formats, and in part because certain documentation styles remain quite traditional (the MLA style, for example, still uses underlining to indicate italicized text, and it puts angled brackets around Web site addresses as opposed to permitting actual hyperlink designations). In addition, however, teachers have not paid enough attention to the so-called advanced features of software programs (e.g., style sheets, master pages, version controls, macros). Such features are not hard to grasp but require a pedagogical commitment deeper than cut, copy, and paste. The payoff, though, is a command over software features that manipulate text elements in ways that are significant and sometimes elegant.

For instance, in most composition and communication courses students are expected to collaborate effectively with their peers in a community of writers who provide feedback and occasionally write together. The educational goal of effective collaboration is one that can be supported by the more advanced features of certain software programs. Needless to say, determining which features might be helpful depends, at least in part, on the model of collaboration being employed. My technical writing classes tend to employ a divide-and-conquer strategy because in nonacademic settings reports are often researched and written by multiple authors. One challenge for students, therefore, is to pull the discrete sections of a report together for both peer reviews and final production activities: Although reports are often written by (and for) multiple

audiences, their structural elements must be unified. Uncoached about the technological features that might help multiple writers merge their texts in productive ways, students tend to set off on their own and create individual structures that seem to be workable. This situation not only wastes time down the road when students show up with a variety of files and formats that must be merged but also discourages valuable discussions of audience, purpose, context, and structure at the invention stage. So I combine my overview of collaboration models with demonstrations of the various software features that can support them. In the case of divide-and-conquer models, for example, I explain how a style sheet works and ask students to develop one for their collaborative reports. This style sheet makes it easy for students to create and merge consistent files because each text element has been identified and defined in advance. On a rhetorical level, however, the design of the style sheet requires students to understand how and why readers rely on the various structural elements of reports.

Teachers should also emphasize the fact that online environments can be customized to suit individual needs. Default configurations accelerate setup and use, especially for novice users, but they also assume a generic operator. However, working and learning styles in academic settings can be highly idiosyncratic. Although public-access machines tend to be locked down to some degree, in many computer classrooms students can still redesign interface representations in both operating systems and applications.[3] In my courses, for example, I encourage students to modify the properties of windows, toolbars, menus, icons, keyboard commands, shortcuts, startup documents, directory views, and desktop styles, items, and images. We also investigate the accessibility options for those who have trouble typing or hearing or seeing. Because an interface arrangement can be saved as a set of network preferences, I ask students to design multiple arrangements that reflect different perspectives and educational goals. In addition, we also consider the ways in which computers can be directed to deliver individualized content, so that the Internet can be mined in a creative and convenient manner. An example would be the function in online newspapers that creates customized pages of headlines and stories based on the search terms and topics that students provide. One convenient aspect of this function is that students can easily redefine the search terms and topics as their research interests change. Although the desktop has become a more flexible communication environment, default settings cannot possibly accommodate all of the interests and viewpoints of users. Thus, stu-

dents must be encouraged to understand the options and settings one can manipulate in order to organize a writing space that is intelligible and, as I will discuss later, manageable.

MyBookmarks.com is a Web site I have used to introduce students to the notion that computer interfaces can be customized. This site provides a good example because its limited customization options are relatively powerful. MyBookmarks is a free Internet service that people can use to access their personal Web bookmarks from any networked computer. After students sign up for this service, the first thing I do is give them a bookmarks file to import, so that they have some content to customize. We then work through the first three options for customization. The first option allows students to manipulate fonts and colors. On the surface this option seems to be rather superficial, so I make sure to talk about the ways in which typography and color can assist users who do a great deal of reading online. The second option allows students to manipulate tool bars, page widths, and display modes (graphics versus text). It also lets students decide if the bookmarks will open in a new window or not. The third option allows students to decide if the bookmarks will be private or public. Because the point of the exercise is to introduce issues of personal customization, at this point I tell students to make their bookmarks private. The final activity is to edit the bookmarks file I asked students to import. Many users do not realize that they can edit bookmark names, which are simply stored in HTML files, yet this is one easy way to customize a heavily accessed menu. The bookmarks students import are for various Web sites that provide resources for writers and researchers. Students first visit these sites to come up with descriptors that are meaningful to them and then edit the bookmark names; they also create folders in which to organize the bookmarks. The result of this exercise is a highly personalized menu structure that students can build on as they continue to write and research throughout the course.

At this point, teachers who want to introduce the next parameter (the social) can ask students to edit their user preferences so that the bookmarks become public via the Internet. The public nature of the bookmarks opens a pedagogical space for discussions of social conventions online. Are the descriptors you selected recognizable in a broader context? Does the menu structure employ familiar language? How might you revise the menu for other students in your major? These kinds of problem-posing questions can introduce the notion that social conventions also influence discourse activities in technological settings.

Social conventions

A functionally literate student understands the social conventions that help determine computer use. Notwithstanding the popular claim that online activities can be more egalitarian because computers reduce contextualization cues (Chesebro and Bonsall; Selfe and Meyer; Sproull and Kiesler; Kiesler et al.), technology does not create a social vacuum. Although controlling a computer is essential, so too is decoding the expectations that have been adopted in socialized network spaces.

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Consider the results of an empirical study of asynchronous communication. Brenda Sims compared e-mail use at Southwestern Bell Telephone and Convex Computer. She learned not only that the computer programs that writers employ shape the linguistic features and formats of their messages but also that differences in organizational culture can influence the rhetoric of e-mail. For example, at Southwestern Bell, an established telecommunications business, e-mail tended to circulate among employees at the same hierarchical level, and messages exhibited the characteristics of paper-based genres. Sims attributed such controlled behavior to a rigidly structured work environment in which employees felt pressured to conform to the norms of traditional communication. The setting at Convex, however, was unconventional, as is often the case in new or small computer companies. Here, e-mail use cut across the entire organization, and discourse habits reflected a more relaxed and creative atmosphere. These findings indicate that settings of work can shape user expectations and understandings of emergent technologies.

But the work settings of users is not the only factor that shapes social conventions online. For example, in her longitudinal study of one Usenet newsgroup, Nancy Baym discovered that external contexts, group purposes, and participant characteristics can influence the dynamics of online conversations. All discourse is multiply situated, and computer-mediated communication (CMC) is no exception. As Baym puts it, "CMC use is always nested in the national and international cultures of which its participants are members. From this they draw a common language, usually but not always English, common ways of speaking, and a good deal of shared understandings" (141). Hence, the styles and patterns of communication exhibited in Usenet newsgroups often echo preexisting practices in a discipline. In addition, group purposes can influence discussion topics and the extent to which participants invest in the

topics. Baym linked markers of online conversations to either professional or recreational goals, although in his research on e-mail use, Irvin Peckham describes playful activities that confound this distinction. Finally, participant characteristics can affect CMC outcomes. According to Baym, one characteristic that is particularly potent is perception of the medium. Among the individuals she studied, for example, the perception of an online space "was a major determinant of whether or not people used it socially" (148).

In composition classrooms involving CMC, the types of factors discussed by Sims and Baym—work settings, external contexts, group purposes, and participant characteristics—seem to be no less forceful. Indeed, when Robert Yagelski and Jeffrey Grabill studied two undergraduate writing classes, they found that the nature and rate of participation in the online discourse was influenced by a number of social forces—among them, the nature of the course and the ways in which students understood its purposes and structures, the nature of the in-class face-to-face discourse, the ways in which the teachers assigned and managed online conversations, student perceptions of computers as communication media, and student understandings of the roles of participants in online discourse. In the discussion of their results, Yagelski and Grabill note, "online discourse might exhibit very different characteristics in different classroom contexts" (36). Given the evidence that studies of asynchronous communication provide, this situation probably has at least as much to do with shifting conventions as it does with shifting technologies.

So participation online revolves around normative behaviors determined, at least in part, by a wide range of social conventions. No great surprise there. But by what method might such conventions be illuminated in the classroom? To date, a common approach has been to cover the rules of etiquette that have been developed for interaction on computer networks. University policies on acceptable technology deployment routinely list these rules, as do textbooks for courses in writing and communication. Often, the discussions in textbooks focus on manners in cyberspace. For example, Jan Rune Holmevik and Cynthia Haynes suggest to students that MOO users should "be nice and friendly" and avoid "offensive language or actions" (41). In addition, rules of etiquette can take into account the nature of communication in an online medium. For example, Janice Walker and John Ruszkiewicz advise that when it comes to e-mail messages, students should use a subject line that accurately "describes the topic" and avoid "the use of all-capital letters," which represents the "electronic equivalent of shouting" (55). Guidelines such as these remind students that there are boundaries and expectations online and that the Internet con-

nects individuals and cultures as well as computers. In this way, rules of etiquette are a valuable starting place.

However, as Carl Herndl argues, textbooks tend to dilute ethnographic research because the political and material conditions of authorship encourage overly practical advice. Thus, to move classroom discussions beyond rules of etiquette, I ask students to study and produce thick descriptions of the social conventions in actual computer-mediated communications. Margaret McLaughlin, Kerry Osborne, and Christine Smith have constructed a taxonomy of reproachable conduct on Usenet that can frame this type of instructional activity. These researchers collected articles posted to five popular newsgroups for a three-week period and coded numerous instances of unacceptable behavior. The taxonomy they constructed organizes these behaviors into seven categories: incorrect or novice uses of technology, bandwidth waste, violation of network conventions, violation of newsgroup-specific conventions, ethical violations, inappropriate language, and factual errors. This classification scheme organizes and extends online rules of etiquette in important ways. Thus, I ask students to use the scheme to help them analyze the social conventions of a newsgroup in which they are interested.

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I should mention a pitfall in this assignment: the inclination to generalize findings from one or two sites to the entire landscape of networked computers. Studying and producing thick descriptions cultivates an informed perspective, but it would be foolhardy to assume that the aforementioned taxonomy accurately represents or exhausts reproachable conduct in all cases. In her work on computer networks as social spaces, Linda Harasim reminds teachers: "Each particular networld has its own culture and norms for acceptable and appropriate communication. Standards vary as to what is considered legal, tasteful, and manageable communication" (31). Furthermore, conventions for online discourse are still in a somewhat embryonic state (Hawisher and Moran) and consequently can be difficult to predict or pin down. Nevertheless, functionally literate students not only recognize that social conventions limit and shape communication online but are capable of analyzing the discourse forums in which they are interested and discerning productive modes of engagement. Thus, teachers should be sure to cover primary research methods and the methodological complications that arise when one tries to investigate social processes in electronic environments (see Jones).

Specialized discourses

A functionally literate student makes use of the specialized discourses associated with computers. Historically, a focal point of courses in computer literacy has been the components of a computer. Students studied the development of computational devices and then memorized the different parts of a modern machine. A final exam asked students to label internal and external sketches of a typical system. I suspect such an exercise was invaluable to future scientists and engineers, for it helped them to understand and express what goes on inside a computer. But there are other discourses that must be emphasized if students hope to converse productively about their technological projects in composition and communication contexts.

Cultural privileges accrue through effective discourse practices. That is, one must appropriate the language of a community in order to have a voice within it (Bazerman; Bizzell; Bruffee). Greg Myers substantiates this claim: he traced the tensions within two biologists who were attempting to argue that controversial new research or research falling between two specialized fields can be entirely congruent with the established directions of a field. The proposal writers he studied used personae, citations, significant vocabularies, and other linguistic devices to assert the importance of potential contributions that were situated on the margins of their specialty areas. If Michel Foucault had observed the rhetorical moves these biologists made, he might say that they acknowledged the controls over discourse production that a discipline can exert. As Myers puts it, biologists "learn the rhetoric of their discipline in their training as graduate students and post-docs, but they relearn it every time they get the referees' reports on an article or the pink sheets on a proposal" (240).

Closer to home, in a widely cited essay, David Bartholomae described requirements for the type of student English teachers tend to hear: "He [or she] has to learn to speak our language, to speak as we do, to try on the peculiar ways of knowing, selecting, evaluating, reporting, concluding, and arguing that define the discourse of our community" (273). However, in his critical look at how the profession has imagined the effects of such social forces, Joseph Harris provides a perspective that is useful to computer users. He appreciates the fact that communities "instigate and constrain" (98) the things that can be said but also points out that "the borders of most discourses are hazily marked and often traveled" and that "the communities they define are thus often indistinct and overlapping" (103). Harris complicates the idea of a coherent dis-

ciplinary discourse and maintains that the job of teachers is to help students negotiate the multiple and contradictory discourses in which they will be implicated as writers and communicators. In a digital age, these discourses invariably include the various rhetorics that inform the design of literacy technologies.

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To date, the language of computer networks has captured a great deal of attention because teachers have confronted it repeatedly under urgent circumstances. In computer-supported classrooms, students and teachers need to know immediately about file servers and synchronous conferencing systems, list commands and domain names, Ethernet and e-mail. The ability to talk on some level about the infrastructure of a computer classroom is critical to just about any responsible measure of instructional success. And when problems crop up in these facilities—and they always do—the troubleshooters will need a precise description of the conditions of the situation. The facts of existence in academic institutions have also encouraged writing and communication teachers to become better versed in the argot of computer connectivity, which, as Tharon Howard notes in his overview and glossary of wide-area networks, is not only technical but exclusionary. Howard admonishes teachers to embrace the language of an appropriate technology that historically has been monopolized by an elite few. In his words, teachers "must have this language if they are both to understand how network technologies can support or defeat our pedagogical goals and to wrest computing resources away from economy-oriented university computing centers" (42).

But students also need access to the discourses that constitute online environments. For while certain everyday computer terms must be mastered, interfaces are informed by a variety of disciplinary specialties. In the late 1970s, the Media Lab at the Massachusetts Institute of Technology anticipated the convergence of the computer industry, the print and publishing industry, and the broadcast and motion picture industry (Brand). By 1987, the Media Lab housed eleven interdisciplinary work groups with many alliances among them: Electronic Publishing; Speech; The Advanced Television Research Program; Movies of the Future; The Visual Language Workshop; Spatial Imaging; Computers and Entertainment; Animation and Computer Graphics; Computer Music; The School of the Future; and Human-Machine Interface (Brand 12–

13). Nicholas Negroponte and former MIT President Jerome Weisner assumed that graduates of the Media Lab would "be required to pursue studies in epistemology, experimental psychology, filmmaking, holography, and signal processing, as well as in computer science" (Brand 11). The Venn diagram that illustrated the merger of the computer industry, the print and publishing industry, and the broadcast and motion picture industry prophesied an interdisciplinary relationship that has come to steer the multimedia directions of twenty-first-century computer technologies. Although interfaces have been reconfigured in dramatic ways, one implication for users is that they readily encounter the lingo—and territory—of several different industries and the numerous perspectives that inform them.

In too many instances, the discourses of the print and publishing industry and the broadcast and motion picture industry get shortchanged, especially in departments of English.

I am sanguine about the chances students have to appropriate the discourse of the computer industry because it permeates nearly every aspect of university settings today. However, in too many instances, the discourses of the print and publishing industry and the broadcast and motion picture industry get shortchanged, especially in departments of English. The reasons for this have to do with the relatively glacial pace of curricular change and the fact that teacher training in computer use typically adopts an instrumental rather than a pedagogical approach. Nevertheless, the categories and distinctions within these neglected industries anchor the new media landscape and help frame the software suites that have come to dominate college campuses. For example, the principles of the print and publishing industry are central to document production efforts, yet these principles remain a mystery to numerous students who, if pressed, would struggle to articulate an informed rationale for their typographic or document or graphic designs. They also remain a mystery to many English teachers. In fact, given how computers tend to get treated in English classes, students are often actively discouraged from seeing, for example, the discourses of typography or graphic design as important. The broadcast and motion picture industry represents a special challenge in that its discourse is farther afield. Nonetheless, multimedia texts depend upon this discourse, which pervades the software programs used to create them. For example, the theatrical interface metaphor in MacroMedia Director emphasizes unfolding actions rather than static displays of information: Multimedia designers select their cast (various media objects), arrange them on stage (in a visual display area), and write a script (via manipulations of the timeline). In

short, students must be able to understand a unique combination of symbolic representations that are woven together nowadays in some of the most common platforms for writing and communication activities.

But how does one encourage students to appropriate the various discourses of literacy technologies? There is no simple answer here. A certain amount of immersion and uninterrupted time in technological contexts helps, but I do not find osmosis to be a particularly reliable or responsible approach. So I have developed a few pedagogical strategies that are a bit more direct. One way to quickly introduce the parameter of specialized discourses is to invite students to use advanced engines for their Internet searches, which rely on the discourses of the library and the computer industry. For example, in order for students to take advantage of the advanced functions in HotBot, a popular search engine, they must be familiar with Boolean operators and word stemming and the different elements on the Internet that can be searched. Some of these elements are fairly obvious (e.g., images, MP3 files, video clips), but some searches demand more domain knowledge of the computer industry, such as searches for file extensions, JavaScripts, and sites that employ Shockwave, VRML, and ActiveX technologies, technologies that are used to enhance the Web. In this fashion, advanced search engines make it clear to students that a comprehension of at least two specialized discourses can help them become better researchers.

A more ambitious approach would be to create an actual assignment that requires students to more deeply engage the specialized discourses of the software programs that are central to a course. An assignment I employ draws on the techniques of task analysis, a methodology used to help people design software and its documentation from a user-centered perspective. To start the assignment, I select a software program that will be important to the course and show students how to conduct a task analysis, which in this case is basically just a list of the user steps and options that are associated with a menu item. For example, in DeskScann, a program students can use at Penn State to digitize images, a task analysis for the Image Type option under the Custom menu would include the following steps: (1) Select Image Type from the Custom menu; (2) Select the color content of the image (color or black and white); (3) Select the style of the image (drawing, halftone, or photo); (4) Click Okay. The one option users have is to sharpen the image by varying degrees of intensity when it is scanned. I use this example here because it is brief—task analyses can become quite involved, especially for menu items that have layers of options. But what this brief example does show is a pretty typical instance of a

specialized discourse that often puzzles students. What is a halftone? How is it different from other types of images? And under what conditions might I want to use one? These are the kinds of questions students often ask, and not just about image types. For example, the discourse of color in DeskScann (hue, saturation, intensity) also seems to mystify students regularly.

Once students have completed their task analyses, the rest of the assignment is relatively straightforward. Because the analyses provide an exhaustive map of the various specialized discourses that constitute the software program, we select out a subset of discourses associated with the features that are particularly relevant to class activities (this aspect of the assignment makes a connection between the functional parameter of educational goals and the functional parameter of specialized discourses). I then assign the different discourses in the subset to different groups of students and ask them to research and report back to the class on the contexts from which these discourses were appropriated, including any offline contexts, and what might be learned from them about productive computer use. Students who have researched the contexts for the theatrical discourse in MacroMedia Director, for example, have learned that a background in certain aspects of film and theatre can illuminate the workings of Director. Likewise, students who have researched the contexts for the publications management discourse in Adobe PageMaker have learned that a background in the history of printing and type can illuminate the workings of this program. On one level, then, a focus on specialized discourses can help students develop conceptual schemata for the ways in which software programs operate. On another—and no less important—level, this focus can remind students that the knowledges represented in online environments originate from numerous sources and communities, not just the computer industry. So a concentration on the discourses and practices of that particular industry would be incomplete, at best. At worst, such a one-dimensional focus would produce the harmful and distorted approaches to computer literacy that I criticize in this essay.

Management activities

A functionally literate student effectively manages his or her online world. This unremarkable assertion seems self-evident, and in certain ways of thinking it is. For example, no proof or explanation should be required when it comes to the maintenance computer-based activities routinely call for, such as changing passwords, backing up files, and deleting old versions of documents. But because computers help students organize their ideas on a meaningful level,

housekeeping cannot be the only management issue given due consideration. To some extent, how students handle work influences the elements that comprise the mosaic of thoughts associated with a writing or communication project. Put in different terms, the strategies and structures for managing online environments also shape the work that happens in those environments.

To some extent, how students handle work influences the elements that comprise the mosaic of thoughts associated with a writing or communication project.

Computer users create and collect an astounding amount of information. A culture of accumulation has been encouraged by the ease with which vast materials in multiple media can be digitized, circulated, and stored. As David Shenk writes: "With virtually no effort and for relatively little cost, we can capture as much information as we want. The capturing requires very little planning or forethought, and in fact is built right into the design of our machines" (29). Undeterred by the positive prospects of this state of affairs, Shenk subsequently raises a red flag: "Only as an afterthought," however, "do we confront the consequences of such a low transaction cost" (30). To put the consequences in perspective, they seem to be so profound that print-based protocols of reading have been modified and multiplied to help computer users attend to the prodigious volumes of information with which they are continuously deluged. In other words, readers of online texts have begun to develop alternative reading strategies (Sosnoski). Not only that, but what has been collected by a computer user often stands in for the totality of the reading experience, even though it is only one aspect of that experience. For example, a MOO transcript is often used to stand in as the official, total representation of the MOO session. However, by leaving out temporality, the transcript does not provide a sense of the important, often crucial lags between one post and the next. The same thing happens, on a different level, when students assume that the Internet holds everything; it can be difficult to get certain students to think that they should go to the library rather than just use Google or Yahoo for their research.

The question of resource management has been approached from a number of different angles. Some have criticized the conventional file and directory structures that underlie the ubiquitous desktop metaphor currently governing the management of information on almost every computer. For example, Scott Fertig, Eric Freeman, and David Gelernter propose a time-ordered versus location-based architecture that organizes electronic objects in a manner that more closely parallels the ways in which people tend to imagine the complexion of their discursive work. Others have addressed the matter of re-

source management as an application issue. For example, Starr Roxanne Hiltz and Murray Turoff offer concrete features that enable users to more easily manage massive sets of communications in a computer conferencing program. In addition, researchers have developed meta-level search engines that cut across systems and hierarchies and filter huge dataspheres. For example, Daniel Dreilinger and Adele Howe focus on algorithms that strive to enhance and refine the results of large-scale queries on the Internet. Looking toward the future, some researchers anticipate a day when computers will completely take over the task of information retrieval and management. In fact, Hal Berghel reviews the literature on intelligent agents and concludes that some of the major hurdles in making autonomous software robots work effectively on behalf of computer users have already been cleared.

Technical solutions to the problem of how to deal with electronic information are undoubtedly indispensable, and a functionally literate student takes advantage of software attributes that automate management activities in ways that are helpful. Some of the features ready for use already are detailed filters for screening and organizing e-mail messages; list commands for altering listserv subscription options (e.g., Digest, NoMail); resources for personalizing home pages that index favorite sites and search engines and that provide content that is automatically updated; utilities for remotely accessing and capturing research bookmarks for the Web; and shareware programs for carrying out the important jobs of maintenance, repair, data recovery, and data backup. Although I have no direct evidence, I suspect many writing and communication teachers overlook these solutions because they appear to be the responsibility of campus computer support.

Although computer skills and writing skills cannot be so easily separated, a barrage of technical fixes will not always provide a complete or satisfactory solution to the problems associated with resource management, in large part because such problems always seem to have social dimensions of one sort or another. To illustrate this point in a more general way, let me take a brief detour through the case of teledemocracy, the process of political participation that has appeared online. Proponents vehemently argue that technology improves the political process because it amplifies discourse and increases the avenues available for public participation. "Optimists see the Internet as the seedbed for a new politics," Graeme Browning proselytizes, "one free from the distorting influence of the mass media and closer to the democratic ideas at the core of our Republic" (xi). Leaving aside the fact that large news organizations like CNN have some of the most popular sites on the Web, an underlying

assumption of online activism is that students are apathetic because they do not have objective knowledge about political issues or easy access to politicians; the all-inclusive resources on the Internet, so the logic goes, will rescue representative government because in cyberspace students can endlessly access, search, and study the legislative record. However, the counterargument—one that students quickly pick up on—is that neither more data nor better-managed data warehouses will necessarily produce an enlightened body politic. As Theodore Roszak explains, "we must [also] insist upon a new standard of political discourse" (165). His contention, in a sentence, is that "it is the vitality of issues that saves democracy" (167), not technological fixes all on their own. In fact, the end result of teledemocracy initiatives that are driven by a more-is-better logic is likely to be an overabundance of unmanageable information that not only defies navigation and use but also obscures rather than clarifies debates about the public good.

Resource management activities in writing and communication courses call for a similar approach, one that draws on hybrid solutions with both technical and social aspects. Given this reality, an important step for students is to be able to size up the management activities that can be successfully turned over to a machine (this step harkens back to the functional parameter of educational goals and reminds students that, to some degree, the different parameters are interrelated). Student questions will necessarily reflect local systems and policies and thus include institutional as well as technical dimensions. For example, can shareware programs be downloaded and installed in a public laboratory? What are the constraints in personal networked spaces? Are software utilities available to help manage online work? Although often invisible, elaborate apparatuses usually exist to manipulate and protect materials on communal computers or on private computers connected to university networks.

But the activities that cannot or should not be entirely mechanized are harder for students to visualize. For example, consider the distinction between file-related tasks and communication strategies: The former has to do with productivity and the latter with people and projects. Although both of these management activities are essential, they can be contrasted in the framework of graphical e-mail programs, if one contemplates an attachments folder over against the inbox. As most people know, an attachments folder collects files e-mailed to a user. Assuming an environment that automatically decompresses and decodes the files (a MIME-compliant environment), the main chore for students is to organize their attachments so that they can be searched and used in an effective manner. At a minimum, this involves manipulating file

formats, file names, and directories. On the other hand, the inbox presents more of a social challenge. Here, students must manage not only large amounts of information but also priorities, relationships, and collaborative activities. So in spite of the fact that management activities will probably vary from student to student, they almost always unite technology and literacy in ways that require social judgments, as this rather mundane example of e-mail management demonstrates.

In spite of the fact that management activities will probably vary from student to student, they almost always unite technology and literacy in ways that require social judgments, as this rather mundane example of e-mail management demonstrates.

In the classroom, the ubiquity of e-mail provides an easy way to illustrate the importance of management activities. To highlight their sociotechnical aspects, I introduce a useful feature of e-mail that very few of my students actually use: filters.[4] Filters allow computer users to take more control over their e-mail by creating scripts that automate the ways certain (inbound or outbound) messages get treated. For example, one could create a filter that automatically places the attachments from project collaborators into a unique folder. However, this script would go unexecuted if collaborators supply the wrong subject line or send attachments from e-mail accounts they do not normally use. So social as well as technical conventions must be established and followed in order for some e-mail filters to take effect. This is one reason why very few students tend to use filters: setting them up is a commitment to supporting long-term managerial structures over the short-term ease of just pressing the delete key or individually sorting messages manually as they come in.

To introduce the workings of filters in a pedagogically oriented fashion, I have students create several filters at the start of each semester that reflect course structures at a broad level. From there, students can create additional filters to manage finer grained activities. For example, I ask students to create filters for course assignments, course announcements, and personal messages from me. As might be expected, each of these filters calls for a different set of parameters. The purpose of the filters for course assignments is to organize all of the messages related to a single assignment into one space. So if the course has five assignments, we create five filters. However, because the parameters for these filters are variations on the same theme (course assignments), the requirements for students are not that hard to remember: the subject line for messages related to the first assignment must start with "Assignment One,"

the subject line for messages related to the second assignment must start with "Assignment Two," and so on. The purpose of the filter for course announcements, which anyone can send, is to call attention to e-mail messages that are time-sensitive, such as changes in due dates, updates to the class Web site, or last-minute notices about guest speakers on campus: It is easy for students to overlook such messages in a full inbox. Thus, the parameters for this filter change the status of announcement messages to the highest priority and alert students to their arrival by playing a simple beep. The purpose of the filter for personal messages from me is to create an archive of the review comments I have made on student projects. Over the past few years, I have increasingly read and responded to student work online, primarily using the annotation tools in Microsoft Word to embed comments in student files, HTML files included. But I have found that students do not always keep track of the numerous files I return to them over the course of an entire semester, even though I have created a management scheme for file names. So the parameters for this filter place my comments into a single folder and automatically return an e-mail message to me to confirm that the files were received by the student. Not surprisingly, one of the biggest challenges associated with the use of e-mail filters is social in nature: Students must not only act in accordance with the parameters that have been defined but also retrain themselves so that inbox is no longer the sole focal point of their asynchronous communication.

Technological impasses

A functionally literate student resolves technological impasses confidently and strategically. Students reach technological impasses when they lack the computer-based expertise needed to solve a writing or communication problem. A basic example would be when students do not have the expertise to turn off the grammar checker that by default analyzes all of their writing in real time, including brainstorming and note-taking sessions. There are several indicators of technological impasses that are relatively easy to recognize, such as stalled progress on a project or asymmetrical contributions during the phases of a collaborative project that require technical expertise. Thomas Duffy, James Palmer, and Brad Mehlenbacher identify two types of technological impasses: performance-oriented and learning-oriented. Teachers should be particularly interested in performance-oriented impasses because these take place amid the various tasks of writing and communication. Learning-oriented impasses are generally less compelling on the grounds that English courses should not

be a place where students are simply trained to operate computers and their programs in decontextualized ways.

Unproductive reactions to technological impasses are a function of numerous determinants. Analysts often allude to a digital generation gap that seems to include anyone who was not raised on a computer (Papert). But studies of apprehension paint a much more complicated picture of computer anxiety, phobia, and trouble. Self-efficacy beliefs such as low expectations and debilitative thoughts can impinge upon user responses to computer predicaments (Martocchio), as can other psychological, behavioral, and affective factors. For example, statistical research has obtained significant correlations between computer anxiety and math anxiety and moderate correlations between computer anxiety and both computer experience and mechanical curiosity (Heinssen et al.). Furthermore, race and gender have been known to influence user attitudes toward computers in significant ways (Brecher; Parasuraman and Igbaria). In fact, Faith Gilroy and Harsha Desai argue that women and minorities have been unusually susceptible to computer anxiety because in historical terms their technological opportunities and experiences have been so severely limited. Why has this been the case? Some indict the exclusionary values that pervade technological contexts, values that champion epistemologies aligning with the power, authority, and politics of the dominant cultural formations (Markussen). On a cultural level, these values tell women and minorities that they will not be computer experts, a conclusion that can become a self-fulfilling myth, especially when admitting that one needs help is viewed as confirmation of an unsuitability toward technology. Thus, apprehension should not be conflated with negative attitudes. One can be open to change and yet paralyzed when it comes to technological impasses.

Systematic responses to user breakdowns have varied, but some of the major ones are discussed in the intervention process proposed by Raymond King and Michael McNeese: assessment, treatment, adaptive computing systems, and collaborative support systems. Although there are certain aspects of these approaches that could be helpful, for the most part they are either unworkable in the context of English departments or contrary to a socially informed perspective on computer literacy. Moreover, the clinical discourse of intervention and treatment found throughout the literature on computer anxiety and phobia, which constructs technological impasses as instances of psychological trauma, can be less than appealing to humanities scholars and teachers. Still, let me briefly explain the interrelated parts of the intervention process and point out aspects that could be useful in classroom settings.

The first part of the process is assessment, and King and McNeese recommend "an easy-to-administer assessment instrument to predict who is likely to harbor manifestations of apprehension when confronted with computing tasks" (207). Although I agree that some sort of assessment vehicle could be useful, I am unconvinced that psychological anxiety inventories hold the key.[5] The second part of the process, treatment by means of "systematic desensitization" (207), is more problematic. King and McNeese suggest therapeutic sessions that try to alleviate the provoking constituents identified during the assessment stage by linking them to techniques for progressive muscle relaxation. I am not sure what to make of this suggestion, but I do know that it is unworkable in the context of English courses. So too is the third part of the process: adaptive computing. Adaptive computing systems should be somewhat familiar to teachers of writing and communication because many computers today have features that assist students with disabilities. However, the state-of-the-art systems discussed by King and McNeese, those that adjust their interfaces based on the emotional and psychological states of users, are too expensive and experimental to be considered realistic solutions at this point. The fourth part of the process, instituting collaborative support systems, holds the most promise. Collaborative support systems supply a structure that enables users to share their fears and difficulties when it comes to computers. On a basic level, one can imagine the utility of an e-mail list where a community of engaged and generous students answer questions related to technological impasses. To sum up, then, certain types of assessment activities and collaborative support systems could be useful in writing and communication classrooms.

If major parts of the standardized process proposed by King and McNeese are not viable, micropolitical practices provide alternative approaches that students can internalize. Unfortunately, teachers have been in the habit of either brushing off or working around technological impasses in the classroom, often because they are embarrassed to admit that they might not have all of the answers. Indirect attempts to provide support schemes are invaluable and should be carried on. That is, teachers should continue to take advantage of campus-wide resources, invest in documentation, prepare students as technical consultants, set up help notebooks in which students record problems and solutions, and provide electronic environments that foster useful interchanges about technological impasses. However, teachers should also embed more formal discussions that help students reason systematically about breakdowns.

On the order of rhetorical exigencies, the key is to situate technological

impasses in a broader context so that their characteristics can be organized and understood. Ben Shneiderman developed an early syntactic-semantic model of user knowledge that helps to clarify a central shift in thinking students need to make. As the model indicates, syntactic knowledge about computers is motley and device dependent; it is acquired by rote memorization, and thus forgotten rather quickly (43). An example would be the exact sequence of steps needed to transfer HTML files to a university server from a Macintosh computer running Fetch 4.0.3 as an FTP client. In contrast, semantic knowledge is structured and therefore more easily remembered. It is device independent and amassed in purposeful circumstances (43). As Shneiderman notes, semantic knowledge can be conveyed by showing examples, offering general theories or patterns, relating concepts to previous knowledge, describing concrete or abstract models, and indicating examples of incorrect use (49). For example, in the classroom, semantic knowledge about the transfer processes used for HTML documents could be anchored by analogy to the concept of copying files or downloading content from the Internet. Other pedagogical tactics could explain client/server technology and situate FTP as a species of TCP/IP, the suite of Internet protocols that includes the familiar Hypertext Transfer Protocol (HTTP). Although syntactic knowledge is important, semantic knowledge assists users in imagining problems and understanding computer systems.

However, against the backdrop of specific scenarios, the syntactic-semantic model thins on an applied level. Suppose students reach an impasse for which they do not have either syntactic or semantic knowledge. What should they do in such an ordinary situation? I would say that functionally literate students should be able to call up heuristics that help them represent the impasse in a meaningful way and solve it in a systematic way. Toward this end, one relatively simple heuristic I have invented has three parts. The first part asks students to phrase an impasse as a qualitative question. This part encourages them to focus on process and meaning rather than cause and effect. For example, instead of fixating on the fact that the grammar checker is triggered by "ungrammatical" sentences (cause/effect), a more fruitful line of attack would be to ask this question: How can I turn off the grammar checker? This seems utterly obvious, and it should be; yet believe it or not, I often have students who think that the only way to turn the grammar checker off is to stop writing "ungrammatical" sentences. In other words, some students have bought so deeply into the logic of the machine that they almost always see themselves as the causal root of technological impasses.

The second part of the heuristic asks students to locate the qualitative question in a classification matrix derived from empirical research on user-aided design. According to usability specialist Kevin Knabe, five categories exhaust the majority of computer-user concerns: goal questions (What can I do with this?), descriptive questions (What is this? What does it do?), procedural questions (How do I do this?), interpretive questions (Why did this happen? What does this mean?), and navigational questions (Where am I?) (286). For example, "How can I turn off the grammar checker?" is clearly a procedural question, although the impasse could have also been phrased as an interpretive question: Why is the grammar checker triggered as I write? The third part of the heuristic matches these five categories with appropriate forms of assistance. Parasitic facilities such as tracking systems and visual organizers can answer navigational questions, for example, whereas interpretive questions should be directed at more comprehensive resources (e.g., reference documents, campus help desks). The procedural question about the grammar checker would lead students to a user manual or online help system, two forms of assistance that characteristically include elaborated procedural instructions. Although heuristics complement a syntactic-semantic model of user knowledge, they also help students become more resourceful and discover effective ways to work through performance-oriented impasses.

Functional literacy as a social problem

This essay attempts to recover the concept of functional literacy in a way that speaks to teachers of writing and communication. I am quite sensitive to the fact that the vast majority of functional approaches are not only overly simplistic but also downright harmful. Critics are right to condemn perspectives that understand literacy as a set of value-free skills that can be defined, learned, and measured in absolute terms and whose main purpose is to serve economic development. Such perspectives ignore the inextricable ties among literacy, power, culture, and context, and as a result promote approaches to computer literacy based on mastery of technique. But there is no reason why functional literacy, which offers certain kinds of important access to a culture, cannot be reconceived in a more positive way as well as articulated with other types of literacies. Which is to say that functional literacy need not

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be disempowering and that functional and critical literacies need not be mutually exclusive.

Although most approaches to functional literacy are utterly impoverished, that does not change the fact that students must learn to work with computers in productive ways. The five parameters I propose—educational goals, social conventions, specialized discourses, management activities, and technological impasses—do not narrowly tie instruction to specific software features that will undoubtedly change with time. Moreover, the parameters position functional literacy as essentially a social problem, one that involves values, interpretation, contingency, communication, deliberation, and more. In instructional situations in which such matters are properly emphasized, I am certain that teachers of writing and communication will discover that functional literacy is one important aspect of computer literacy.

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Notes

1. The misconceptions I refer to here include two prominent myths: the myth of equality through computers, the belief that computers will automatically level the educational playing field; and the myth of efficiency through computers, the belief that computers will automatically make people more productive and, thus, are a cost-effective way of doing business.

2. Although there are some exceptions to this view of functional literacy, contemporary composition has tended to bracket functional issues off into critical analyses rather than using them to deconstruct the whole distinction between critical and functional literacies. For example, Johndan Johnson-Eilola ("Wild Technologies") analyzed the ways that particular functional terms de-skilled subjects in online help systems, while Lester Faigley pointed out the political aspects of grammar in computer conferences. But in general the field does not want to deal with functional issues, except in handbooks. So we already understand, at one level, just how important functional literacy is; we just have not internalized and conceptualized that understanding yet.

3. Of course the extent to which public computers can be customized depends on the nature of the network. The networks at my institution support roaming pro-

files, an increasingly common feature that associates settings and files not with a specific computer but with a specific user ID. Thus, when a student logs on to any computer in any public lab, his or her settings and files are automatically copied from the profile server to the local machine. After the student logs off, the system copies back to the server any changes in settings or files, including new files.

4. At present, popular Web-based e-mail clients like Hotmail do not provide adequate filtering capabilities, so my approach works best with POP mail clients such as Eudora or Outlook Express, clients that tend to provide a richer array of options for managing e-mail.

5. For a more productive approach to assessment that employs literacy narratives, see Barbara Duffelmeyer.

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