Journal of Literacy and Technology
Volume 5, Number 1: Fall 2005
ISSN: 1535-0975

Autonomous Literacy or Social Practice? Students' Constructions of Technology Literacy

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ISSN: 1535-0975

Overview

From Clinton's 1996 "Technology Literacy Challenge" to Bush's 2001 "Enhancing Education Through Technology (ED Tech) Initiative," educational policies of the last two administrations have made "technology literacy" a top educational priority and a major target for federal spending (U.S. Department of Education, 1996, 2001). Technology literacy was defined in 1996 as "computer skills and the ability to use computers and other technology to improve learning, productivity, and performance." In these and subsequent educational plans, technology literacy continues to be linked to national progress and our nation's success in a high-tech global environment (U.S. Department of Education, 1996, 2000; ISTE, 1998; Selfe, 1999a; 1999b). This connection between literacy and progress once again brings home a risk that technology literacy and print-based literacy face together: the peril of limiting literacy to a set of de-contextualized skills, upon what Street (1995) and Bruce (1997) call an "autonomous" model of literacy which represents the meaning of literacy for others in terms of limited mental operations, giving no attention to "social structures within which the concepts and philosophies of specific cultures are formed" (Street, 1995, p.85). In an autonomous model, literacy is separated from its social context and considered an independent variable making it possible to associate literacy with symbolic elements such as progress, social mobility and economic stability (Gee, 1996). Because the autonomous model of literacy has dominated educational policy for the last decade, it is important to consider the consequences of this model upon students' views of technology literacy. This study examines the extent to which students construct an autonomous or socially situated definition of technology literacy and discusses the implications of each of these constructions.

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Alternatives to Autonomy: Technology Literacy as a Social Practice

Gee (1995) calls literacy a socially contested term whose traditional meaning—the ability to read and write—appears rather straightforward and obvious. But by linking literacy with individual abilities, such definitions fail to acknowledge the ways in which literacy is implicated in power relations: “situating literacy in the individual person rather than in society, obscure[s] the multiple ways in which literacy interrelates with the workings of power" (p. 2). According to Street (1995), such traditional definitions of literacy are based upon an "autonomous model," autonomous because literacy is extracted from its social, cultural, and historical context. When treated as a technical skill or mental operation independent of social context, literacy is associated with consequences that have no relation to the social situations in which it is embedded. The payoff for being literate has, in our society, taken on mythic qualities so that when we talk about literacy we have nothing less than our national well being at stake. As both Street and Gee suggest, this "literacy myth" entails dire circumstances for those who do not become literate even as it raises false expectations for those who do become literate. Because literacy is in the hands of the individual, the 'illiterate' are those too lazy to learn or, even worse, unable to learn. This situation enables governments to shift focus away from societal problems and onto victims' individual shortcomings (Street, 1996).

A growing body of research and scholarship known as the New Literacy Studies avoids the pitfalls of the literacy myth by engaging in research that captures the complexity of literacy practices in the social contexts that make them meaningful (Snyder, 2001). This body of work is linked by its adherence to what Street (1996) calls an "ideological" model of literacy, which concentrates on the social practices of reading and writing and the ideological and culturally

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embedded nature of these practices. In addition, the ideological model maintains a wariness of claims for literacy and distinguishes between these claims and the actual significance of literacy for the people involved. Literacy in the ideological model looks beyond a technical definition of literacy to consider "literacy practices." Rather than limiting literacy to events that involve reading and writing, Street broadens the scope to "literacy practices" which take into account "the behavior and the social and cultural conceptualizations that give meaning to the uses of reading and/or writing" (p. 2). Literacy practices incorporate 'literacy events'--those situations where reading or writing are integral to communication--but focus as well upon the conceptions people have of those events and the norms, values, beliefs in which those practices are situated. This concept of literacy practices gets us away from the literacy myth by re-inserting social and cultural context and arguing that whatever benefits come from literacy also come from the contexts in which it is embedded. Different circumstances yield different benefits. Furthermore, literacy practices emphasize the fact that people must be socialized into these practices. It takes into consideration that language is more than grammar and structure, that it is "ideologically saturated" and internally stratified (or heteroglossic) into languag*es* that reflect social groups, professions, communities, families, etc. (Bakhtin, 1981). As such, in order to become "literate" one not only needs to acquire language but also ways of thinking, acting, and believing (Lankshear & Snyder, 2000).

Like its less technological cousin, the autonomous model of technology literacy links a neutral, skills based approach to technology with national progress and increased individual cognition. Technology literacy, as policy makers and government officials use it becomes a symbol for national success in a global economy: "Just as literacy embodied the ideals of an Industrial Age, technology is positioned as a symbol of enlightened progress in the Age of

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Information" (Tyner, 1998 p. 17). It is the promise of technology touted by government officials and policy makers that have led many to argue that technology literacy *is* the new literacy myth (Ohmann, 1985; Selfe 1999a; Lankshear and Snyder, 2000)). Technology literacy programs like the Technology Challenge explicitly link the ability to use computers with equal opportunity for high paying jobs and social mobility:

> We know, purely and simply, that every single child must have access to a computer, must understand it, must have access to good software and good teachers and to the Internet, so that every person will have the opportunity to make the most of his or her own life (U.S. Department of Education, 1996).

The government thus promotes technology as a "panacea for social and economic stability" (Tyner, 1998, 17). If individuals have access to a computer, they will be able to "make the most of his or her own life." Given the access to technology, the individual who becomes technology literate will have a greater chance at success. But, as Selfe (1999a) argues, we have no reason to believe that technology literacy will live up to its promises:

> We have no specific evidence that the current project to expand technological literacy will change the patterns of literacy and illiteracy in this country. Rather, this project is likely to support persistent patterns of economically-based literacy acquisition because citizens of color and those from low socioeconomic backgrounds continue to have less access to high-tech educational opportunities and occupy fewer positions that make multiple uses of technology than do white citizens or those from higher socioeconomic backgrounds (1999a, p. 423).

Understanding the full effect of technology in the classroom requires seeing the use of technology as something that embodies a complex set of actions, behaviors, discourses,

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assumptions and ideologies, rather than simply as the acquisition of word processing skills. As Snyder (2001) notes, failure to place technology literacy within its social contexts leads to unrealistic expectations. If educators and students can overcome the view of technology as tools for efficiency rather than as constitutive aspects of their social and cultural landscape, they can "engender a realistic conception of the technologies' significance and of their own and their students place in an information and knowledge-based society" (Snyder, 2001, p. 128). In addition, scholarship shows us that by maintaining an autonomous model we inherit a number of risks. We risk perpetuating literacy myths, failing to engage in a useful, critical dialogue about technology in society, and foregoing the opportunity to shape and guide the ways in which technology is used in education (Haas and Neuwirth, 1994). Given the opportunity to examine and critique the technologies that impact their world, students may less susceptible to uncritically accepting a given view of which technologies they should learn (as is posited in the autonomous model) and instead become actively involved in which technologies should be utilized to help them meet their goals.

Research Design and Methodology

As early (in "technology years") as 1994, Haas and Neuwirth (1994), and Selfe and Hilligoss (1994) were calling for a new research agenda that linked technology with literacy in order to better understand the relationship between technology, literacy and culture are connected. According to Hilligoss and Selfe (1994): "Such research is crucial for informing the design of curricula for teaching writing and can guide the wise use of technology in writing" (p. 320.) Similarly, Bruce (2002) describes the need for research that positions literacy within "a matrix of historical, institutional, cultural, social, and technological relations" and asks key questions about

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what happens in the classroom when new approaches to literacy are introduced, and how students perceive themselves and their literacy practices in relation to new media (p. 17). This research study makes crucial connections between literacy practices, technology, and their social context asking, "Do students construct autonomous or socially situated definitions of technology literacy, and what are the implications of these constructions?"

The site for this study was a newly designed literature course entitled En305: Literary Narrative in the Digital Age offered through the English Department at Boston College. The instructor, Jeanne Po, created and proposed the course as a means for exploring the changing nature of literary narrative in a digital age. En305 incorporated a number of different technologies, including a course website, online discussion forums, e-mail (for communication and for handing in and receiving papers electronically), and instant messaging. The course requirements included reading traditional print novels and writing essays as well as reading a number of digital texts (both on the web and on CD-ROM), and creating a collaborative web page as a final project. The course itself took place in a networked classroom equipped with a computer and an LCD projector, as well as other audio-visual equipment. The classroom was also wireless so that students with laptops were able to access the course lecture materials online during the class if they desired.

The participants for this study were upper-level college students taking a relatively specialized course. The students in this particular course presented a unique opportunity and yielded insights that can, in fact, be utilized by college instructors on a wide spectrum. Even these students, who we might assume would represent a singular view of technology, responded with a wide range of opinions and skill levels, from the senior who still did not own a personal computer, to the junior who was bored at is summer job writing code for a software company;

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from the young woman who instant messaged her roommate as they sat in the dorm room together, to the woman who felt she was "behind" her peers because she wasn't sure what an MP3 was. The assumption underlying my choice of site and participants is that literacy and technology literacy are socially situated, and since no group of individuals represents exactly the same social context their constructions of technology literacy would vary. The small sample size made it possible for me to talk at length with each participant outside of class and to observe participants as they engaged in classroom work. The twelve participants ranged in age from 19 to 21 with one sophomore, three juniors, and eight seniors. The participants majored primarily in English, with three communications majors and one computer science major. Seven of the participants were male and five were female. The students represented diverse cultural backgrounds including two Latina students, and two Pilipino students, each of whom spoke English as a second language. Geographically, students hailed from the cities of New York, Chicago, Providence and Boston, as well as smaller towns in Nebraska, North Carolina, Ohio, Massachusetts, and Wisconsin.

In addition, this particular course allowed me to observe students using technology, to talk with them and interview them about how this technology related to their literacy practices, and to utilize their reflections as they engage in the discussions about the impact of technology upon literary narrative. Due to the nature of the course topic, students were immersed in thinking about how literary narratives have been affected by the "digital age" in which we live; therefore, their responses to questions were thoughtful and thought provoking.

In order to understand the social and cultural context of learning with technology, I employed an ethnographic approach to data collection and analysis, focusing on attitudes and behaviors towards technology in the contexts that give those behaviors purpose and meaning

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(Morse, 1994). Thus, I attended classes as a participant observer, taking a membership role in the community (Angrosino and Mays de Perez, 2000) by occasionally taking part in class discussions, offering technical assistance, and spending time with students before and after class. In order to understand the students' experiences I adopted a negotiated, dialogic approach to a series of interviews in which I asked students to tell me about their experiences with technology both in and out of the class. These interviews allowed for a "conversational relationship about the meaning of the experience," so that as students discussed their constructions I presented them with my understanding at which time they added further reflections or corrected my understanding to better reflect their experience (Van Manen, 1990, p. 66). In the initial interview, I asked students to describe how technology fit into their daily lives. I encouraged them to tell me about the technology they used, why it was important to them, and how they used technology both in and out of school. In the second interview, I asked them to tell me more specifically how college students use technology. I asked how the technology fit into their course work, their research, and their social lives as college students. In the final interview, I asked only one question: How do you define technology literacy? I saved this question for last, with the assumption that after a semester of thinking and talking about technology, the students would have stronger opinions about technology literacy, and would be more apt to give a full and detailed answer. The questions and the order in which they were asked were designed help me understand fully how the participants constructed technology literacy, how this construction might be related to their social contexts and experiences, and the implications their constructions of technology literacy might have in relation to their approaches to technology both in and out of school.

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In addition to these interviews, data also included field notes, transcripts from the online discussion page, e-mails from students, and student papers. Each of these was transcribed and subjected to three different ways of reading (holistic, selected, and detailed) in order to identify and develop themes that captured the students' experiences (VanManen, 1990). The data were then coded according to the words and phrases most commonly associated with the word technology. For example, the data could be divided into technology in relation to family or school, friends and peers as well as social contexts, such as school or entertainment and leisure. Grouping the data in this way allowed me to see how students' constructions of technology literacy were related to their social contexts. The data were also chunked according to the criteria students used in talking about technology literacy (i.e., comparative, in which students compared their knowledge to others; specific, in which students named specific technologies that made one technology literate; and "changing," for students that argued technology literacy could not be defined because of the changing nature of technology). These groupings allowed me to see the extent to which the constructions were socially situated; that is, whether they more typically talked about technology literacy in relation to certain social situations, or whether their references to technology were removed from social contexts and therefore autonomous. Using HyperResearch to compare these codes showed that while in the beginning of the semester students focused more upon making comparisons between family members and peers in all contexts, by the end of the semester, students were more focused upon the complicated nature of technology literacy, the fact that it was changing rapidly, and that different technologies were appropriate for different people and contexts.

Comparative Notions of Technology Literacy

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Students' initial conceptions of technology literacy were based upon comparing the technologies they felt they had mastered to the technologies they believed other people (i.e., family members and peers) had mastered. Their adherence to an autonomous concept of literacy was clear in that their comparisons focused on specific technologies they felt their friends and family knew. For many students, the autonomous definition of technology literacy contributed to a sense of disconnect between the "skills" that students believe are valued in academic and work environments and the technology-related literacy practices in which they were engaged daily (instant messaging, e-mail, surfing web pages, etc.). As a result of this disconnect, students tended to ignore the fact that they were often engaged in very meaningful literacy practices and simply label themselves and others illiterate.

In the first two interviews, students were asked to talk about how technology fit into their world and not explicitly about their conceptions of technology literacy. I did not introduce the term "technology literacy,' primarily because the term is not agreed upon or particularly well defined in any materials with which my participants would be familiar and thus would invite confusion. Additionally, I decided that I might gain more insight from asking the students to describe technologies that played an important role in their world, which gave students a chance to talk about the technologies they used in the context of their lives at home and at school. However, as the students talked about technology *they* often introduced the term literacy or computer literacy themselves, and in doing so revealed previously formed notions of what it meant to be technology literate. For example, in the quotes below, David and Mary expressed their confidence that "everyone" knows certain programs. At the same time, they also showed some impatience with people who don't know the programs:

> *Besides my parents, there isn't anyone who doesn't know how to IM.* (David, Interview 1, Fall 2002)
>
> *I mean, a three-year-old knows how to click on an icon and find something on the web. It's really easy to do . . . I mean, I can't fathom people not knowing how to click on the Internet and finding something they need to know about.* (Mary, Interview 1, Fall 2002)

For David and Mary, instant messaging and surfing the Internet are actions so common and familiar that truly everyone should know how to do them. Both quotes assume an autonomous notion of technology literacy, where "illiteracy" is seen as a failure on the part of individuals that don't take advantage of or are unable to learn specific skills (Gee, 1996; Street, 1995). Additionally, David and Mary asserted that being technology literate meant knowing how to Instant Message and get around on the Internet. These comparisons assume an autonomous conception of technology literacy in that they are formulated around specific, de-contextualized skills or technologies.

Technology Literacy in Comparison to Mom

In the course of talking about the technologies they used at home, the students invariably described the technologies their family members used, and what made them more or less knowledgeable than their family members. For the most part, Moms did not fare well in terms of technology literacies. Dads were only somewhat more technology literate, while younger brothers and sisters were often described with bemusement and wonder at their easy and consistent use of a number of technologies. In any event, as students discussed their uses of technology in comparison with other family members, it became clear that their conception of technology literacy was based upon a notion of literacy as the mastery of certain skills.

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> *My mom doesn't know anything about computers. My mom doesn't even know what www means. She's like . . . she tries to teach herself but she's like . . . My mom is funny.* (John, Interview 1, Fall 2002)

> *My mom doesn't know [about computers]. We like set up an e-mail address for her so she can keep in touch with me and she never uses it. She can't even check our voice-mail on our phone. My mom is really out of technology.* (Robin, Interview 1, Fall 2002)

> *I don't know if [my Dad] really knows how to open a program. He just never uses computers. He can check e-mail, that's the one thing he knows how to do. He kind of has it hard-wired in his head how to do it. Like click on this. And he can't like apply, like he wouldn't be able to say, if I click on this I will open another program. He just knows how to click on the one icon. He probably thinks it's a little picture in the background.* (David, Interview 1, Fall 2002)

For these students, parents formed a kind of base line for technology literacy. Parents bought the family's first computer and supported their sons and daughters' use of technology. However, each of the students in this study felt that as college students their own knowledge of computers and sense of proficiency had come to exceed their parent's knowledge. The quotes above show that their sense of literacy is comprised of knowledge about specific actions: using e-mail, surfing the Internet, and working with current operating systems. David, in the last quote, takes this a step further by suggesting that technology literacy is also using knowledge about one software program to make educated guesses about using another software program. During our conversation, David supposed that perhaps his parents' use of technology is limited by the

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demands of their own social contexts. As he describes his parents' use of technology in the quote below, David begins to show some awareness of the fact that his parents' technology literacy practices were influenced by their "identity kits" which includes their roles as physician and homemaker, rather than the existence of a new technology that "everyone" should master:

> *I think for my dad it doesn't apply at all. I mean he is a physician. I don't know when he would ever use IM. My mom is a homemaker so she could use IM to talk to her friends, but prefers to use the phone.* (David, Interview 1, Fall 2002)

Yet, even as David begins to consider that technology literacy might be related to social practices and contexts, he returns to the notion the onus is on the individual to attempt to understand the existing technologies or risk being out of touch and "wasting" the technology:

> *I would prefer she use the technology that is there; it's just a waste if you don't. [It's] a waste of somebody thinking it up. At the most basic level it would be like—it's not this severe—but it's like if some one had a totally artificial heart that functioned perfectly, like a normal one with no complications, and no one would use it. It would be insane!* (David, Interview 1, Fall 2002)

David's response echoes Street's (1995) concern that autonomous definitions of literacy disguise the ways in which literacy functions ideologically in our society. As David talks about 'basic" levels of technology use, he brings into focus the ways in which literacy is often used synonymously with "functional" literacy, meaning the basic skills one needs to know in order to function in society (Street, 1995). According to Lankshear (1997) functional literacy is a naïve conception of literacy, subsumed under the "autonomous model" of literacy. This conception of literacy becomes a means for diverting attention away from power structures and institutions in society and place blame on "individuals who failed to learn literacy at school, or continue to

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refuse remedial attention as adults, thus diverting blame from institutions to individuals, from power structures to personal morality" (p. 125). To view technology in terms of an autonomous tool is to ignore the fact that one's use of technology is wrapped up in a sense of identity and in the social contexts that shape both technologies and identities; in other contexts, technology may be irrelevant or even at odds with that identity. Thus, when students talk about technology literacy in terms of knowing "the basics," they are basing their construction of technology literacy around autonomous definitions of literacy, taking technology out of the social contexts that make it meaningful and attempting to identify "basic" technology skills that everyone must master in order to be considered technology literate.

On the opposite end of the spectrum, a number of students lauded their younger brothers and sisters' extensive knowledge of computers. Unlike their perception that older family members haven't mastered "the basics," when these students talked about their younger siblings' technology literacy practices, they began to asses their own practices as somehow lacking. For these students, the literacy practices of younger siblings entailed using sophisticated technologies that were not necessarily a part of their own practices. If the students in this study defined their own use of literacy in terms of social practices, they might have simply associated their siblings uses of technology as being embedded in the social context that made their siblings use of technology meaningful. However, because the students in this study adopted an autonomous notion of technology literacy as being the mastery of skills, they suddenly felt less sure about their own knowledge:

> *My sister is very, very good with computers. She is almost sixteen and she is the one who taught me how to write CD's, and she is always downloading music, she's obsessed with it.* (Roberta, Interview 1, Fall 2002)

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> *I have a younger brother who goes to BC also and he is really, really into [computers]. Like he will make mixes onto CD's and stuff. I have always wanted to but just don't know how to do it. . . . He was very—technology is like his thing, like I was saying. He was the first one in my family to get a cell phone. Like he has all the little gadgets. The MP3 players and the camera, and the iPod. It is unbelievable.* (Catherine, Interview 1, Fall 2002)

> *My brother, he is a genius. He can do those role-playing games. I have no concept or understanding [of them] but he, like in a day he will finish. These are like two or three disks in a pack and he will finish [them]*. (Mary, Interview 1, Fall 2002)

The younger brothers and sisters described here portray a picture of technology literacy as skills that include knowing how to download music onto CD-ROMs and playing video games but also a sense of fluid mastery of any number of computer programs. The students above describe their siblings' use of technology with a mixture of pride and bewilderment, and they note that their siblings' use technology in ways that they do not necessarily understand themselves. When Catherine says, "I have always wanted to but just don't know how" and Mary says, "I have no concept or understanding" they express a sense of insecurity about their own technology literacy practices. With phrases like, "technology is his thing" and "he is a genius" both Catherine and Mary identify their siblings as being technology literate in the autonomous sense because their brothers have mastered mixing CD's or role-playing video games. In this autonomous conception of technology literacy, people who are more technology literate have simply mastered more skills. Because they associate technology literacy as the mastery of specific skills,

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they express the opinion that their own technology literacy may be lacking because they themselves had not yet mastered those specific "skills." For these students, an autonomous notion of literacy was creating a gap between what they believed made a person "technology literate" and the technology literacy practices that were meaningful and useful in their own social contexts.

Technology Literacy in Comparison to Other College Students

In addition to making comparisons with family members, the students in this study also constructed technology literacy around comparisons to other college students. Once again, these comparisons stemmed from an autonomous notion of technology literacy: when students like David were asked to talk about the technologies they used on campus, they often listed a number of specific technologies they felt every college student should know in order to succeed on campus.

> *They [college students] have to know how to use the programs. Like Word, they have to know how to . . . figure out how to instant message, because that makes things so much easier as far as coordinating efforts. I mean* it's *great. It is a great tool for meeting. To create meetings. To get things done. To talk online with someone who needs help, on their work, instead of having to* go *over to their place or talk on the phone.* (David, Interview 1, Fall 2002)

Mary offered her opinion in the form of comparing her roommate, whom she considered not technology literate, to other more technology literate college students:

> *I don't know how she does it. But she, her computer isn't even hooked up to the network. So she comes on my computer to do things like Instant Messenger, or goes to the*

> *computer lab. She doesn't have any MP3 files, she doesn't have any of this stuff, and she really wishes she did. She has a laptop. Last year we worked together. She never used her laptop on the network. She never hooked it up to the Internet. I was amazed, I was like how do you do that?* (Mary, Interview 1, Fall 2002)

Mary's autonomous construction of technology literacy led to expressions of surprise at how her roommate was able to get along on campus without knowing how to network her computer or download MP3s, although it was apparent that her roommate was getting along quite well without having mastered those skills. In other words, her roommate was engaged in other technology literacy practices that were meaningful and useful on campus (i.e., using her laptop and going to the computer lab), without having mastered the specific skills Mary had associated with being technology literate (i.e., hooking laptops to the campus network).

Like Mary's roommate, other students in this study seemed to be doing well on campus without having mastered similar technologies, but these individuals subscribed to the autonomous notion of technology literacy and, like Mary, believed that because they had not mastered specific technologies they were behind other students in terms of technology literacy. Two students in particular made comparisons to other college students and pronounced themselves *not* computer literate. Catherine, for example, described herself as being very "basic" and "simple" when it came to technology, particularly in comparison to her roommates.

> *Catherine: Well, basically . . . everything is simple to me. I have my computer that I got my freshman year, a laptop. So, I am kind of organized. Like, all the programs are in it and everything. I just really use it to type papers and to go onto the Internet to check the web for things for the papers, and for projects like that. . . I do Instant Messenger and*

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that's about it. Like I don't sit there for hours like people I know that download MP3's, I don't do that, I've never done one. I just basically use it to find information.

Ellen: Do you know a lot of people that download MP3's?

Catherine: Oh, all my roommates. All my roommates are addicted to that. They have thousands of songs on their computer. I have never done it before.

Ellen: Do you want to?

Catherine: Yeah, actually, I think I would.

(Catherine, Interview 1, Fall 2002)

For Catherine, not knowing how to download and play MP3 files made her a more basic user than her roommates who had "thousands of files." Despite instant messaging, using the Internet, e-mailing, and word-processing, Catherine had identified one specific program that rendered her a basic user. Once again, this autonomous sense of technology literacy had brought her to the conclusion that without mastering specific skills she could not be considered technology literate. Similarly, Mark compared himself to other students and also found that he did not measure up:

Mark: Other college students are much more computer savvy than I am.

Ellen: What do you mean by computer savvy?

Mark: Like able to use—they can use other programs. I mean I can use the Internet, I can use a search engine. But that's pretty much my limitations.

Mark: I do have a computer, but I don't use it all that often except to type up papers.

(Mark, Interview 1, Fall 2002)

For Mark, technology literacy was some tenuous quality that he couldn't quite define, but he knew that he was not as "savvy" as his peers. Like Catherine, Mark had a computer and was able to surf the Internet, conduct online research, check e-mail and otherwise engage in a number of

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technology-related literacy practices that were meaningful to him. Nonetheless, he defined himself as less literate based upon his comparisons with other college students.

The students above show that too often they assess their own literacy practices and find that they fall short of an ideal. In many cases, students constructed technology literacy around notions of skills acquisition that ignored their own most common literacy practices. This phenomenon finds a parallel in the literature on adolescent literacy in which scholars have identified literacy practices that students engage in by choice, but which are not recognized or deemed useful in school (Alvermann & Heron, 2001, Chandler-Olcott & Mahar, 2003; Moje, 2000). Similar studies have shown that the gap between literacy practices and the hegemonic notion of what constitutes literacy contributes to the students' sense that the practices that are most important and relevant in their everyday lives are not valued in school (Heath, 1983). Williams (2003) argues that the gap between literacies is essentially another aspect of the digital divide which instructors must work to close. Williams suggests instructors "[W]ork to include a sum up of students' out-of-school computer literacy, including identifying the digital divides so that they can be bridged rather than perpetuated" (sec 6, para 5). One option available to instructors using technology is to compile an auto-ethnography of technology use, as suggested by B.Q. Smith (2004). According to Smith, instructors must help students to understand how autonomous constructions of technology as a neutral tool can be disempowering. Smith advocates a critical technology pedagogy that helps to develop a conceptualization of technologies and the discourses surrounding them as political and ideological. Students are encouraged think about the role technology has played in their lives and how it is historically situated amid the social, political and ideological forces that are at work in the context of their lives.

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Another method might be to combine a scientific and literary approach to critiquing technology. In the sciences, the AAAS *Benchmarks for Science Literacy* advocate a critical approach to technology, encouraging a broad approach to technology that helps students to acquire informed attitudes on the social, cultural, economic, and ecological consequences of using technology. In this context, students participate in activities in which they examine technological systems, in which technologies are designed to solve problems, but with enormous social, political and economic consequences that should be studied and critiqued. Participating in design activities and critiquing real life examples of the impact of technological systems could easily be paired with the kind of fictional literature Professor Po assigned in En305. DeLillo's *White Noise*, for example, provides an opportunity to consider technology in relation to the main character, Jack, his fear of technology and of death which (literally) "cloud" his relationships with his wife, family and coworkers. Gibson's *Neuromancer* is another chance to consider technology in its extreme, futuristic sense, in the way things *could* become and, again, its impact upon our relationships to each other and the world around us. Fiction paired with real life science can act as powerful invitations to critique our relations with technology and to see technology as functioning within complex social and cultural systems rather than as discrete programs students must master in order to be literate.

Technology Literacy at Work

Another implication of the students' autonomous definitions of technology literacy is that students are set up to fail if they are left to languish under the impression that being proficient with a pre-determined set of technologies and skills would translate into finding high paying jobs in the workforce. In this rapidly changing world, identifying specific technologies necessary in

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the workplace is practically impossible. More importantly, the computer skills students develop in and out of school may not be the kind of "value-adding" work that is equated with higher paying professional status in the workplace (Apple, 1991; Bromley and Apple, 1998; Lankshear. 1997; Warschauer, 1999). Lankshear (1997) and Warschauer (1999) use Reich's (1992) notion of "symbolic-analytic" work to describe the kind of work that involves diverse problem-solving and strategic activities and typically includes jobs such as scientists, consultants, systems analysts, and others. Unfortunately, knowing how to make web pages or knowing specific software programs such as PowerPoint cannot be equated with symbolic-analytic work. According to Lankshear (1997):

> Symbolic-analytic wok is closely associated with new technologies and the capacity to integrate them into 'adding value.' This does not mean, of course, that all work involving dexterity and technical know-how with new technologies is symbolic-analytic work. Much of it is routine. This has important implications for different kinds of acquired and learned abilities (Krashen, 1982; Gee 1991) mediated by and centered around new technologies—whether these acquisitions and learning occur in school, via the formal curriculum, or out of school (p.170)

As the data below show, some students believed that the technologies they learned in school would, in fact, enable them to find symbolic-analytic work. For example, both Catherine and Mark—two students who specifically identified themselves as not as technology literate as their peers—felt that learning a specific technology related skill would be helpful when they began looking for jobs. Both students took Professor Po's English class because they would be learning how to create web pages, and both students assumed that this skill in particular would be important in the workplace. Catherine's quote below also provides some support of the argument

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that although workers may be proficient with technology, they may wind up conducting routine tasks at work (Bromley and Apple, 1998; Lankshear, 1997):

> *Mark: Basically, I wanted to learn how to do web design and stuff like that.*
>
> *Ellen: Why?*
>
> *Mark: Because I think that is really useful. Especially for someone who might want to do writing when they get out of college. That's a big part of the field. Like writing web design. You know web design and stuff like that. So I have to embrace it sometime. You know? I would like to have all the skills that I could possibly have, you know?* (Mark, Interview 1, Fall 2002)

> *Catherine: A lot of my friends have taken communication classes where they have done web pages. And I haven't done that and I think that would be interesting. You are seeing it. We, you surf the Net you are going through, people your age making web pages and link sites.*
>
> *Ellen: Do you thing that is important to do?*
>
> *Catherine: Yeah, in an Internet publishing company that I worked at, I worked with the event marketing part and they had a website that was not that modern and they were working on it. [My job was] just entering data, on Excel sheets. I mean, they teach you when you get there how to do it. I think it was really important.* (Catherine, Interview 1, Fall 2002)

For Mark, learning how to create web pages was something he felt he had to learn eventually. In the quote above, he identified a job—being a writer—that would fit into the definition of a symbolic-analyst. He then identified a specific technology—creating web pages—he felt would

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support his efforts at finding such a position. Catherine also believed that knowing how to create web pages would be an important asset in the workplace. She uses the ability to create web pages as a point of comparison to her data entry job. Her assumption was that had she known how to make web pages she could have avoided the more mundane and less intellectually stimulating task of data entry. This task required knowledge of Excel, which, as Catherine notes, was taught on the job. Taking a class on Excel or learning it in school was largely irrelevant, something Bromley (1998) predicted when he wrote that "[H]igh-tech schooling may even be irrelevant because the jobs a majority of students are more likely to apply for and receive will provide the necessary skills and training in the workplace (p. 11). Catherine's experience supports Bromley in that for her job knowing Excel was not necessary; it was a technological skill taught in the workplace in order to conduct the routine task of data entry. The ability to create web pages, on the other hand, was infused with meaning and expectation, so that both Catherine and Mark distinguished between the skills needed to make web pages and those needed to use a program like Excel.

Catherine and Mark assume that knowing how to create web pages, a newer form of technology, would help them to acquire professional-status jobs, unlike the skills associated with using a program like Excel, which is a more common program. Drawing this somewhat arbitrary distinction between these two software programs is evidence of what Bromley (1998) calls "credentials inflation." According to Bromley, new technologies become the new forms of cultural currency:

> The older credentials have become badly inflated; everyone has them and they no longer guarantee a cushy sinecure. The formerly privileged react by creating a new credential.

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> Initially, of course, no one has it, so the first few to acquire it are now distinguished from the crowd that has inflated the old credentials, and stand to benefit substantially. (p. 11)

Using Catherine's quote (above) as an example, the software program Excel can be viewed as the older credential that everyone needed to know as it was (and is) widely used in the workplace. However, as more people become proficient with Excel, a new technology—creating web pages—rises in its place so that now students feel it is important to master the new technology. Unfortunately, there is no guarantee that by the time Catherine and Mark graduate their knowledge of creating web pages will be at all useful. In fact, as a former web master myself, I can attest to the fact that with the onset of new software programs, creating web pages is close to being a routine, data entry job in itself.

From Functional Technology Literacy to Community of Practice

Even as the students in this study formulated a conception of technology literacy based upon comparisons with others, they revealed yet another disadvantage of an autonomous notion of technology literacy in that technology is so rapidly changing that it is nearly impossible to capture exactly what skills are important at any given time. Some of the students in this study identified the fact that when technology literacy is defined as a set of skills, it follows that one should be able to delineate just what those skills must be which, of course, is a rather impossible task when it comes to technology. Noting with frustration the futility of identifying specific software programs or technologies that could make one technology literate, some students began to grapple with their own constructions of technology literacy. For some students, this meant re-defining technology literacy in broader terms (that is, not mentioning specific technologies) but maintaining the autonomous notion of functional or basic technology literacy. For others,

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however, this struggle to re-conceive of technology literacy led them to argue that technologies necessary in one context may not be relevant in another, and that what made the use of technology meaningful was its relationship to a social context.

By the end of the semester, the students in this study had spent months thinking about the impact of technology upon literature, their lives, and their education. In addition, they had worked as collaborative groups to create websites, which for many meant mastering a new technology. In the final interview, which took place in the last week of classes, I asked the students to tell me what technology literacy meant to them. Many students' responses revealed an attempt to deal with the shifting nature of technology distinguishing a kind of functional technology literacy that forms the basis for what people should know about computers. In his response below, David talks about a distinction between "using" computers and being able to create with them. Similarly, Roberta talks about a minimal literacy—knowing how to turn on the computer—and a maximum literacy, which meant knowing how to use the computer to its full capacity:

> *I feel like that I can't be more technologically literate. I think there is a level, either you are or you are not. I feel like before the course I was technologically literate. And adding to the website was, I think knowing how to build a website is beyond that. I think reading a website, being able to navigate, that is literacy. But once you learn how to create it, that is something else. It's not being an expert or anything. But it is going a step further. Like reading a book is literacy, but writing a book goes a step further. I think that just being able to navigate a website, being able to understand how to use a TV, or able to understand how to use a radio . . . How to use the medium [and] understand what is being shown through it—that is literacy. And um, if you can create*

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something using the medium then you are beyond it. So yeah, just being able to use the medium is literacy. (David, Interview 3, Fall 2002)

[Technology literacy is] having the knowledge or ability to use technology. But I think that it depends on how you look at it. If you consider literacy as reading a book, then it is very minimal. Then it can be a five-year-old's ability to read a book—that is considered literacy. When it comes to technology, it can be as simple as being able to turn on a computer. And I think that with the advances that we make I would say—because I have high expectations of people—that technology literacy would be like the maximal ability to be able to use the computer. Or, at least, like my mom doesn't know how to use the Internet. She doesn't even know how to check voice mail on our answering machine. Stuff like that, it's not difficult to grasp but nobody thinks that they need it. But I think it really does make life easier. So I would say, you don't have to be like Bill Gates or something. (Roberta, Interview 3, Fall 2002)

I think you can be technologically literate and not know how to make a website. Or you can be technologically literate and not know how to make a PowerPoint presentation. I mean it's more. . . you can look at it as knowing how to read. But not necessarily knowing how to read like Ulysses or something like that. You don't necessarily need to be specialized in any one thing. It is just a basic understanding of how it works, or knowing how to navigate a website without having to know how to make a website. It's not getting too specific, or too technical but, knowing the basics of something. (Alan, Interview 3, Fall 2002)

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David, Roberta, and Alan in the quotes above, attempt to work through the challenge posed by constantly changing technology that "ups the ante" in terms of what one needs to know in order to get by. They each react by establishing a kind of foundation or a "functional" level of literacy, which once again falls under the autonomous conception of technology literacy. These ideas about a minimum or basic level of technology literacy echo what Warshauer (1999) calls the "technocratic paradigm of literacy that emerged after World War II [which] continues to dominate today" (14). In this paradigm, literacy once again means isolated, discrete skills. In terms of technology literacy, a functional level refers to skills such as keyboarding—skills that can be taught using technocratic methods like the "drill-and-skill" methods associated with workbooks in other literacy pedagogies:

> The computer supplements the teacher and workbook by offering individualized lessons to help students develop basic competencies in areas such as grammar, spelling and reading comprehension. These lessons are referred to as either drill-and-practice or, more pejoratively, as drill-and-kill. Thus, the computer becomes a vehicle for literacy (albeit of a limited scope) but does not itself become a medium of literacy practices. In some cases, computing itself becomes one of the skills to be taught (p. 14).

Once again, a distinction can be drawn between the kind of routine tasks that come of a "functional" technology literacy, and the symbolic-analytic work that would result from a richer, more integrated approach to technology literacy (Bromley and Apple, 1988; Lankshear, 1997, Warshauer, 1999). Such an approach would see technology as "one of a number of tools that students learn to use as they engage in authentic and collaborative experiments, projects and analyses (Warshauer 1999, p. 16). To think of technology as a "tool" in this sense is to see tools as situated rather than neutral; the use of a tool carries with it its own meaning and consequences.

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A tool in a community of practice, for example, is an active participant in the transactions that take place between members of the community, their discourses, and their ways of making meaning. According to Wenger (1998), "Having a tool to perform an activity changes the nature of that activity" (p. 59). To consider technology as a situated tool that plays an active role in the negotiation of meaning within a community of practice makes defining a minimum or "functional" level of technology literacy unnecessary.

Like David, Roberta, and Alan, other students began to struggle with their initial constructions of technology literacy as the mastery of specific skills; however, these students also argued that trying to identify basic or functional levels of technology literacy is an impossible task. In the responses below, students' express their frustration with changing technologies, and reveal just how futile it is to establish "functional" technology literacy:

> *I think the whole idea of technological literacy changes as quickly as the technology itself, just because there's always going to be the IT people who know everything that's just coming out, and can deal with the servers and the more expansive issues. But as that becomes more complicated the people who are supposedly simpler than the computer technicians are expected to know more. Like ten years ago, all you were expected to know is how to type. But now you have to know how to use the web.*
>
> (Melissa, Focus Group, Fall 2002)

> *Technological literacy would be…I think it is always changing. I think we talked about it one day when you were in class. I think it is all changing. You can't really ever be totally literate. Or, I don't know. Who would be totally up to date? People who make computers? People who work with computers all the time? I know that I have a lot less*

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> *knowledge in some areas in computers and technology then some people that are younger than me or people who are the same age. But also my parents have a lot less knowledge than I do.* (Kyle, Interview 3, Fall 2002)

While David, Roberta and Alan talk about minimum levels of technology literacy, Melinda and Kyle argue that that minimum is constantly changing, so that one can never really establish a "basic" level of technology literacy. In the quotes above, Melissa and Kyle hit upon another reason why technologies cannot be seen as neutral tools: technologies themselves are situated in, reflective of, and responsive to historical, social and political contexts that are always changing. To establish a "minimum" technology literacy is to ignore the inexorable march of time.

In the final two quotes below two students show some disagreement with their classmates, arguing that one can get around the problems inherent in locating a "basic" technology literacy by suggesting that being a part of a community where one learns from simply working with technology and from talking with others in the community. For both Mary and Terry, being technology literate had less to do with knowing specific technologies than being willing and able to take advantage of the knowledge pool in their social environment. In the first quote below, Mary describes the kind of learning that Wenger (1998) associates with a community of practice, where a more knowledgeable member of the community socializes newer members into the use of tools:

> *A lot of my friends are computer majors. Like one of my friends is a computer genius. He tells me you can do this and this and then there is a way to like. Because sometimes certain files that I use in my . . . on my computer. There is a way to download something and transfer and make them this . . . So he has taught me how to do stuff like that. I would have never learned if he had not told me. So it is how. It's all shared information,*

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> *like word of mouth. If I look it up on the Internet and find something, I will work with that too.*

Mary describes learning from her peers and from her own research on the Internet, drawing from a number of sources in the community. In this way, Mary comes closer to the definition of technology literacy that incorporates a number of different practices involving meaningful uses of reading and writing, and the ability to work within a social environment to learn from exiting tools (i.e., computer help programs, manuals) as well as from teachers and peers. In the next quote, Mary shows that in the context of her English course, learning about web pages required the flexibility to learn more about a program both within the formal confines of the class and by talking to her classmate (Shane). For Mary, learning how to make web pages reflected the way technology was changing. To stay on top of technology required some internal "changes" in the form of learning as much from a classmate (Shane) as she did from the class. Mary described some frustration in learning from a classmate, but she felt that it was necessary for her to be flexible and to draw what knowledge she could from the class as well as from her peers.

> *If all you need is the minimum to get by then in two years it is going to change and it is not enough anymore. Now you need to know more. But, I never thought I would take a class on how to make a webpage, but I did and I was flexible. I learned something. Knowing how to use IM wasn't enough anymore, I wanted to go into DreamWeaver and know how to do things myself. Shane [another student] was there to help me. I had to change myself for that.* (Mary, Interview 3, Fall 2002)

Similarly, Terry describes learning as much from his friends as his classes. It is interesting to note that what he learned from his classes was exactly the kind of drill and kill, technocratic methods associated with "functional" levels of technology literacy:

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> I *did take MS Word and an Excel class and a typing class in junior high and it was like a crawl, walk, run thing. I learned the basics and when I got to college I got my own computer and that's how I figured it out. I figured out a lot of it on my own, a lot from my roommates but I definitely say that at this point that although my basics were established in my classes I learned 10 times more just from use of it here in college and from talking with my friends.* (Terry, Focus Group, Fall 2002)

The discrete skills Terry learned in school only went so far. As he says, the knowledge gained from using technology in the university environment and from talking with peers was equally if not more useful. In this way, Mary and Terry illustrate the idea of technology literacy as being a part of a "community of practice," which, according to Williams (2003) means adopting the idea that:

> Perhaps computer literacy is not in one person but is distributed: between the machines, the support staff, the manuals, and the social relationships. These social relationships might include students, faculty, and tech support staff but might also include being a fellow techie who understands that knowledge about ICT systems is something a group of people have, not one individual. As a result, computer literacy is about belonging to an invisible fraternity that has this orientation towards ICT, talks a particular language, and is hence able to solve problems together. (Literacy is Social, para. 5)

Williams' notion of an "invisible fraternity" nicely captures these students' experiences in which knowledge is gained from a variety of sources. A community of practice allows for changes in technology and makes it possible to avoid having to develop "standards" for what one needs to know in order to be literate which, as the students above note, is a frustrating and ultimately futile act.

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Conclusion and Implications

The participants revealed the rather insidious and persistent belief among college students in this study that literacy is synonymous with the mastery of specific skills and to be technology literate is to master specific software programs and technologies. This assumption about literacy has two detrimental affects: one, students do not value their own literacy practices. Even students who reported technology literacy practices that ranged from conducting online library research to figuring out the intricate world of video games labeled themselves not technology literate. If, for some reason they had not learned certain software programs or technologies, students immediately label themselves "illiterate" and lacking in "basic" knowledge. Second, students associated those de-contextualized skills with benefits such as more lucrative employment and professional status in the work place. Their "commodification" of technology literacy emphasized the idea of technologies as neutral skills to be acquired and traded in the marketplace (Gee, 1996). As a result, students enter into a vicious cycle of constantly trying to identify the specific technology that would act as the key to the symbolic-analytic work associated with professional status in the workplace.

Educators have a unique opportunity to break this cycle by preventing their students from letting others decide what constitutes literacy (Luke, 2000, Selfe, 1999a, 1999b, and Snyder 2002). Luke (2000) argues that the risks of complying with popular notions of technology literacy as the mastery of skills are further exacerbated when economic concerns dictate requirements for literacy pedagogy:

> Literacy requirements have changed and will continue to change as new technologies come on the marketplace and quickly blend into our everyday private and work lives.

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> And unless educators take a lead in developing appropriate pedagogies for these new electronic media and forms of communication, corporate experts will be the ones to determine how people will learn, what they learn, and what constitutes literacy (p. 71).

Luke's argument is supported in this study by the data that showed students felt the need to pile on skills such as knowing how to build a website because it was assumed that corporations required this particular "literacy." Educators can work towards engaging students in re-defining technology literacy in a number of ways, including incorporating a crucial critical component to literacy pedagogy that engages students in analyzing the power relations and corporate self-interest underlying the belief that specific programs and technologies are skills that must be added to one's repertoire. Incorporating critical multiliteracies into literacy and/or English pedagogy is necessary in order to allow students to explore what it means to be technologically literate, who benefits, and where notions of technology literacy arise in the first place (Luke, 2000, 2003).

The data in this study suggest that educators can help students to understand that technology literacy practices, like print-based literacy practices are inherently embedded in one's social context and that being technology literate means being able to read, write an communicate in electronic environments, in ways that are meaningful and useful to one's social context. Students need to be empowered to identify those technologies that are most useful to them, and educators must work to bridge the gap between the technology literacy practices students engage in outside of school and those utilized in the classroom. Because technology literacy practices are socially situated, an important question arises in how to incorporate technology literacy practices into the classroom, without stripping these practices of the sense of meaningfulness students afford them in other contexts. As suggested earlier, one approach might be to think of

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technology literacy in terms of a "community of practice" characterized by mutual engagement, a joint enterprise, and a shared repertoire (i.e., language) (Wenger, 1998). The community of practice re-directs the focus of technology literacy from identifying and teaching discrete skills, to thinking about technology literacy as being distributed among social relationships and tools, so that becoming "literate" means learning the language and negotiating the relationships of a particular community. Although the idea of a community of practice presents a useful approach to technology literacy, further study of exactly how to effectively incorporate socially-situated technology literacy practices into the classroom is certainly merited.

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