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Usable Pedagogies: Usability, Rhetoric, and Sociocultural Pedagogy in the Technical Writing Classroom

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This article explores the ways that the discourse of usability might support a socially oriented pedagogy within technical communication. Specifically, it explores two approaches to usability—user-centered design and distributed usability—and suggests that the conversation between these approaches can ground socially responsive discussions of technology and technical communication. As such, the discourse of usability provides a field-specific means to address increasing calls for socially situated pedagogies within the field of technical communication.

For at least two decades, technical writing instructors have debated what role social context should play in the technical writing classroom. Technical communication has, as a discipline and a set of practices, always concerned itself to some degree with what it means to communicate within an evolving technical and professional context; it is rare to find technical communicators who do not ground their practices in real-world consequences and effects. The question raised, however, is what demands such an acknowledgement of context make upon the ways in which we teach our students technical communication.

Carolyn Miller explored this question as early as 1979 in her article, "A Humanistic Rationale for Technical Writing." Miller claims that it is within the humanities that questions about the status of knowledge and its social construction can most readily be asked and that it is for this reason that technical writing can and should be considered a province of the humanities as much as any scientific discipline. Dorothy Winsor forwards a similar argument in "Engineering Writing/Writing Engineering," which opens with the claim that "[k]nowledge is not found ready-made in nature. Instead, knowledge is constructed in the interplay between nature and the symbol systems we use to structure and interpret it" (58).

The acknowledgment of the relationship between socially constructed knowledge and technical writing has further led technical writing scholars to focus on

the role of ethics in the reporting of scientific and technical communication. Winsor's 1990 article, "The Construction of Knowledge in Organizations: Asking the Right Questions About the *Challenger*," explores the ways that organizational cultures necessarily determine technical communication, and she concludes that these cultural constraints should receive attention in the technical writing classroom. In 1992, Steven Katz published his now-famous article, "The Ethic of Expediency: Classical Rhetoric, Technology and the Holocaust," in which he considers the role played by technical communication in the operations of the Third Reich. In 2003, following the collapse of Enron, Donna Kienzler and Carol David also argued for the need to place ethics at the center of professional communication curricula.

Such a shift could be termed a sociocultural turn and has led technical communication scholars to argue for the need to place sociocultural concerns at the center of our teaching. Thralls and Blyler advocate such a pedagogy in their 1993 article, "The Social Perspective and Pedagogy in Technical Communication." More recently, Jack Bushnell argues that, if we accept the social construction of knowledge, our pedagogies will need to focus on "questioning, critiquing, and perhaps changing entire paradigms" (178). Thus he insists that we need to encourage students to become active thinkers rather than simple doers, for their professional as well as their social well-being. Such a sentiment is echoed in Kelli Cargile Cook's "Layered Literacies: A Theoretical Framework for Technical Communication Pedagogy," in which the author asserts the importance of placing social, ethical, and critical literacies alongside basic, technological, and rhetorical literacies.

These articles, along with work on the intersections between technical communication and such areas as feminist theory, multiculturalism, and medicine, have led to the foregrounding of sociocultural concerns within the field of technical communication. In this article I hope to contribute another potent vehicle for approaching sociocultural issues in the technical writing classroom: the discourse of usability. Although usability scholars such as Clay Spinuzzi ("Exploring"), Robert Johnson, and Geri Gay and Helene Hembrooke have all addressed the need for a sociocultural turn in our consideration of usability and user-centered design, these topics are surprisingly absent from discussions of sociocultural pedagogies within technical writing. This article suggests that usability theory not only encourages us to look at the social and political aspects of technical documentation and information design but also provides a pedagogical frame "specific to the field" (Cargile Cook 8).

The argument that follows traces the potential offered by usability theory by first exploring the sociocultural turn within the field of usability itself. It also traces the development of distributed theories of usability in response to the weaknesses of earlier understandings of user-centered design. I then focus on one example of how distributed usability can be used to explore the technological mediation of the classroom itself, and further, how this exploration can foreground cultural and eco-

nomic assumptions at work in the technical systems that surround us. Finally, I conclude my argument by suggesting the ways in which distributed usability can be fruitfully leveraged in the teaching of technical writing.

ARTIFACTS AND ACTIVITIES: USER-CENTERED DESIGN VERSUS DISTRIBUTED USABILITY

In a traditional sense, usability research is most commonly associated with the work of Jakob Nielsen, Donald Norman, Michael Wiklund, and Janice Redish and Joseph Dumas, among others. These authors advocate user-centered design in the development of technology. User-center design is the idea that the best product-design principles are those that support user needs and expectations. In this model, designers evaluate the artifacts in question by engaging in the study of user interactions. Based on the outcome of these interactions, design teams engage in iterative design processes in order to refine the functionality of the artifact. Such design practices lie at the heart of the Windows desktop environment for personal computers, the abbreviated instructions located in video game manuals, and the ergonomic design of office furniture. Understood in this way, usability is "a cumulative attribute of a product," an attribute that "places users' needs high—if not first—on the list of design priorities" (Redish and Dumas 4). User-centered design is thus important in moving away from older, system-centered models of design that emerged more from the design team than the intended end user, and moving toward a more responsive understanding of the role of technology in people's lives.

Nielsen describes user-centered design as comprised of five basic elements:

- Learnability
- Efficiency
- Memorability
- Errors
- Satisfaction

These five categories aim at addressing the primary needs of users in their interaction with products (26–37). Learnability consists of the ease with which users can familiarize themselves with a product; efficiency, how well the product performs its allotted tasks; memorability, the impression that a product and its use make on the user's mind; errors, a product's potential for breakdowns and misuse by the user; and satisfaction, the pleasure and fulfillment that users derive from their interaction with the product. As such, we could say that a hammer scores highly with regard to learnability (simply pick it up and swing) and memorability (due to the self-evident nature of its function). But it might prove inefficient at driving nails into certain ma-

terials. In addition, those who have hit their thumb with a hammer know the potential effects of errors using the tool. The satisfaction derived from the hammer is a little harder to determine and will no doubt emerge from a user's personal experience. Thus these categories are particularly useful for designers insofar as they cover practically all stages of the user-artifact relationship, from early encounters (learnability) to continuous use (efficiency and error). But most important is the way in which these categories foreground the importance of "the user's task and their individual characteristics and differences" in the design process (Nielsen 43).

In *The Design of Everyday Things*, Norman further emphasizes the cognitive and cultural aspects of user-centered design. Norman emphasizes the importance of using clear conceptual models and natural mapping, that is, design principles that seem obvious to users. Conceptual models describe the mental pictures that users form of a given product based on their interactions with it (12). The Windows computer environment attempts to provide a readily comprehensible conceptual map by using icons such as folders and pages to represent various operations. Natural mapping suggests that the best kinds of conceptual models are those that conform to physical or cultural conventions (23). Thus one could look at a felt-tip pen and readily comprehend how and why the pen works, based on the pen's conformity to physical conventions (the provision of a shaft for the hand) and the user's cultural familiarity with inscription and its various methods.

Norman also emphasizes the importance of making product operations visible to the user and providing feedback on user interactions (99). Clear instructions and visible product features thus contribute to learnability and reduce the frustration caused by errors insofar as they allow the user to more readily make sense of the product. By building feedback into the product, designers further add to memorability and user satisfaction by preempting impatience and reiterating for the user the tasks they are attempting to perform. Although feedback may not be as important for using a felt-tip pen, it becomes increasingly important as the complexity of the product rises. Thus a modern computer program may provide "dialog boxes" and "wizards" that assist users by both guiding the performance of a given task and providing feedback on the user's actions.

Such design features thus aim to make a product or technology as natural to the user as possible. This emphasis creates what Winograd and Flores have called, after Heidegger, "ready-to-hand" relationships, or relationships in which the artifact or tool seems to become a natural extension of the user (36). Both the hammer and the felt-tip pen mentioned earlier establish effective ready-to-hand relationships by becoming extensions of a user's arm or hand. The simple manner in which both tools allow a user to perform given tasks allows the tool to take a backseat to the task itself. Design principles that aim at ready-to-hand relationships therefore emphasize transparency at the point of the interface so that users can readily comprehend the operation of a product. This in turn facilitates immediate, efficient "structural coupling" between user and product, as the structure of the human body and

the structure of the hammer compose, more or less seamlessly, a new structure capable of driving nails (45).

There is much to commend this ethic of comfort and transparency in user-centered design. In a highly developed society, one in which technological advances come quick and fast even for the most avid and up-to-date user, user-centered design allows individuals to continue to function as active citizens while incorporating new technologies into their lives. More important, user-centered design delivers products that are more efficient and pleasant to use. Nor is this simply a value-added facet of design; user-centered design principles also have been at the forefront in the design of products and artifacts that meet the needs of the differently abled. Insofar as it has returned the idea of design to the terrain of use and user, user-centered design also has returned the question of ethics to the terrain of design.

But despite these benefits, user-centered design also runs the risk of suggesting that usability inheres in the artifacts themselves and is little more than a question of design. The broader contexts that surround how people determine use and usefulness are eclipsed by iterative testing and artifact-centered discussion of design. But just as alarming is the simple way in which user-centered design seems to suggest that usability, while manifesting itself in artifacts, can be determined simply by asking or watching the user. This seems to suggest that tools are simply instrumental and can be redesigned according to the needs and whims of the user. Such an instrumental understanding of technology and design threatens to further eclipse the social and political factors that inhere in artifacts and in the discourse of design.

The tension between user-centered design and the political structures that inhere in technology also attend Norman's work. Although much of his work advocates user-centered design principles, Norman also suggests that constraining the possible interactions between user and product can be one way of simplifying design (86). By limiting the number of possible actions that a user can perform with a given object, designers can alleviate the stress associated with operating complex technical systems. Norman provides the example of a Lego motorcycle to demonstrate the means by which artifacts can suggest or, more accurately, limit the actions of users (82). Importantly, the focus on constraints suggests that designers are not simply responding to user needs but are in fact producing particular kinds of users via their products. A more obvious example of this would be the way in which a ballpoint pen demands that a user drag it across the page to write. Although this feature allows the user to quickly determine how to hold the pen and easily use it, it also demands that left-handed users actually place their hand in a far less comfortable position to successfully complete the same action. Thus constraint as a design principle necessarily brings with it the privileging of particular users.

The political element of such design practices is made even more apparent in Norman's discussion of various kinds of doors throughout *The Design of Everyday*

Things. Many of his examples look at the ways in which various door handles and signs fail to conform to conceptual models and natural maps, thereby specifically excluding a segment of users. One example is that of a door in a school for students with varied abilities (204). The door in question has its handle located at the top of the door, thereby limiting the ability of the students to operate the door without teacher assistance. Although such design features in some cases may be necessary, they nonetheless remind us that product design does not focus simply on what the user wants the technology to do but also on what the designers want the user to do.

It is in response to this idea of constraint that Spinuzzi has suggested that rethinking the use of the phrase *user-centered design*. Spinuzzi notes:

> One of the reasons that I dislike the term "user-centered" is that it hides the fact that technical communicators actually do try to marginalize, inhibit, and discourage certain types of users and assign circumscribed roles to these readers. ("Exploring" 215)

Spinuzzi argues that, by submerging such concerns beneath principles of natural mapping and transparency, usability theorists also submerge the sociocultural aspects necessary for any comprehensive study of usability. In a focus on the end user, the competing claims of multiple stakeholders are ignored, as is the network of political and social forces from which a given activity and its agents and agencies emerge. Without paying attention to these issues, user-centered design has a harder time accounting for the emergence of the very user-artifact binary that it inhabits. Not only does this argument isolate a central weakness in the discourse of user-centered design—the eclipse of central premises that attend and shape the discourse—but it also further suggests that user-centered design runs the risk of reinforcing particular politics of design and use that may in fact run contrary to the stated aims of usability testing.

Within the field of user-centered design, usability experts such as Jacob Burr, Susanne Bødker, and Lucy Suchman have already attempted to attend to these difficulties through participatory design practices. In "Making Work Visible," Suchman argues that the ways user activities are represented in design practices form "interpretations in the service of particular interests and purposes, created by actors specifically positioned with respect to the work represented" (58). Such an acknowledgment demands that designers involve users in the creation of these representations and the technologies that make use of them. Blomberb, McLaughlin, and Suchman advocate the use of "work-oriented design" in product development, an approach that utilizes close observation of everyday work processes across the times and spaces in which they occur (91).

Burr and Bødker approaches the same problem through the discourse of participatory design. Buur and Bødker coin the term *design collaboratorium* to describe "a design approach that creates an open physical and organizational space where designers, engineers, users and usability professionals meet and work alongside

each other" (297). This approach focuses early on issues of usability, and demands that designers actively involve users in the design process. Users are thereby recognized from the start as significant stakeholders in the process of product development, adoption, and use.

Also responding to the political difficulties raised by user-centered design, some usability theorists have argued for a contextual understanding of usability. Barbara Mirel, approaching usability from the activity theory of Vygotsky, "assumes that task knowledge 'is in the connections,' in the meeting of material, social, cultural, institutional, technological, historical, and individual forces" (16). Robert Johnson sees attention to context—an attention that takes into account the influence of culture and history on the user—as the foundation for a rhetorical theory of user-centered technology (39). Spinuzzi likewise sees usability "as distributed across the genres, practices, uses and goals of a given activity" ("Grappling" 16). Understood as task knowledge, "distributed usability" describes the capacity of a given network to support users as they engage in meaningful activity (16). These activities, or tasks, also emerge from such an activity network; understood as the terrain from which particular tasks, users, and artifacts emerge, activity networks further provide the terrain for understanding usability.

But perhaps the most important point that emerges from distributed theories of usability is that users are not simply users of products but are in fact users of networks. Gaye and Hembrooke explain that an activity network "consists of people, artifacts, an objective or motive, sociocultural rules, and roles" (2). It is these networks, which coalesce as users pursue specific objectives, that determine the relationships between users and other artifacts within a given network. These relationships are also mutually constitutive, insofar as users who support and maintain a given activity network are also defined as users by that network. Thus it is not the hammer that is or is not usable; it is the entire task environment that surrounds the act of driving a nail. Given that the nail is no doubt going to perform some other function—suspending a picture on a wall, for example—it could just as easily be said that the nail is usable. Hammer, nail, and user are all distributed across the terrain of the task and represent the series of elements that comprise that very terrain. Distributed usability could therefore be described as the capacity of a network to enable structural coupling, with structural coupling understood to be the development of meaningful relationships between users and artifacts within a given network. These relationships are further considered meaningful insofar as they (a) facilitate the completion of meaningful tasks and (b) allow users to develop the requisite knowledge to create more meaningful relationships.

Distributed usability also challenges the simple privileging of ready-to-hand relationships within the discourse of user-centered design. As has already been noted, the privileging of ready-to-hand relationships applies only to certain user groups and leaves others excluded from certain activities. Ready-to-hand relationships are therefore the concretization of particular political forces within a net-

work, with the result of concretization being the naturalization of those political relationships. Distributed usability demands that we ground these relationships within broader sociocultural frameworks that make apparent the political investments at work.

To that end, distributed usability turns from ready-to-hand relationships to present-at-hand relationships, which describe moments when the connections between user and artifact break down and the artifact becomes present to the user (Winograd and Flores 36). When a person inevitably strikes a thumb while attempting to hang the picture hook, the hammer becomes about as present-at-hand as it could possibly be. Likewise when a pen runs out of ink, the writer quickly notices it as an object and no longer simply as a conduit through which writing flows. Such relationships emerge as a result of product failure, user frustration, or other "deeper discoordinations" within the network (obsolescence, for example) (Spinuzzi, "Grappling" 20).

But far from representing a simple failure in design, these instances of breakdown become, for the distributed usability theorist, the moment at which usability can be studied and renegotiated. Breakdowns certainly do suggest that something is amiss, but this might just as easily be a glitch in the system as a problem with a given artifact. When we strike our thumb with the hammer, it could be that we are holding the tool problematically or that the nail we are using is too short. Whatever the problem, it is unlikely to reside only in the hammer. Thus Mirel "felt difficulties constitute the need and condition for learning, critical thinking, and doing" (23). It is in the context of such difficulties that "technologies are constantly tested and refigured by those who use them" (Johnson 10). Distributed usability insists that we turn to the dynamic networks that constitute the entirety of the task environment, if we want to understand what constitutes usability in a given instance.

Such a concept of distributed usability has considerable consequence for theories of design. In *Understanding Computers and Cognition: a New Foundation for Design*, Winograd and Flores have already attempted to outline a theory of design based on a networked understanding of activity. The design theory that the authors advocate is one that takes into account the role of breakdowns in the development of robust and usable networks:

> A breakdown is not a negative situation to be avoided, but a situation of non-obviousness in which the recognition that something is missing leads to unconcealing (generating through our declarations) some aspect of the network of tools that we are engaged in using. (165)

Breakdowns here play an evolutionary role similar to that found in distributed theories of usability, with present-at-hand artifacts and users providing the motivation for further developing a given network. As "deeper discoordinations" between user and artifact draw attention to those elements of a network that are out of align-

ment with the activities the network performs, users are then able to refigure those relationships.

Winograd and Flores thus posit a model for design that anticipates breakdown and develops a systematic domain within which to deal with breakdowns (174). Under this model, "design is always already happening," and what remains is to integrate such an awareness into technical systems (173). Although for Winograd and Flores, writing in 1987, this means the integration of better feedback and interaction systems into computer systems, similar principles have guided the development of open source software, as evidenced in Eric Raymond's *The Cathedral and the Bazaar.* Open source development models use instances of breakdown, and direct user participation, to engineer responsive and robust operating systems. This enables users directly to respond to problems with a given program as they occur, by accessing the code that runs the software and making direct changes. If they are not certain about how to fix the problem, they might contact other users who are. Certainly this demands that users learn something about the operations of the software they are using, but, following this learning curve, open source software represents one of the most open and flexible responses to the demands of distributed usability.

Distributed usability also provides a more dynamic means of engaging the rhetorical aspects that determine technological development and use. By centering on the broader complexes that contextualize usability, distributed usability focuses our attention on the competing political and cultural forces that determine various technical networks. This focus further draws attention to what Andrew Feenberg has called technical code:

> Capitalist social and technical requirements are condensed in a 'technological rationality' or a 'regime of truth' that brings the construction and interpretation of technical systems into conformity with the requirements of a system of domination. I will call this phenomenon the social code of technology or, more briefly, the technical code of capitalism. (76)

Technical codes thus comprise the connections that enable specific technologies to operate in conjunction with broader social and economic elements. One can see the technical code of capitalism at work in the demands that products must be marketable and therefore must be as cheap to produce as is humanly possible. Robert Reich discusses the way such a code shifts in post-industrial capitalism by noting that many products (such as cars and copy machines) now assume and require an entire service sector in order to maintain them; when one buys such a product, one also buys a relationship with warranties and service staff that directly implicate the technology in the technical code of capitalism (85). Distributed usability allows us to investigate this code by focusing on the points where various forces fail to mediate the relationship between technology and capitalism or the demands of the user

and the demands of other stakeholders in a given network. Put another way, distributed usability provides a means of describing the rhetorical terrain from which technical codes, including that of the user/artifact dyad, emerge.

It could thus be said that the discourse of usability emerging here from discussions of user-centered design and gradually moving toward more distributed understandings of usability and design has itself taken a social turn. As usability theorists become more interested in how the interplay of material and social forces determine the usability of given networks, more time is given to the discussion of the political and social forces that always attend the design process. Distributed usability emerges here as the ethical claim of user-centered design followed to its natural limit. But just as important, as I will argue in the next two sections, distributed usability provides a robust means of exploring the relationships between technical systems, users, and the technical discourses that constitute larger activity networks. Insofar as these activity networks are also networks of communication, usability research provides a rhetorical framework that opens up the sociocultural terrain of technical communication to classroom inquiry.

AN ANGEL IN THE CLASSROOM: USABILITY AND COURSE MANAGEMENT SYSTEMS

The Summer 2002 special issue of *Technical Communication Quarterly* was devoted to the topic "Computer Classrooms and Technical Communication Pedagogy." Articles by Lee-Ann Kastman Breuch and Michael Salvo dealt explicitly with the need for critical engagement with the technologies that determine and mediate classroom environments, particularly in the technical writing classroom. In my own classes, I introduce my students to the discourse of distributed usability through the exploration and critique of the design and function of classroom technologies, particularly "A New Global Environment for Learning" (ANGEL), Penn State University's course management system. In the following discussion, I attempt to trace the ways in which my classes and I talk about the design of the course management system in terms of usability. User-centered design principles can serve to defamiliarize many of the more transparent elements of a course management system's interface and can further draw attention to the ways in which users are configured via their movement through the various aspects of the system. Distributed usability provides a means of contextualizing these interactions within the context of the competing stakeholders and diverse discourses that are present in a course management system's design. This approach not only introduces students to concepts of usability and design but also encourages them to see these concepts as a means of engaging the sociocultural concepts of technical writing.

Penn State's course management system, ANGEL, is a product of the Cyberlearning Labs of Indiana University–Purdue University at Indianapolis. Although necessarily smaller in scale and distribution than WebCT or Blackboard, ANGEL has many of the same features and follows many of the same design principles, such as a Windows-style user interface, easy-to-use navigation systems, and features for making files and classroom exercises available online. Given the relationship between ANGEL and the classroom, this makes the system a useful site through which to teach students about the concepts of usability and user-centered design.

User-centered design provides students with a useful opening into discussion of the course management system, as it can help to defamiliarize many of the design features of these systems. This process allows students to see how a system like ANGEL is designed for learnability, efficiency, memorability, satisfaction, and reduced errors. Help features and the use of centrally located navigation bars increase learnability and memorability while multiple frames allow efficient movement around the system. Links provided to the Penn State library system, the student directory, and the course schedule aim at increasing satisfaction by centrally locating those elements of Penn State's network that are in high demand. The

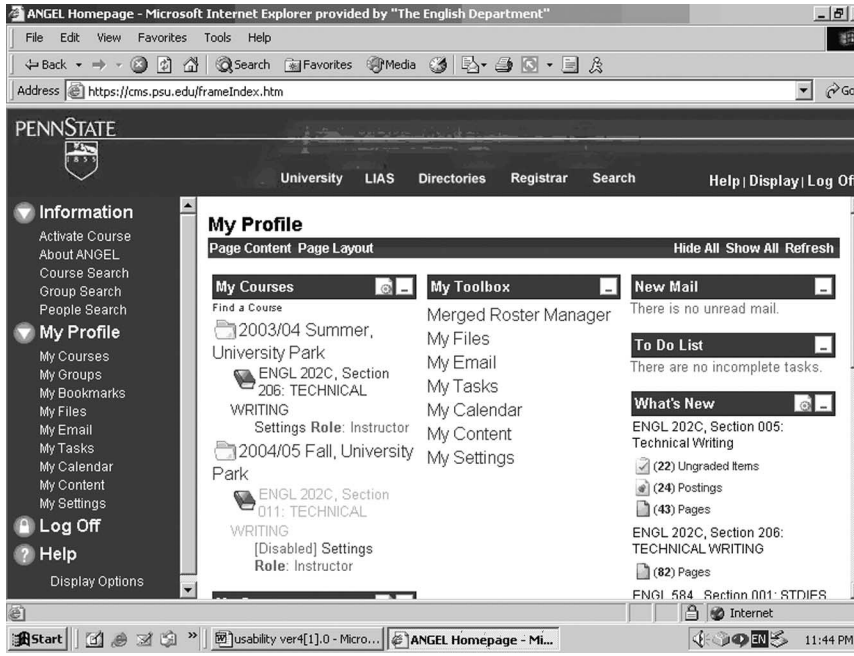

FIGURE 1 ANGEL's portal-style design follows many of the conventions of user-centered design.

portal-style design of ANGEL allows users to centrally organize and manage most of their online activity at Penn State. In sum, the course management system demonstrates a design that accords with Nielsen's five usability categories, one that is both familiar to Web users and responsive to student needs.

The communication facilities found in ANGEL likewise show attention to user-centered design. Message boards allow users to choose between full-screen display to facilitate reading and writing and threaded view to observe the development of discussions. Dropboxes provide an uploading interface similar to many Web-based FTP programs and allow users, if the option is enabled, to retrieve other students' work for discussion and review. Aside from the synchronous chat facility, which is located with course mail under the "In Touch" tab, all synchronous and asynchronous communication facilities can be accessed under the central "Lessons" tab. Thus the design of ANGEL anticipates users who are at once familiar with computer interfaces and need an easy-to-use interface by which to manage their courses.

In drawing attention to the portal design of the system, user-centered design principles also highlight the conventions at work in the ANGEL interface. ANGEL deploys left- and top-aligned navigation bars, with a large frame on the right-hand side being used for content display. The display itself is closely modeled on the "My Computer" file management interface of Microsoft Windows, with folders, files, and links being represented by familiar icons and a line of explanatory text. This facilitates both learnability and efficiency, as the system is essentially organized in the same way as the user's desktop. This further aids memorability and satisfaction, as the system allows for the nonintrusive management of course materials.

This analysis can be used in technical communication classrooms to explore the use of conventions that determine interface design and education software. In my own classes, students have discussed whether the top/left orientation of navigation bars reflects reading practices or, instead, represents an emergent convention in Web design. We have likewise focused on the way in which students log on to the network using the same usernames and passwords that allow access to e-mail and lab computers through the Penn State network. Discussion here looks at how this meets the criteria of learnability, memorability, and efficiency. Students have also commented that this increases satisfaction by assuring that students' work can be easily identified, thus assuring the efficient management of assessment items by the teacher.

But such an analysis also suggests to students the complexities involved in discussions of usability. Although Nielsen's categories are useful for discussing user-centered versus system-centered design, it quickly becomes apparent that these categories introduce complexities of their own into the analysis. Learnability, memorability, and satisfaction are in many ways determined by broader design conventions that demand interrogation. Efficiency is no doubt

important, but it may well streamline and obscure processes in which users expect greater engagement.

Students are also quick to point out that the artifact-oriented analysis described earlier, although useful in defamiliarizing and disrupting ready-to-hand relationships, nonetheless makes two problematic assumptions. The first is that ANGEL's end-users are a relatively stable group comprised primarily of students; ANGEL is in fact used by a far larger and more broadly defined audience of administrators, teachers, students, and staff. The second is that ANGEL's clients—those groups that purchase but do not necessarily interact with the system—are not represented as users in this analysis; this runs the risk of ignoring corporate, economic, and certain logistical issues that no doubt determine certain elements of the system. Discussions of these limits also highlight the fact that user-centered design, in suggesting that product design primarily responds to user needs, runs the risk of being unable to account for the emergence of conventions in product design.

Students are also quick to point out that ANGEL not only facilitates their actions but also constrains what they are able to do as users. For example, ANGEL makes use of Penn State user IDs not only to provide an easy method of access but also to allow the tracking of students' movements within course sites. Via this

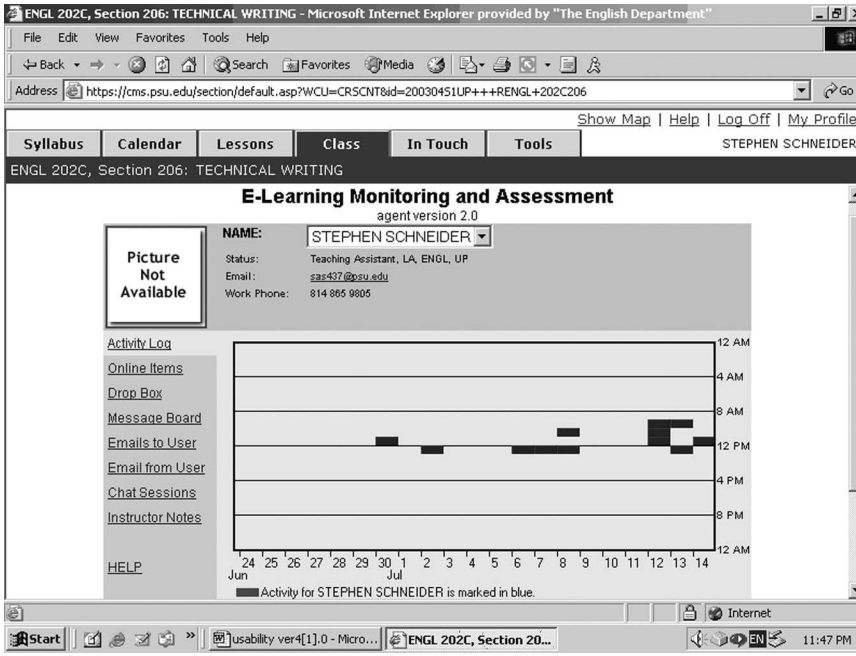

FIGURE 2 ANGEL's E-Learning Monitoring and Assessment agent provides instructors with a detailed profile of students' online activities.

mechanism, teachers can access untold amounts of data on exactly how students are using the site, including when they accessed it, what they accessed, and how long they were in the site. The Electronic Learning and Monitoring Agent (ELMA) allows teachers instant access to a range of reports on each student. Thus students are not simply users to which the system's design responds, but are tracked and therefore configured by the system in very specific ways.

Such an observation can and should cause instructors and students some concern. Read as mechanisms of control, ANGEL's tracking features produce fields of what Paul Virilio has called "indirect illumination," or sites where surveillance operates to control individuals (16). This tracking is at once invisible to students and always already active in the system; although the display can be hidden, the tracking cannot be turned off. Insofar as course management systems make user movement available for scrutiny, they further enable what Joseph Janangelo has called technopression. In his article "Technopower and Technopression: Some Abuses of Power and Control in Computer-assisted Writing Environments," Janangelo recounts several instances where the indirect illumination maintained by computer networks allowed more direct and potentially oppressive relationships to emerge between users (passim). Both authors thus remind us that ANGEL provides teachers, another important user group, with the means to exercise direct and intense power over students. At this point, it appears that principles of user-centered design, catering here to both teachers and students, replicate and intensify the power relations found in the classroom.

Insofar as ANGEL limits avenues of communication to various course facilities, and makes visible all movement within those facilities, it also qualitatively changes the manner in which students and teachers interact with one another. By producing fields of permanent visibility, systems such as ANGEL threaten to undermine the development of what Robert Brooke, after Erving Goffman, has called the "underlife" of the writing classroom (142). The underlife, comprised of those informal networks that emerge despite the more formal elements of the classroom, provides space in which teachers and students can engage in off-task and resistant practices that augment and productively inflect the classroom. Thus students can consult one another about unclear topics, disrupt classroom lectures with questions, or even improvise in unexpected ways with in-class exercises. But ANGEL restricts such interaction by making all student interaction visible and further attaching user IDs to that interaction. ANGEL fundamentally alters not only the dynamic of the classroom but also the kinds of user that students can become. One could therefore question whether this constraint aids or in fact impedes usability as it relates to the tasks for which ANGEL is intended: those of meaningful and engaged education.

These critiques are no doubt essential in any attempt to use course management systems as teachable sites within technical communication classrooms. By looking at the various user groups that are given a course management system's design,

technical communication classes can readily observe the power relations at work in that system. Such relationships also emerge as points of ambiguity, tension, and conflict. By recognizing the multiple interests at work in course management systems, students are also able to engage in broader discussions about the ways in which usability is negotiated and distributed through a network of relationships that are only partially represented by the system itself. Seen through the lens of distributed usability, ANGEL represents a complicated network of diverse interests: Penn State students, teachers, university administrators, information technology support staff, and instructional designers at Cyberlearning Labs (the company responsible for ANGEL's development). These groups further bring with them a host of demands and goals, not all of which are complementary. A study of ANGEL can thus allow us to look at how these various goals affect the conditions that determine the system's usability.

But my point here is not to suggest that course management systems necessarily undermine the performance of student tasks or negatively affect teacher-student relationships (though discussion of such relationships is notably absent above). Rather, I hope to illustrate the various discourses that inflect usability within course management software. I would also note that these discourses are not always in competition; student tracking enables students to receive credit for the work they complete in a course, allows teachers to get a sense of the students in their class in the absence of face-to-face contact, and ensures that administrators can make more informed decisions about classrooms and their management. Based on such an administrative assessment, one might say that a system such as ANGEL, in efficiently mediating these tasks, sustains and possibly improves the usability of the classroom activity network.

But one might also look at where the aforementioned interests of students, teachers, and administrators do not necessarily act in a complementary fashion. For example, ANGEL allows teachers to request work from students outside normal class hours, such as on weekends. ANGEL thereby restructures the student-user, insofar as the system demands attention well beyond what used to be required in the physical classroom. Given that teachers can also see when work was submitted, and more broadly what time students accessed the site, they are also able to make judgments about student work habits that previously were not possible. Although a teacher's conclusion that a student who submits work at 5 a.m. is lazy or a last-minute worker is not logical, nonetheless such an assessment can affect student performance.

In this context, a study of usability might conclude that the flexibility and information that ANGEL provides to instructors actually serve to constrain students' use of the system, but whether this is good or bad will no doubt depend on our views of power relations within the classroom. Distributed usability would encourage us to look at how course management systems facilitate or impede the goals and activities of the classroom network and what relationships they hold open for

the various stakeholders in that network. Such an examination further encourages students to look at the always already-present sociocultural factors that determine the various forms the classroom network takes.

By calling our attention to the sociocultural dimensions of the classroom network, distributed usability also provides us with a means of understanding the conventions and assumptions that inform user-centered design. For example, we might ask students to ask why Cyberlearning Labs privilege top/left navigation bars or why they make use of an office/study interface. Why does the system allow only teachers access to the tracking display? Or more broadly, why does ANGEL not support Netscape Navigator and other non-Microsoft browsers? By contextualizing these assumptions, we also encourage our students to adopt an engaged rhetorical stance toward the technical systems around them. Such a stance enables them to explore the various discourses that shape both artifacts and users and thus affect the relationships that constitute individual lives. Although I do not want to overstate the effects that such an analysis might produce in students, I do want to suggest that it allows instructors to critically teach the contexts in which technical artifacts and technical discourses emerge.

In providing discussions of the discourses that inform the design of the ANGEL system, technical writing instructors can also help students to manage and transform their interactions with this system. Establishing the various interests at work in the system can encourage students to become more familiar with ANGEL's features and various operations. Students can thereby better manage their interactions or, alternatively, learn to occupy ANGEL in different ways. For example, students can elect to establish their own group sites within ANGEL for collaborating and distributing work, in preference to using instructor-controlled class sites.

Students can also be encouraged to more actively participate in the design processes that produce systems such as ANGEL. ANGEL, for example, utilizes a built-in feedback feature that e-mails Penn State's Information Technology Services with complaints and upgrade suggestions. This feature allows Cyberlearning Labs to extend the process of iterative design and further remain responsive to user needs. It was in response to instructor requests through this system that Cyberlearning Labs turned off the default display of tracking features. Usability theory not only provides the means for critiquing systems such as ANGEL but also demonstrates the ways in which such technologies remain open to intervention.

But distributed usability theories also encourage us to situate the technologies we use within the activity networks that structure our goals and actions. Thus students might also look at whether ANGEL is the most appropriate system for meeting and pursuing the needs of the technical writing classroom. Identifying the goals and features of classroom networks can encourage us to put systems such as ANGEL into dialogue with other emerging technologies such as websites, chatrooms, and wikis, further providing students and teachers with the means to evaluate and utilize these technologies.

DISTRIBUTED USABILITY AND THE TECHNOLOGIES OF TECHNICAL WRITING

The preceding analysis shows the further potential of distributed usability theories as a pedagogical approach to the technical communication classroom. Although I noted earlier the implications of such theories for product design practices, I want to further suggest that distributed usability provides a useful way to discuss technical communication and technical documents. By emphasizing the networks from which such communicative practices emerge, distributed usability provides the technical communication instructor with the means to draw such networks into classroom conversation. Insofar as it is a rhetorical as well as a technical discourse, distributed usability draws attention to the constitutive role of language in those networks. Thus it could be said that usability research offers a rhetoric for the ecological model of technical writing advocated by such theorists as Marilyn Cooper (367).

The analysis of the ANGEL system, aside from exploring the rhetorics that inform technological design, also demonstrates the ways that technical communication itself is mediated through technological networks. Technological progress over the last two decades has expanded and transformed the field of technical communication and the environments within which such communication takes place. Advances in communication technologies, insofar as they constantly reshape these environments, place greater demands upon technical communicators and often alter the ways that technical communicators approach their tasks.

Distributed usability theories provide us with a means to interrogate ANGEL as one environment that structures technical communication. Users of ANGEL, particularly users of Macintosh computers, quickly become aware of cross-platform compatibility problems within the system. Such users often face difficulties in opening files posted in ANGEL both because these files are normally composed in Microsoft PC format and because ANGEL relies on Windows file recognition to load files smoothly. Such constraints allow technical communication instructors to discuss file formatting and compatibility issues in the composing of technical documents. These features of the ANGEL system also show the ways in which institutional software and hardware choices directly affect technical communication practices. Usability theories provide a pedagogy that emphasizes the centrality of these issues to technical communication and the framework with which to engage them.

This approach encourages technical communication instructors and students to examine the ways that discoordinations occur between a system such as ANGEL and the goals of the technical communication classroom. For example, the student tracking feature within the ANGEL system can encourage students to view the composition of technical documents in an individual and proprietary nature rather than as a collaborative practice that emerges from a specific network of users and

interests. We might therefore ask students to think about how they might use ANGEL to support collaborative writing practices, or we might even choose to discuss the tension that exists between proprietary and collaborative communication practices. We can thereby use usability theory to interrogate ANGEL within the context of broader activity networks and to highlight the limits and potentials of those networks.

Within this context, technical communication practices also present themselves as a means for effectively managing and transforming the technical networks that structure academic and vocational activities. By focusing on the ways in which technologies such as ANGEL structure communicative possibilities, technical communication instructors can help students develop strategies for using such systems. Topics such as file naming, file formatting, and attachment and file distribution emerge as important elements in the creation and management of usable technical documents. But further interrogation of the networks that structure technical communication also reveals sociocultural factors that demand our attention: product compatibility, software choices, and access for differently abled users, to name only a few.

Distributed usability also allows us to foreground for students the networks constituted by technical communication. In this regard, usability discourse can remind us that these networks consist of not only human actors but also technical systems and artifacts that support the goals and activities of a given network. Understood in this light, technical communication could itself be described as a set of practices by which individuals interrogate, maintain, and transform the usable relationships within an activity network. As such, technical communication is always already implicated in the development and maintenance of technical artifacts. Although we risk losing the specificity of particular networks if we push this analysis too far, we can nonetheless safely say that distributed usability is as much a set of rhetorical practices within a broader network as it is an immanent technological discourse.

If we view technical communication as being concerned both with the usability of multiple technical and professional networks and the facilitation of networked activities and goals, then technical documents themselves should be studied as usable artifacts—or rhetorical nodes within a broader social structure. Technical documents thus become forces with the power both to directly modify the relationships of an activity network and to make such modification on a number of levels. Analyzed in this way, technical documents reflect the same kinds of conflicting forces that can be located with course management systems; documents no less than products are amalgams of competing genres and stakeholders. Inasmuch as such documents coordinate the relationships that emerge between these forces, they also help coordinate technical and social codes.

Within this model, readers of a technical document become active users of the communication and respond to such technical documents by modifying the

relationships in which they participate. Readers as users transform the role and force of technical documents at the same time that technical documents transform the roles and forces of readers as users. This conception of audience seems far more powerful than understandings of audience as receiver precisely because it emphasizes a dynamic relationship between communication and audience that extends beyond the simple encoding of a message. Rather, the user actively transforms technical documents through use and thereby has the potential to affect the entire network.

By emphasizing the importance of communication and relationships, distributed usability models foreground the ecological aspects of technical communication. Spinuzzi emphasizes the connection when he talks about "genre ecologies" and the ways in which genres of communication and activity have mutually transformative relationships that demand detailed sociocultural analysis ("Grappling" 17). This accords with Cooper's theory of "writing ecologies" and her calls to approach the teaching of writing as an ensemble of ecological practices (368). Such practices are firmly enmeshed in their context and appear to be symptomatic rather than static or prescriptive messages. Thus the study of writing ecologies provides technical communication instructors the means to approach communication as a practice that emerges from various political, cultural, technical, institutional, and economic contexts.

Responding to the challenge of this form of contextualized instruction, Mirel suggests that the use of case studies can demonstrate to users the highly specific situations that determine usability research (34–35). Johnson, responding to the same challenge, advocates the study of rhetorical theory and history within technical communication (158). Although both of these approaches are useful and inflect my own classroom practices, I would add to their suggestions the need for technical communication instructors to engage the political and technical networks that inform classrooms and other instructional sites. By exploring the activities and goals that define these networks and the ways in which these networks determine the relationships and activities of the classroom, technical communication instructors can leverage the discourse of usability to provide a sociocultural framework for teaching technical communication.

The analysis I offer of ANGEL is one such attempt at interrogating these networks. Further, my analysis indicates the potential of a usability-centered pedagogy to address intersections of culture, technology, and communication in the technical communication classroom. As a discipline that is already invested in the sociocultural implications of design practices, usability scholarship provides a discourse that is familiar to many technical communication instructors. Usability further provides a discourse that is appropriate for both the interrogation of classroom technologies and the networks through which technical documents move. Insofar as they provide a potent means for interrogating the broader social and technical networks that determine technical documents and their circulation, usability theo-

ries emphasize the sociocultural conditions that always already determine the communication in which we participate.

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