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Education Equity and the Digital Divide

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The term "digital divide" has traditionally described inequalities in access to computers and the Internet between groups of people based on one or more dimensions of social or cultural identity. Accordingly, researchers tend to compare rates of physical access to, or actual use of, these technologies across groups based on race, gender, socioeconomic status, education level, disability status, first language, and other identifiers. But this conceptualization for the digital divide fails to capture the full picture of inequity and alienation recycled by these gaps and the resulting educational, social, cultural, and economic ramifications, particularly by those who are already alienated by exclusive curricula, school cultures, and most other dimensions of education. The purpose of this article is to reformulate a conceptualization of the digital divide and its relationship to education by building on a critical review of recent research and shifting the "access" paradigm toward one not based on equality of physical access, but on equity of access.

By August 2000, women had surpassed men to become a majority of the United States online population (National Telecommunications and Information Administration [NTIA], 2000) leading many instructional technology scholars to hail the end of the gender digital divide—gaps in computer and Internet access rates between women and men. If there were more women than men using the Internet, the logic went, equality had been achieved. (The slightly larger overall number of girls and women, as compared with boys and men, using the Internet was consistent with the slightly

larger overall number or girls and women, as compared with boys and men, in the U.S. population.) But girls and women continued to trail boys and men in educational and career pursuits related to computers and technology, due largely to a lack of encouragement, or blatant discouragement, from educators, peers, the media, and the wider society. And women remained virtually locked out of the increasingly techno-driven global economy while men were much more likely to recognize computers and the Internet as tools for economic and professional gain at much higher rates than women, who were more likely to conceptualize these technologies as gateways for pursuing hobbies and friendly correspondence. The equalizing of Internet access rates between girls and boys, and between women and men, was a significant step toward the elimination of the gender digital divide—a step toward equality. But if we looked through a different lens, one painted with the sociohistory of sexism in U.S. public schools, a much more complex conceptualization for "access," the heart of digital equity, began to emerge.

This conceptualization, which continues to emerge through the critical study of a fairly new media phenomenon, clarifies the lines between equality of access and equity of access, ultimately forcing us to think more critically about the richness of context and history in which all inequities are immersed. For example, if 2,000 students attend a high school in which two sections of an advanced level mathematics class are taught, does everyone have the same access to those classes? Assuming the school complies with standards set by the Americans with Disabilities Act, making the school accessible to students with disabilities, all students probably do, indeed, have physical access to the classes. In other words, I know where the class meets; I have physical access to the class. But consider the question broadly, contextually, and historically. Can we assume that each student has been encouraged equitably to pursue mathematics throughout her or his educational careers? Can we assume that teachers have demonstrated expectations for mathematical achievement equally, regardless of gender, race, or socioeconomic status? What does it mean that research shows women and girls are systematically steered away from pursuits in mathematics and other technology-related subjects beginning as early as elementary school (Turkle, 1991; Clark & Gorski, 2002a)? When we begin to pose these types of questions, the fraudulency of the supremacy of equal access—of women and men enjoying the same rate of physical access to computers and the Internet—without equitable access is exposed as a mirage, a recycler of old inequities under a seemingly well-meaning, but misleading, reform attempt.

What is clear within this complexity is that an institutional paradigm shift is needed. The term "digital divide" has traditionally described inequalities in access to computers and the Internet between groups of people based on one or more social or cultural identifiers (Gorski, 2002). Accordingly, researchers tend to compare rates of physical access to, or rates of actual use of, these technologies across individuals or schools based on race, gender, socioeconomic status, education level, disability status, and first or primary language. The "divide" refers to the difference in access rates among one or more groups. For example, the racial digital divide is the difference in computer and Internet access and usage rates (at home, school, work, or other locations) between those groups with higher rates of access and usage (White people and Asian Pacific Islander people) and those with relatively lower rates of access and usage (Native American, African American, and Latina[o] people). But this traditional understanding of the digital divide fails to capture the full picture of inequity and alienation recycled by these gaps and the resulting educational, social, cultural, and economic ramifications, primarily for groups of people already educationally, socially, culturally, and economically oppressed. Meanwhile, such a limited view of the digital divide serves the interests of privileged groups and individuals, who can continue critiquing and working to dissolve gaps in physical access and use rates while failing to think critically and reflectively about their personal and collective roles in recycling old inequities in a new cyber-form.

The purpose of this article is to reformulate an understanding of the digital divide by building on a critical review of recent research and shifting the "access" paradigm toward one based not on equality, but equity. This, in turn, will facilitate a more meaningful discussion of strategies for eliminating the digital divide.

SHIFTING THE DIGITAL DIVIDE PARADIGM

A new understanding of the digital divide must provide adequate social, cultural, and historical context, beginning with a dedication to equity and social justice throughout education. Multicultural education, a field of inquiry and transformation that enters every discussion about education with this dedication, provides a desperately needed framework for such an understanding (Gorski, 2002). Multicultural education insists that it is not enough to critically examine individual resources or programs. We must dig

deeper and consider the medium and the content, the past, present, and future, the curriculum and the pedagogy, and how our assumptions, decisions, and practices contribute to, or challenge, systems of control and domination by people historically and presently privileged by the education system (such as White people, boys and men, first language speakers of English, heterosexual people, and able-bodied people). Multicultural education replaces an equality orientation with an equity orientation by considering this broader, more contextualized, picture of education and society. The result is a significant paradigm shift, leading to a more complete and progressive understanding of the digital divide that differs from the traditional conceptualization based on at least seven principles. (Each of these will be revisited in a later discussion of various dimensions of digital inequities.)

First, and most importantly, a new approach for framing the digital divide must be critical of digital inequities in the context of larger educational and social inequities. The race digital divide is a symptom of racism, and to understand it outside this context diminishes its significance and cripples our ability to address it effectively. The same is true of the gender, socioeconomic, and every other divide. As such, we must keep at the fore of the digital divide discussion the fact that the groups most disenfranchised by it are the same groups historically and currently disenfranchised by curricular and pedagogical practices, evaluation and assessment, school counseling, and all other aspects of education (and society at large).

Second, we must broaden the meaning of "access" beyond that of physical access to, or usage rates of, computers and the Internet to include access to equitable support and encouragement to pursue and value technology-related fields, educationally and professionally. Educators, parents, the media, and society in general must continuously express expectations and assumptions that all students have an opportunity to achieve mastery of computer and Internet skills, regardless of race, gender, socioeconomic status, ability status, or any other dimension of their identity.

Third, we must broaden "access" to include that to equitably non-hostile, inclusive software and Internet content and experiences. We must particularly critique the movement to label the Internet the "great equalizer" when, for example, most of the gender inequities in society are replicated online, including conversation dynamics in online discussion groups, the proliferation of online pornography, cyber-stalking, and cyber-harassment.

Fourth, a new approach for understanding the digital divide must critically

examine both who has access to, or uses, computers and the Internet, as well as how these technologies are being used by various individuals or groups of people or by those teaching them. One way that expectations are communicated is through instruction—through the level of thinking skills with which I am expected to participate in my learning. Again, patterns in such expectations as expressed through traditional teaching methods are replicated through the approaches with which teachers employ instructional technology (National Center for Education Statistics [NCES], 2001), a reality that must be dissected and abolished.

Fifth, the paradigm shift must also lead us to consider the larger sociopolitical ramifications of, and socioeconomic motivations for, the increasing levels of importance assigned to information and instructional technology both in schools and society at large. How does the growing merger of cyberculture with wider U.S. culture privilege those who already enjoy social, political, and economic "access" in the broadest sense?

Sixth, this approach must expose capitalistic propaganda, such as commercials portraying children from around the world announcing their recent arrival online, that lead people to believe that these technologies are available to anyone, anywhere, under any circumstances, who wants to use them. Such messages understate the severity of the digital divide, and further demonize those who, for various reasons, do not have access to, or perhaps do not want to use, these technologies.

Finally, the new approach must reject any measure or program that purports to "close" the digital divide simply by providing more computers and more, or faster, Internet access to a school, library, or other public place. In addition to its offensively patriarchal nature, the suggestion that increasing or improving physical access to computers and the Internet will close the divide is simplistic and shallow—a band-aid approach to a remarkably ill social and educational system.

These seven principles provide a crucial starting point for examining the problem of the digital divide and formulating viable and far-reaching solutions in context. But more so, they demonstrate the complexity of the digital divide (as well as other equity issues) and the interrelatedness of its various components. This complexity and interrelatedness will become even more pronounced as we explore five dimensions of the digital divide: racism, sexism, classism, linguisticism, and ableism.

RACISM AND THE DIGITAL DIVIDE

In 1999 the Economic Development Administration (EDA) conducted a study of technology infrastructure needs in Native American communities and found several sociohistorical and sociopolitical barriers to improving this infrastructure. Among these barriers was federal policy that fails to consider the severity of technology gaps faced by Native American people (EDA, 1999).

Their concern was for good reason. Since 1998 the United States government has collected and published an endless array of statistical collections and reports on the digital divide and other technology issues through a variety of departments, including the NCES and the NTIA. The most recent of these reports, and the first to be released under the George W. Bush administration, *A Nation Online: How Americans are Expanding Their Use of the Internet*, was released in February 2002. But for some reason not explained in any of these reports, the government stopped collecting or reporting information related to technology infrastructure, the digital divide, and computer and Internet use among Native Americans after 1999. According to Kade Twist (2002),

> the Bush administration is effectively removing Indians from the public discourse relating to the digital divide, placing them at a further disadvantage in the emerging economy. Furthermore, the exclusion of Indians leaves federal decision makers without evidence of a problem or a solution—it's simply an act of avoidance. (p. 1)

This avoidance oppresses Native American communities in a variety of ways, two of which illustrate the larger complexity of the racial digital divide as a symptom of systemic racism: (a) it shields the federal government from the responsibility for addressing the technology infrastructure needs of many Native American communities, and (b) it strengthens the status quo by failing to provide Native American communities with data on any progress they have made or on successful strategies that could be replicated across these communities.

Any discussion of the racial digital divide in the United States must begin with a critical analysis of this omission, of this invisibility, of this most dangerous form of racial privilege that allows those in power to simply ignore a problem that is too large or complex or economically costly to

understand. This serves as a powerful metaphor for the largeness and complexity of the racial digital divide overall, which may be best understood through an examination of three strands of access disparities: (a) gaps in computer and Internet access, (b) gaps in access to support and encouragement to recognize technology-related fields as viable and attainable educational and professional pursuits, and (c) gaps in access to educational experiences that incorporate these technologies in progressive and pedagogically sound ways.

Computer and Internet Access

Between August 2000 and September 2001 (the last period for which data is available), 55.7% of African Americans and 48.8% of Latina[o]s were regularly using computers. Both figures represent marked increases and important progress in just over a year. Still, both groups continued to lag behind when compared with the overall percentage of computer users in the U.S. population (66%), White people (70.7%), and Asian American/Pacific Islanders (71.2%). Similarly, by September 2001, about 60% of White people and Asian American/Pacific Islander people regularly used the Internet, while only 39.8% of African American people and 31.6% of Latina[o] people did so (NTIA, 2002). Though these gaps have closed slightly, they continue to contribute significantly to existing privilege and domination hierarchies in the United States (Table 1).

Table 1

Rates of Computer and Internet Use by Race between August 2000 and September 2001

	Asian American/ Pacific Islander	**White**	**African American**	**Latina[o]**
Regularly used computers	71.2%	70.7%	55.7%	48.8%
Regularly used the Internet	60.4%	59.9%	39.8%	31.6%

Note. Based on data from *A nation online: How Americans are expanding their uses of the* Internet (NTIA, 2002). Parallel data for Native Americans does not exist for the time period.

An examination of where people access the Internet sheds some additional

light on digital race inequities. Among people who identify themselves as Internet users, 55.2% of the Asian American/Pacific Islander population and 45% of the White population report accessing the Internet at home, at work, and at school. Only 29.8% of African American Internet users and 32.3% of Latina[o] Internet users access it from home, work, and school. Additionally, African Americans and Latina[o]s are much more likely than White or Asian American/Pacific Islander Internet users to have no access at home, school, or work, instead needing to find a different location, such as a public library, to go online (NTIA, 2002). These disparities raise crucial equity questions for classroom teachers. Undoubtedly, some of these "Internet users" are students who have been assigned work for which they need computer and Internet access. What does it mean that this access is much more easily attainable for some than for others? (This point will be discussed further in the section on Classism and the Digital Divide.)

Some suggest that these gaps can be explained by socioeconomic differences. Their explanation assumes, for example, that a study of economically disadvantaged Asian American/Pacific Islander people and similarly disadvantaged African American people would reveal similarly low rates of computer and Internet usership. But analysis of data from December 2000 shows that the most socioeconomically disadvantaged White and Asian American households are much more likely to own computers and have home Internet access than similarly disadvantaged Latina[o] and African American households (NTIA, 2000). In fact, no matter which other variables are held constant, whether socioeconomic status, education level, or geographic region (rural, urban, etc.), similar patters of the racial digital divide emerge (Gorski & Clark, 2001).

One of the reasons for increasing computer and Internet usage rates across all racial groups is the widespread increase in exposure to these technologies in schools. For example, 95.9% of all 18-24 year old high school and college students use a computer at home or at school. Eighty-four point three percent of five to nine year old students use computers at home, at school, or both (NTIA, 2002). Virtually all schools are wired for Internet access, virtually all teachers have access to instructional computers somewhere in their schools (Smerdon et al., 2001), and nearly 80% of all P-12 public school instructional rooms in the United States are wired (NCES, 2001).

However, considerable gaps remain in school and classroom access to

computers and the Internet across racial lines. By 2000, 85% of the instructional rooms in schools in which People of Color comprised less than 6% of the student body were wired for Internet access. Meanwhile, in schools in which People of Color comprised 50% or more of the student body, only 64% of instructional rooms were wired (NCES, 2001). Students in schools with high populations of People of Color also enjoyed fewer computers per capita. What may be more alarming is that teachers who have access to these technologies in their classrooms are much more likely to use the technologies in other areas of their schools than teachers who do not have access in their classrooms (Smerdon et al., 2001). So even if a teacher without classroom access to these technologies has the option of using a state-of-the-art computer lab elsewhere in the building, they are less likely to do so than a colleague who already has computers and Internet access at their fingertips. The result is an additional loss for Students of Color, who are less likely to have the technologies in their classrooms.

In the end, White students are increasingly likely to build confidence and mastery over computer and Internet technologies, known as "net savvy." They are being prepared for the highly digitized global economy and pushed to understand technology in a complex way. Students of Color, less likely to be exposed to these technologies, remain largely unaware of the power and complexity of the techno-society, and therefore outside the digital loop. And, as explored later, this exclusion can have social, cultural, and economic ramifications. Additionally, teachers who do not enjoy classroom access to these technologies lose the opportunity to develop comfort, familiarity, and proficiency with computers and the Internet, contributing to another strand of the racial digital divide: gaps in access to educational experiences that incorporate these technologies in progressive and pedagogically sound ways (Gorski & Clark, 2001).

Access to Progressive Learning Experiences

Teachers in schools with high enrollments of Students of Color are less likely to have access to the resources they need to incorporate the Internet into their instruction than teachers in schools with low enrollments of Students of Color. Compared with teachers in schools with less than 6% Student of Color enrollment, those in schools with 50% or more Student of Color enrollment are less likely to have training in the use of the Inter-

net (82% compared with 70% having been trained) and less likely to have assistance in the use of the Internet, such as an onsite technology specialist (76% compared with 65%). They are nearly a third less likely to have training, assistance, and classroom-level Internet access than their counterparts at predominantly White schools (46% compared with 31%). As a result, teachers in schools with low Student of Color enrollments are more likely to actually use these technologies for instructional purposes in their classrooms. For example, 45% of teachers in schools with greater than 50% Student of Color enrollment report using the Internet in their instruction, compared with 56% of teachers in schools with less than 6% Student of Color enrollment (NCES, 2002).

Teachers in schools with high Student of Color enrollments cite an additional reason for not using computer and Internet technology in their teaching: outdated, incompatible, and unreliable computers. Like the lack of training and support, this problem is much more systemic in schools with high concentrations of Students of Color than in those with high concentrations of White students. Over 32% of teachers in the former cite this concern as a great barrier to their instructional use of computers, a rate nearly a third higher than that of the latter (Smerdon et al., 2001).

With these dynamics in place, it is not surprising that students experience technology in very different ways. Without the necessary training, support, and resources, teachers with classrooms full of Students of Color are more likely to use computer and Internet technology for a skills and drills approach to learning, similar to the "digital flashcards" discussed earlier, or as a reward for good behavior. Meanwhile, consistent with the overall pattern of pedagogical differences regardless of the presence of technology, teachers in classrooms full of White students tend to use the technology for higher-level thinking skills such as critical analysis, construction of ideas and concepts, and research (Solomon & Allen, 2003; Bigelow, 1999; DeVillar & Faltis, 1987).

These trends are not revelations; they simply mirror gaps in instructional practices, preparation, and access to relevant professional development across the education system, with or without technology. But as our dependence on these technologies continues to increase, and as federal and local expectations related to the incorporation of computers and the Internet into day to day instruction increase, these discrepancies drive a more profound wedge between the information age have's and have-not's. An examination

of the third strand of the racial digital divide, gaps in access to support and encouragement to recognize technology-related fields as viable educational and professional pursuits, further illustrates this point.

Access to Encouragement and Support

During a day-long panel on digital equity in education at the annual conference of the Society for Information Technology and Teacher Education, a fascinating discussion emerged from a participants' question: "Why, if we are looking at this through the lens of racism, do Asian American/Pacific Islanders have a greater rate of Internet and computer access than White Americans?"

One particularly passionate White presenter insisted, "The high computer and Internet access rates among Asian people are directly related to their proficiencies in subjects that dominated both early computer and Internet use: mathematics and science." This supposed digital divide expert, buying into an array of racial stereotypes and assumptions, aligned himself with attitudes prevalent in schools and society, among them, the "model minority" myth, which also suggests intellectual, cultural, and social inferiority among other Groups of Color (Gorski & Clark, 2001). His line of thinking, and thus of being, contributes directly to the digital divide. Who would he, an adult educator, more likely encourage to pursue an interest in technology, an African American student or an Asian American student? Unfortunately, such attitudes are pervasive in U.S. schools, not only in terms of computers and the Internet, but across the curriculum.

Considering the aforementioned gap in access to classroom experiences in which these computer technologies are incorporated in progressive, pedagogically sound ways, a symptom of institutional racist biases and assumptions, it comes as little surprise that People of Color and White people tend to use computers and the Internet for different reasons. A study comparing the ways in which African American people and White people use the Internet shows that African American people are more likely to chat (38% compared with 33%), play a game (48% compared with 33%), listen to music (54% compared with 32%) or pursue other hobbies than White Internet users. In addition, African Americans report going online "just for fun" at a much higher rate than White people. White Internet users are more likely to

seek financial, product, or health information online than African American Internet users (Spooner & Rainie, 2000). A different study, leading credence to this conclusion, reveals that Latina[o]s and African Americans are more likely to own a DVD player and a home theater than White people, but much less likely to own a home computer or have home Internet access than White people (Saunders, 2002). These disparities illustrate the results of a systemic lack of social and educational encouragement and support for People of Color, particularly African Americans, Latina[o]s, and Native Americans, to pursue professional and educational interests in the information technology industry. Moreover, these differences must be understood in the context of racist education, socialization, and expectations of African American people in the United States, and the connected maintenance of power and privilege among White people.

We must also remember that the model minority myth, and in this care, how it relates to computers and the Internet, is harmful to Asian American/Pacific Islanders, as well, as it places undue social constraints and expectations on those who may feel alienated if they are not skilled at, or interested in, these technologies.

Other social, cultural, and political factors demonstrate a lack of support and encouragement for People of Color to feel connected to the professional or educational dimensions of Internet technology. As mentioned earlier, the EDA (1999) found that several sociohistorical and sociopolitical barriers contributed to the complex challenge of building technology infrastructure in Native American communities (1999). The first two of these barriers, a distrust of new technologies and a distrust of federal assistance, reflect the present and historical treatment of Native Americans by the US and local governments. A related mistrust has been found in the African American community as well, 72% of whom are very concerned about businesses and other people obtaining their personal information online, as compared with 57% of White Internet users (Gandy, 2001; Spooner & Rainie, 2000). In addition to reflecting another way in which the symptoms of systemic racism rear their heads in relation to what many mistakenly refer to as “the great equalizer,” this collective distrust raises questions about whose interests are served by the techno-explosion and its social, cultural, and economic impact in the United States and around the world (Gorski & Clark, 2001).

Overall, an analysis of available data on the racial digital divide leads to an expected conclusion: though rates of physical access to computers and the Internet among racial groups are slowly shrinking (though still troublingly

prevalent), when we employ a broader, more complex, conceptualization of "access," African American, Latina[o], and Native American people are being left on the sidelines while Asian American/Pacific Islander and White people are being socialized and prepared to benefit from an increasingly technology-oriented society. And even Asian American/Pacific Islanders are restamped with the "model minority" label, which is oppressive to them as well as other People of Color.

SEXISM AND THE DIGITAL DIVIDE

In 1960, J.C.R. Licklider, a pioneer computer scientist in the United States, published a paper that constituted the groundwork for the next several decades of research in the field, introducing concepts that would later be reformulated into the Internet as we know it today. The purposes of the paper, entitled "Man-Computer Symbiosis," were:

> to present the concept and, hopefully, to foster the development of man-computer symbiosis by analyzing some problems of interaction between men and computing machines, calling attention to applicable principles of man-machine engineering, and pointing out a few questions to which research answers are needed. (p. 4)

Eight years later, Licklider expanded some of his ideas from "Man-Computer Symbiosis" in "The Computer as a Communication Device," a paper published in a 1968 edition of *Science and Technology*. He opened that paper declaring in regards to the future of telecommunications: "In a few years, men will be able to communicate more effectively through a machine than face to face" (cited by Digital Systems Research [DSRC], 1990). Licklider's vision for the future of computer science, for using computing machines to facilitate human interaction, strikingly foreshadows the technocentric and Internet-dominated present.

But equally striking is the malecentric language in his work, which, although common scientific practice by male scientists at the time, powerfully foreshadows the gender inequities, sexism, and malecentrism in today's digital community. The word *man*, in its singular or plural form, appears 14 times in the first four paragraphs of "Man-Computer Symbiosis" (Licklider, 1960). So even before the advent of personal computers and the Internet, the

language associated with these technologies was uninviting to and exclusive of women. The man who invented the Internet also invented the gender digital divide.

Despite assumptions and contentions otherwise, the gaps continue to grow today. As mentioned earlier, United States women use computers and Internet at roughly the same rate as men. But as with the racial digital divide, girls and women continue to experience techno-sexism in ways that closely mirror gender inequities in the wider society, leading to unique gaps in computer and Internet access. These include: (a) gaps in access to support and encouragement to value and enter technology-related fields, (b) gaps in access to non-hostile and affirming computer and Internet content and software, and (c) gaps in access to a welcoming and safe cyber-culture (Clark & Gorski, 2002a).

Access to Support and Encouragement

Like the narrowing of the racial gap in physical access to computers and the Internet, the disappearance of this gap between women and men represents an important step forward. However, an appreciation of such strides must be tempered by a consideration of lingering access inequities, if not to the technology itself, then to educational, cultural, and social norms that support and encourage pursuance of technology-related skills and interests. Furthermore, these inequities must be understood in relation to historical and present sexism in education, particularly in those fields, including mathematics, science, and engineering, from which these technologies emerged (Clark & Gorski, 2002a).

For example, of the 24,768 bachelor's degrees in computer and information sciences conferred during the 1996-97 academic year, fewer than 7,000 were earned by women. Fewer than one in six computer and information sciences doctoral degrees were conferred to women (NCES, 1999). In fact, despite popular belief, the number of women earning degrees in computer-related fields has been declining since 1986. Meanwhile, the gap in the percentages of women and men earning degrees in these fields continues to increase (Carver, 2000).

A full understanding of these disparities must begin with an examination of educational and socialization process as early as elementary school. A study conducted by NCES in 2000 highlights differences between boys' and girls' attitudes toward mathematics in 4th, 8th, and 12th grades. The study reveals that, as girls progress through grade school, they become less likely to respond affirmative to two statements: "I like mathematics" and "I am good at mathematics" (NCES, 2000). Though the rate of agreement to "I like mathematics" is virtually the same between boys and girls in 4th grade (69% and 70%, respectively), a disparity appears by 12th grade (53% and 49%, respectively). But of greater concern is the gap in boys' and girls' agreement to "I am good at mathematics," starting at an alarming 9 percentage points in 4th grade (70% and 61%, respectively) and increasing to 12 percentage points by 12th grade (59% and 47%, respectively) (NCES).

Additional analysis of this data reveals other disturbing dynamics that suggest a pattern of discouragement and a failure to support girls and women in mathematics, and later, in computer science. In both grade level samples, a bigger percentage of boys agreed with "I am good at mathematics" than "I like mathematics" (70% and 69%, respectively, in 4th grade and 59% and 53%, respectively, in 12th grade). The reverse was true for girls—in both instances girls showed lower levels of confidence in their mathematics abilities than in their fondness for the subject (61% and 70%, respectively, in 4th grade and 47 and 48%, respectively, in 12th grade). In addition, the agreement rates for both statements experience a more dramatic drop between 4th and 12th grade for girls than it does for boys (NCES, 2000). These analyses support decades of research showing that boys are more likely to be convinced of mathematical competence than girls, regardless of an interest in the subject.

An examination of patterns of mathematics and science course taking among high school girls and boys reveals similarly disturbing symptoms of institutional sexism. Data collected in 1998 shows that, although a considerably higher percentage of high school girls than boys complete first level advanced mathematics courses (15.7% and 13.2%, respectively), a higher percentage of high school boys than girls complete third level advanced mathematics courses. The percentage point drop-off in completion of first and third-level advanced mathematics courses among high school girls is more than three times that for boys (NCES, 2000). Similarly, while high school girls are more likely than boys to complete first level chemistry and physics courses, boys are more likely to complete second level courses in these subjects. Again, the percentage point drop-off for girls (30.9) far exceeds that for boys (21.9) (NCES).

The same pattern emerges in an exploration of computer science course and test taking patterns. By 2000, girls represented only 17% of computer science Advanced Placement test takers and less than 10% of the more advanced AB test takers (AAUW, 2000). So, by the time students begin seriously considering their futures in the workforce or college, girls are losing confidence and interest in coursework related to technology, while boys are gaining confidence and interest in these fields (Kelly, 2000; Clark & Gorski, 2002a).

And the pattern does not stop there; it grows and intensifies in college and graduate school. Between 1996 and 1997, women earned 16.5% of bachelor's degrees in engineering, 37% of those in the physical sciences, and 46% of those in mathematics. During the same span, women earned 12.2% of all terminal degrees conferred in engineering, 22% of those in physical sciences, and 24% of those in mathematics, all well below the overall rate of conferred terminal degrees earned by women, 40.8%. Following this pattern, women represented 27% of computer and information sciences bachelor's degrees conferees between 1996 and 1997 (NCES, 1999), a figure that has declined steadily since 1984, when women earned 37% of these degrees (AAUW, 2000). They earned 14.5% of all computer and information sciences terminal degrees conferred during the 1996-97 academic year (NCES; Table 2).

Table 2

Percentages of Math- and Science-Related Degrees Conferred to Women, 1996-1997

Field	Bachelors Degrees	Terminal Degrees
Engineering	17%	12%
Physical Sciences	37%	22%
Mathematics	46%	24%
Computer Sciences	27%	15%

Note. Based on data from *Higher education degrees* (NCES, 1999).

Again, these patterns mirror those in the larger society privileging men economically and professionally and socializing women to stand clear of mathematics and the sciences. P-12 teachers, though largely women, have been socialized in this world, and thus contribute to these disparities, often without intention. A male student is asked to help the teacher figure out why

the television is not working. A female student is rarely exposed to women who contributed to scientific discoveries. Though, taken separately, they might be explained away by the suggestion that girls are just genetically less interested in technology-related topics than boys, when considered together, they form a web of sexist socialization that can have a long-term impact on everybody involved (Bolt & Crawford, 2000). Some information technology scholars argue that lifetimes of this sort of gender socialization leads women to actively resist masculinized technologies for fear that they undermine their femininity (Schofield, 1995; Jensen, deCastell, & Bryson, 2003).

This dimension of the gender digital divide translates directly into present and future inequities between women and men in opportunities to participate in an increasingly global, increasingly digital, economy. As a result, women, much less likely than men to have been encouraged to value and pursue technology-related fields throughout their educational and social development, comprise only 20% of all information technology professionals (AAUW, 2000). Overall, the percentages of women pursuing educational interests and professional careers related to computer and Internet technology are dropping (Kramarae, 2001; Stabiner, 2003). Despite, or because of, recently equalized levels of physical access to computers and the Internet between women and men in the United States, this devastatingly more important divide persists, for the most part unexamined.

Access to Non-hostile and Affirming Content

Web-based pornography is the most lucrative Internet industry, earning more than $14 billion per year worldwide. In fact, web pornography is as much as 14 times more lucrative than its offline counterpart, largely due to its anonymous nature. But like its offline counterpart, web-based pornography continues to be derived from misogynistic dictates and is consumed, overwhelmingly, by men (Rich, 2001; Clark & Gorski, 2002a). Due to the enormous and growing proliferation of these sites, not only can a single mistyped character or web site mis-click land an Internet user in a seemingly endless maze of pornographic web sites and pop-up ads, but it has also become nearly impossible to avoid receiving unsolicited e-mail advertising pornography (Clark & Gorski).

Similarly sexist conditions are evident in another hugely profitable computer industry: video games. Increasingly, video game producers are relying on violent and sexual content to outdo their competitors. This has created a large-scale competition among video game producers to find new and more devastating ways to show death and destruction and scantily clad women, who are often the "trophies" of male characters. A study by Children Now found that 89% of the top-selling video games contained violent content (Glaubke, Miller, Parker, & Espejo, 2001). Research has consistently shown that girls have little interest in the redundant violence of these games (AAUW, 2000; Kelly, 2000; Gerrard, 1999; Jacobs, 1994). Even games, such as the best-selling *Tomb Raider*, that challenge norms by employing a strong, heroic female lead character, tend to do so in a highly sexualized way, portraying her as a fantasy object for heterosexual male consumers. These characters typically have grossly exaggerated features of a stereotypical "beautiful" White American woman: an unhealthily small waist, unrealistically large breasts (particularly in proportion to that waist), and long, straight, but never messy, hair (Clark & Gorski, 2002a).

Since the 1980s, several software companies have attempted, with varying degrees of effort, to produce games specifically for girls (Gerrard, 1999). Unfortunately, many of these feed into traditional gender roles and stereotypes, including *Barbie Fashion Designer*, the all-time best-selling video game marketed to girls (Herz, 1999; Glaubke et al., 2001). Other titles, produced by feminist or girl-focused software companies in response to research showing different gaming habits between boys and girls, present strong female characters who use intelligence, not violence, to solve problems. But because boys, who remain the biggest consumers of video games, will not play games designed explicitly for girls, the market remains small and, as a result, an afterthought in the computer software industry (Gerrard).

Even more disturbing than the presence of sexism in video games is its presence in educational software. A study of a range of mathematics software programs designed for students from Kindergarten through sixth grade revealed that only 12% of the gender identifiable characters were girls or women, and these tended to play stereotypically female roles. And while both male and female students were able to identify games and programs that included male characters, only 6% could name one with a female character (Hodes, 1996). Another study of 30 of the most used educational software packages showed that only 30% of the characters identified in graphics and text were female. Over 80% of characters with leadership roles were

boys and men (Birahimah, 1993). Despite these overwhelming disparities, more than half of classroom teachers report noticing no noteworthy gender patters in the content of educational software (AAUW, 2000), illustrating the depth and stronghold of sexism in education and society at large.

The usual approach for addressing these problems, adding a few software titles for girls and women, addresses only a symptom of a larger problem—that, by every measure, girls and women are excluded from mainstream computer culture, in part by the hostile, sexist content they often find in computer and Internet content. The crucial step moves us beyond differentiating between software designed for girls and boys and developing software that challenges all users to think complexly, creatively, and critically. Video games are an important starting point for this process, as they remain one of the most important and most often-cited entry point into the techno-world, even among information technology professionals (Cassell & Jenkins, 1998). And although video game and software makers contend that their content is based on market demand (which, again, illustrates the need to understand these dynamics within a larger context of sexism), they continually fail to take responsibility for the fact that the mostly male population articulating that demand is defined, in part, by the women-hostile computing environment supported and maintained by their products (Clark & Gorski, 2002a).

Access to a Welcoming and Safe Cyber-Culture

Gaps in access to non-hostile and affirming content and gaps in access to support to pursue professional and educational paths related to technology have contributed to gaps in access to a welcoming and safe cyber-culture for girls and women. Due to these disparities, girls and women looking for points of connection in technology related fields will find few female role models. And those girls and women who do overcome these barriers and pursue techno-interests often find that they must conform to a male-centric, male-dominated environment (Clark & Gorski, 2002a). Cyber-culture, constructed by men and for men, is at best unwelcoming to girls and women, once again challenging the notion that computers and the Internet are facilitators of equality, inclusion, and equity that many claim them to be (Gerrard, 1999; Grigar, 1999; Herring, 1993).

For example, despite perceived potential for the Internet to facilitate democratic dialogue free from the sexist dynamics of face-to-face communication between women and men, research shows that these sexist dynamics are reproduced almost perfectly online (Herring, 1993; Castner, 1997). A study of online discussion forums reveals that, while men's posts are more likely than women's to receive explicit responses from both women and men, "women are discouraged or intimidated from participating on the basis of the reactions with which their posts are met when they do contribute" (Herring, 1993, p. 3). In addition, discussion topics introduced by women are less likely than those introduced by men to be taken up by the entire group of participants. And in those cases in which women initially participate equally and assert views that challenge those of men, they are often demonized by men exclaiming frustration with the discussion and threatening to leave the online forum altogether (Herring, Johnson, & DiBenedetto, 1994). It would be difficult to know, seeing these results out of context, if the researchers were studying online discussion forums or corporate board rooms.

Another way that the Internet and computer culture remains unwelcoming to women is the persistent threat of cyber-harassment and cyber-stalking. While increased media attention of this problem has led to improved training and monitoring by law enforcement agencies, this attention has also led to a heightened sense of insecurity and vulnerability among female Internet users (Brail, 1996; Clark & Gorski, 2002a). According to Stephanie Brail, a survivor of the terrors of online harassment, "stories of online harassment are told and retold partially because of their 'car wreck fascination' factor, but more importantly because we all keenly feel our vulnerability in the new medium of computer-mediated communications" (p. 143). That is not to say that better policing and media coverage is *causing* the divide. But like in the offline world, whether an individual woman or girl experiences harassment, the threat is enough to limit women's mobility through a heightened sense of vulnerability. In some cases, these dynamics are intensified online due to the added trauma of being violated in the supposed comfort and safety of one's home. Again, offline sexism is replicated in an online form.

These gaps are reinforced by the media, continually cycling the message that women are not welcome in cyber-culture (AAUW, 2000). A study of technology industry advertisements highlights that men are typically depicted as confident, tech-savvy executives while women are depicted as insecure typists or secretaries (Marshall & Bannon, 1988). Such depictions are consistent with an overall picture of gender socialization and education in the United States and the other gaps that comprise the gender digital divide.

They are also consistent with, and supportive of, economic sexism, as women continue to be excluded form the globalized cyber-economy. Like women who, despite institutional sexism, climb the ranks of corporate America, women who fight their way into technology-related fields and techno-economic opportunities often find that they have ventured into an unwelcoming, unaffirming, and hostile environment. Meanwhile, men, conditioned to value and pursue technological competence, and more easily welcomed into they cyber-culture they created, maintain their power and privilege through technologies many assumed would help dismantle these barriers.

CLASSISM AND THE DIGITAL DIVIDE

In February 2001, the United States General Accounting Office (GAO) released *Telecommunications: Characteristics and Choices of Internet Users*, exploring a wide array of issues related to technology access and the digital divide. While their data painted a clear picture of the divide, the summary of their report minimized, if not wholly dismissing, an analysis of digital inequities:

> Some of these findings suggest the existence of a "digital divide" at this time. However, it is often the case that individuals with greater education and income are the first to adopt new technologies, and individuals in rural areas are the last to be reached by the deployment of new telecommunications infrastructure. Because the Internet is still in a relatively early stage of commercial deployment, these socioeconomic and geographic differences in Internet usage are not surprising and may not be long lasting. (p. 7)

Like the racial and gender divides, the socioeconomic digital divide must be understood in a larger sociopolitical and sociohistorical context. Unfortunately, like most scholarship on the problem, the GAO report fails to consider critical political and economic concerns that underlie existing class structures—conditions that will persist whether or not physical access to computer and Internet technologies is provided (Clark & Gorski, 2002b). While the GAO report (2001) broadly identifies the contextual frame of the digital divide, suggesting that, "it is often the case that individuals with greater education and income are the first to adopt new technologies" (p. 7), it remains devastatingly silent about the *ramifications* of this observation.

It fails to make the connection between the socioeconomic digital divide and the maintenance of existing structures of class power and privilege, in schools or the larger society (Clark & Gorski, 2002b).

The report's summary illustrates at least three ways in which flawed or shallow scholarship on the digital divide perpetuates inequities. Most importantly, such scholarship, such as the GAO's summary, flows from the oppressively erroneous assumption that socioeconomically privileged people are entitled to quicker access to new technologies than socioeconomically disadvantaged people. Second, though the report was produced by the U.S. government, an entity with the power to eradicate such inequities, it fails to problematize the fact that "individuals in rural areas are the last to be reached by the deployment of new telecommunications infrastructure" (GAO, 2001, p. 7). Third, mirroring the lack of depth in much of the digital divide research, the report minimizes the complexity of the socioeconomic divide by measuring it only by rates of Internet usage, quelling any sense of urgency for reform by suggesting that the divide will close "naturally" in due course: "these socioeconomic and geographic differences in Internet usage are not surprising and may not be long lasting" (p. 7). If, indeed, these differences "are not surprising," it is because of the institutional nature of classism, which the report assumes to be the natural order of things instead of an inequity to be eradicated. Once again, research purporting to address inequities has simply recycled them.

A more complex view of the socioeconomic digital divide includes at least three gaps in computer and Internet access: (a) gaps in physical access to computers and the Internet, (b) gaps in access to teaching and learning experiences that incorporate computers and the Internet in pedagogically sound ways, and (c) gaps in access to relevant Internet content.

Computer and Internet Access

Children living in high-income households are more than twice as likely to have home computer and Internet access than children living in low-income households (Corporation for Public Broadcasting [CPB], 2003). Among adults, less than 25% of those with annual incomes below $25,000 have Internet access at home, compared with more than 75% of those with annual incomes above $50,000 (Cooper, 2002). Particularly troubling is that the

socioeconomic group with the most quickly growing rate of Internet access is comprised of people in the $100,000 to $150,000 household income range (up 20 percentage points between 2001 and 2002), followed by those in the $150,000-and-up bracket (up 14 percentage points between 2001 and 2002). Meanwhile, people in households making less than $25,000 per year experienced the smallest increate in Internet access, with only a 2 percentage point increase between 2001 and 2002 (CyberAtlas, 2002). Consistent with these gaps, people in lower income brackets are much less likely than people in upper income brackets to enjoy high-speed Internet access from home. According to Mark Cooper (2002), Director of Research for the Consumer Federation of America,

> While lower income households have been gaining access to the narrowband Internet, the Internet has not been standing still. Upper income households have moved on to high speed Internet service. The percentage of upper income households (incomes above $75,000) that already take high-speed Internet is as large as lower income households (incomes below $25,000) that take narrowband Internet at home. In other words, lower income households have fallen a full generation of technology behind. (p. 5)

Among households that have never had Internet access, 17.3% identify cost as the primary reason for not connecting, ranking it higher than a lack of time, access to the Internet elsewhere, a lack of computer knowledge, and concerns about children accessing certain online material. When compared with the total sample, nearly twice as many respondents from households with incomes under $15,000 cite cost as their primary reason for not connecting (32.6%). Meanwhile, only 9.4% of people from households with incomes over $75,000 select cost as their primary deterrent. However, challenging assumptions of complacency among the socioeconomically disadvantaged, people from households in the lowest income bracket are less likely to respond that they do not want Internet access—that the primary reason they do not have access is that they do not want it—than the average respondent 26.6% and 30.8%, respectively (NTIA, 2000). Across all socioeconomic groups, computer and Internet technologies are in high and desperate demand. The problem is that access to these technologies is not equitably distributed (Clark & Gorski, 2002b).

These disparities are also prevalent in schools, despite years of presidential propaganda and programs aimed at dismantling the digital divide. In 1997, the President's Committee of Advisors on Science and Technology

(PCAST) determined that, for effective learning, schools must achieve a student-to-computer ration of 4 or 5 to 1 (1997). But as late as 2001, though the average United States public school had achieved a ration of 5 students to 1 computer, the poorest schools had, on average, 9 students per computer (NCES, 2001). Likewise, by 2001, 82% of classrooms in schools with low proportions of students on free or reduced lunch plans were wired for the Internet while only 60% of those in schools with high proportions of students on free or reduced lunch were wired (NCES). Overall, 32% of students from low-income households reported using the Internet at school, compared with 47% of students from high-income households (CPB, 2003).

An analysis of students' points of Internet access within schools reveals similarly disturbing classism. Only 14% of low-income students reported accessing the Internet from more than one classroom, compared with 28% of high-income students. Likewise, while 33% of low-income students reported using the Internet from their school library or media center, 48% of high-income students report doing so. All groups of students are more likely to access the Internet in a computer lab than in the library or a classroom, but low-income students (66%) are still less likely to do so than high-income students (70%) (CPB, 2003). So, even when low-income students experience the Internet during school, they are much more likely to do so in a computer lab, where teaching and learning can often feel disconnected from the overall educational experience.

It often has been suggested that the way to bridge this divide is to provide students with computer and Internet access before school, after school, and on weekends. But wealthier schools are more likely than schools with high rates of poverty to provide Internet access to students outside of school hours (NCES, 2001), despite the fact that a far greater percentage of students at wealthier schools already enjoy home access than those at lower-income schools. Once again, these dynamics perpetuate cycles of poverty around which the lines of access are already firmly drawn.

Access to Progressive Learning Experiences

Adding complexity to this inequitable equation, teachers in low-income schools, less likely than their peers at high-income schools to have comput-

ers and Internet in their classrooms, are thus less likely to develop comfort, competence, and confidence with the technology (Clark & Gorski, 2002b). In addition, like teachers in schools with high proportions of Students of Color, teachers in schools with high proportions of students on free or reduced lunch are less likely than those at high-income schools to have the other resources they need to develop needed technology skills (McAdoo, 2000; NCES, 2002). Whereas 90% of teachers in schools in which less than 11% of the students are on free or reduced lunch report that they have been trained on how to use the Internet in their classroom, only 67% of teachers in schools in which 71% or more of the students are on free and reduced lunch report such training. Likewise, 82% of teachers at high-income schools report assistance in using the Internet in their classrooms compared with 62% of teachers in low-income schools (NCES; Table 3).

Table 3

Percent of Teachers Reporting Availability of Internet Resource Needs by Socioeconomic Status, 1999

Percent of students eligible for free or reduced lunch	Classroom accessto the Internet	Training in classroom uses of the Internet	Assistance in classroom use of the Internet	Training, assistance, and class room access to the Internet
Less than 11%	57%	90%	82%	48%
11-30%	60%	85%	79%	49%
31-49%	56%	86%	79%	44%
50-70%	44%	72%	72%	33%
71% or more	44%	67%	62%	36%

Note. Based on data from *Beyond school-level Internet access: Support for instructional use of technology* (NCES, 2002).

When this lack of training and support is compounded by the low expectations teachers, and the education system in general, confer to socioeconomically disadvantaged students, the result is predictable: even when teachers of predominantly low-income students incorporate computers and the Internet into their teaching, they tend to do so in pedagogically unsophisticated ways. Teachers at high-poverty schools are more likely to use these technologies for skills and drills and menial, lower-level thinking skills tasks. Meanwhile, those at low-poverty schools are much more likely to use

computers and the Internet for creating instructional materials, research, and engaging students in higher-level thinking skills activities (NCES, 2001; McAdoo, 2000; Riel, 2000; Solomon & Allen, 2003; Fulton & Sibley, 2003). According to Maisie McAdoo (2000), "The public schools may turn out a group of Internet geeks capable of not just accessing but actually creating vast frontiers of knowledge, but, at the same time, may effectively limit access to a techno-class, narrow and rich and white" (p. 144).

Again, these dynamics do not merely add up to a new inequity for educators to understand and dismantle. Instead, they reflect, recycle, and strengthen existing inequitable pedagogical approaches and assumptions related to socioeconomic status and educational capability (Resta & McLaughlin, 2003). Teachers who incorporate these technologies into the teaching and learning environment are not merely making a short-term instructional decision. They are beginning the process of defining students' points of educational relation and connection to computers and the Internet. If my only point of connection with these technologies is established through lower-level thinking experiences and rote learning, I am cheated out of both more effective learning opportunities that may or may not include computers as well as an understanding of the educational, social, and economical potentialities of these media. And while some instructional technologists continue to hail computers and the Internet as equalizing media that recognize no gender, racial, or socioeconomic distinctions, the reality simply reestablishes and reinforces the status quo: rich students are prepared to take full advantage of new technologies and opportunities while poor students are left out of the digital loop (Clark & Gorski, 2002b).

Access to Relevant Internet Content

Even when the necessary infrastructure and supports are in place, socioeconomically disadvantaged Internet users often find that the online world is not created with their needs in mind (Clark & Gorski, 2002b). According to a study by the Children's Partnership (CP; 2003), the types of resources low-income Internet users hope to find are scarce, if not non-existent, online. The study, supporting previous findings by CP, identified four primary barriers to contributive online information faced by various populations of low-income Internet users in the United States: (a) a lack of pertinent information about their local community; (b) a lack of resources accessible

to people who do not read at an advanced literacy level; (c) a lack of meaningful documents in languages other than English; and (d) a general lack of cultural diversity among the resources, information, and documents that do exist. An earlier study estimated that over 50 million people in the United States face at least one of these barriers (CP, 2000).

According to CP, the resources low-income Internet users most want to find online are virtually non-existent. These include local job listings (including entry-level positions), local housing listings (including low-rent apartments and homes in foreclosure), and general community information about schools and health care services (CP, 2003; 2000).

Due to the interrelatedness of socioeconomic status and literacy (part of the larger picture of institutional classism of which the digital divide is a contemporary symptom) many low-income Internet users find very few web sites accessible. Some of the limited-literacy resources they seek, but rarely find, include preparatory materials for working toward a high school equivalency degree, sites that incorporate graphics and other non-text tools for improving reading skills, and computer and Internet tutorials to help them realize the day-to-day benefits of these technologies (CP, 2003). Nearly all of the limited literacy web content (roughly 1% of all web sites) is created for young children, not adults (CP, 2000).

Another substantial low-income group still in search of relevant web content includes those for whom English is not a first or primary language. The resources sought by this group include online translation tools, English language tutorial programs, and general information in multiple languages. Although several large online information portals including *Yahoo!*, *MSN*, and *Lycos* contain substantial amounts of content in a few languages other than English, most of this content focuses on entertainment as opposed to life needs and human services (CP, 2003). (The language digital divide will be addressed in greater detail later.)

The fourth barrier faced by low-income Internet users searching for relevant web content is a general lack of cultural diversity among the resources, information, and documents that do exist (Bolt & Crawford, 2000). These users seek platforms to share information and dialogue about heritage and cultural practices and accessible and culture-specific health information. Though information about culture and history is relatively easy to find, content related to health and human services for low-income people is sparsely available (CP, 2003).

Due to these disparities and other content gaps, even those socioeconomically disadvantaged people who do have computer and Internet access become frustrated with their online experiences more often than socioeconomically privileged people. In fact, over 80% of low-income Internet users reported that it takes them too long to find pertinent information on the Web (CP, 2000). As a result, low-income users, rarely finding themselves or their interests reflected online, remain unlikely to recognize the technology industry or related technology competencies attainable, valuable, or desirable. A long list of technology world millionaires who never finished high school reminds us that one does not need a terminal degree or any formal education to develop deep levels of computer and Internet literacy; the potential for some economic equalization exists through the techno-world. But it remains nearly impossible for low-income Internet users, socialized to believe that cyber-culture and the computer world is not and has no plans to be inclusive, to find the motivation to build the necessary techno-literacy for this upward mobility (Clark & Gorski, 2002b).

LINGUISTICISM AND THE DIGITAL DIVIDE

Most research reports, articles, and books about the digital divide focus exclusively on race, gender, disability, and socioeconomic status, with no mention of access disparities related to language (Gorski & Clark, 2002a). Nearly all of the available research and literature on the relationships between language and Internet access has been produced by marketing firms that help online companies decide who, other than native speakers of English, they should target and how they should use language to target them (CommerceNet, 2000; Global Reach, 2001; Vilaweb, 2000; Pastore, 1999). But even a cursory examination of the data collected and distributed by these firms elicits access and equity concerns, both key elements of the digital divide. The concerns include gaps in access to first language web content and gaps in access to culturally relevant online resources.

Access to First Language Web Content

Current or potential Internet users who do not speak English, or for whom English is not a native language, may find the Web to be a very lonely place.

Over 57% of Internet users worldwide are native speakers of languages other than English (Global Reach, 2001). However, less than 32% of all web pages are in languages other than English (Vilaweb, 2000; Table 4). Over 68% of all web content is in English despite the fact that first language English speakers comprise only 14% of the world population. Among web pages not in English, 63% are in other European languages (French, Spanish, Italian, and German, among others). Asian languages dominate web sites that are not in European languages (Global Reach, 2001). Of the 10 most popular web site languages, 7 are European and 3 are Asian, a situation consistent with and reinforcing the racial digital divide (Vilaweb, 2000; Gorski & Clark, 2002a).

Table 4

The 20 Most Highly Represented Languages on Web Pages, 2000

Language	Web Pages (in Millions)	Percent of Total
English	241.250	68.39
Japanese	18.336	5.85
German	18.070	5.77
Chinese	12.114	3.87
French	9.263	2.96
Spanish	7.573	2.42
Russian	5.901	1.88
Italian	4.883	1.56
Portuguese	4.291	1.37
Korean	4.046	1.29
Dutch	3.162	1.01
Swedish	2.929	0.93
Danish	1.375	0.44
Norwegian	1.259	0.40
Finnish	1.199	0.38
Czech	0.991	0.32
Polish	0.849	0.27
Hungarian	0.499	0.16
Catalan	0.443	0.14
Turkish	0.431	0.14

Note. Based on data from *Web pages by language* (Vilaweb, 2000).

Despite growing language diversity, the language digital divide flourishes among U.S.-based web sites, too. According to a CP (2003) study of 1,000 U.S.-based sites "selected from the best portals on the Web rather than what

was typically available" (p. 10), only 2% offer any multilingual content. Nearly all of these sites incorporate some resources in Spanish, but rarely any other languages. All in all, an estimated 70% of all web documents originating in the United States are available only in English even though more than 45 million Americans speak languages other than English at home (CP).

These disparities, like those related to other dimensions of the digital divide, cannot be understood fully outside the context of existing linguisticism. Just as some schools and other social, cultural, political, and educational institutions are translating materials into a variety of languages, hiring translators, and finding other ways to serve a linguistically diverse society, the linguistic digital divide ensures the maintenance of inequity and exclusion.

Access to Relevant Online Resources

Like socioeconomically disadvantaged Internet users, speakers of languages other than English who find their way online are unlikely to find culturally relevant resources there (Resta & McLaughlin, 2003). As mentioned earlier, the limited non-English content offered by popular Internet portals such as *Yahoo!* tends to focus on entertainment rather than daily life needs. Additionally, commercial sites rarely offer information about human services in a language other than English (CP, 2003), especially those originating in the United States. Even *LatinoWeb*, perhaps the most popular Latina[o]-based web portal, reinforces these dynamics and the resulting stereotypes. While its links to business, industry, health, and even bilingual education resources are in English, those to shopping resources are in Spanish.

Another significant barrier for non-English-speaking Internet users is English-centric search engines. When Internet users seek non-English web content by employing U.S.-based web search engines, they often find the results of their searches irrelevant. But even Spanish-language search engines pale in comparison with English-language engines. A CP study shows that users of English language search engines have a 1 in 5 chance of finding information relevant to the search whereas users of Spanish language engines have only a 1 in 8 chance of finding relevant information or resources (CP, 2003).

Again, these disparities are directly connected to larger issues of linguisti-

cism both in the United States and around the world. Instead of challenging the norms of power and colonialism, the current configuration of the Internet confers additional status and power to English speakers (Gorski & Clark, 2002a). And both of these factors—status and power—are linked by research to educational underachievement among language minorities (Cummins, 2000).

ABLEISM AND THE DIGITAL DIVIDE

The Internet is capable of having a profound impact on the lives of people with disabilities. About 48% of adult Internet users with disabilities reported that the Internet significantly improved the quality of their lives, a rate nearly double that of adult Internet users without disabilities. Accordingly, adult Internet users with disabilities spend twice as much time online as those without disabilities (Taylor, 2000). According to adult Internet users with disabilities, by providing electronic opportunities to connect with other people, the Internet broadens their "mobility." As a result, they are more likely to indicate that the Internet significantly increases the extent to which they feel connected to the world around them and that it significantly increases their ability to reach out to people with similar interests and experiences than adult Internet users without disabilities (Taylor).

Unfortunately, while computer and Internet technologies have proven to be valuable resources for those who have access to them, the digital divide remains a wedge between this potential and the digital reality for most people with disabilities (Staples & Pittman, 2003; Gorski & Clark, 2002b). (In most of the digital divide literature, "disability" is conceptualized roughly parallel to the criteria spelled out in the Americans with Disabilities Act [ADA; 1990]: [a] He or she has a physical or mental impairment that substantially limits one or more of his/her major life activities; [b] He or she has a record of such an impairment; and/or [c] He or she is regarded as having such an impairment.) Like the race, gender, socioeconomic status, and language divides, the disability digital divide can be observed and understood as a series of access gaps between people with and without disabilities, including: (a) gaps in physical access to computers and the Internet, (b) gaps in access to affordable computer and Internet equipment, and (c) gaps in access to a non-discriminatory and supportive information technology (IT) culture.

Access to Computers and the Internet

People with disabilities, regardless of what disabilities they have, are less likely to own, have home access to, and use computers and the Internet than people without disabilities (NTIA, 2002; Lenhart, 2003). Even when people with disabilities live in a household that has a computer, they are less likely to use that computer or the Internet than people without disabilities in the same situation. Depending on the disability or combination of disabilities, the rates of home computer use among 25 to 60 year old people with disabilities living in a household with a computer ranges from 67.8% (for people with multiple disabilities) to 77.1% (for people who have difficult leaving home), compared with 83.4% for those without disabilities. (Some of the reasons for this will be explored.) Similarly, between 56.4% (multiple disabilities) and 68% (deafness or severe hearing impairments) of 25 to 60 year old people with disabilities living in a home with a computer use the Internet, compared with 75.1% of those who have no disabilities (NTIA).

This gap is equally observable and equally troubling among the younger U.S. population. People who are between 3 and 24 years old and have one or more disabilities are almost as likely to live in a household with a computer than those with no disabilities. However, whereas the rate of home Internet use among 3 to 24 year old people with disabilities ranges from 26.6% to 32.4%, people without disabilities enjoy a 43.8% rate of home Internet use. Overall, only 38% of U.S. people with disabilities use the Internet, a rate significantly lower than that of the overall U.S. population (58%) (Lenhart, 2003).

The gap in computer and Internet use among people with and without disabilities, like parallel gaps, is a symptom, a point in the cycle of institutional ableism (Gorski & Clark, 2002b). The symptom must be understood in its larger context because that context informs and helps explain the symptom. For example, one reason people with disabilities enjoy less computer and Internet access than people without disabilities is that they are more likely to be unemployed, more likely to live in poverty, and more likely not to have completed high school than people without disabilities (Lenhart, 2003; NTIA, 2002). These factors, like the gap in computer and Internet use and the disability digital divide in general, are symptoms of the larger problem of ableism in the United States.

Access to Affordable Equipment

People with disabilities are more than twice as likely to live in a household with less than $20,000 annual income than people without disabilities (29% and 12%, respectively) (Lenhart, 2003). Add to this the cost of adaptive software and hardware (programs and equipment that help facilitate computer use among people with disabilities including hearing and visual impairments), and these technologies become largely inaccessible to many people (Kearns, 2001; Lenhart, 2003). According to Amanda Lenhart's report, *The Ever-Shifting Internet Population* (2003),

> It can cost thousands of dollars to buy adaptive technologies such as magnified or large monitors, hands-free mice and keyboards, and speech synthesizers. A head-mounted mouse can cost 10 times what a normal mouse costs, and a large button keyboard can run 5 times the cost of a normal keyboard. Braille interface machines cost over $3,000, and magnified screens are selling for nearly $2,000. Considering that people with disabilities have, on average, significantly smaller disposable incomes, the cost of adaptive technology in addition to the normal costs of computers and Internet access can be a significant barrier to getting online. (p. 32)

The situation is equally bleak in schools. Public computer labs as well as public and private schools are frequently ill-equipped for students needing adaptive technologies to access computers and the Internet. And even in those schools that have adaptive resources, most teachers do not know how to use them (Ability Hub, 2002).

A lack of access to adaptive technologies renders many people with disabilities entirely locked out of the computer and Internet world. But even those who have overcome these barriers often find that the battle for equitable access has only begun.

Access to a Non-Discriminatory and Supportive IT Culture

If the prohibitive costs of adaptive technology in addition to the regular costs of computers and Internet service are not enough to dissuade people with disabilities from taking full advantage of these technologies, a non-supportive, often discriminatory IT culture may be. For example, because

the majority of computer and Internet workshops are not designed to accommodate people who need adaptive resources (Kearns, 2001), people with some disabilities are forced to seek out educational opportunities developed specifically for people with such needs. As a result, they often pay more for technology-related workshops and classes (Gorski & Clark, 2002b). And again, the disability/poverty cycle stays in motion.

Another way ableism leads to an unsupportive and discriminatory IT culture for people with disabilities is based on the assumption that people with disabilities do not need access to educational or professional resources because they cannot, or do not want to, achieve what people without disabilities achieve (Gorski & Clark, 2002b). A study by the International Center for Disability Resources on the Internet reported that many people without disabilities assume that people with disabilities have no reason to access the Internet (Kearns, 2001). The institutionalization of these attitudes leads people with disabilities to be "hesitant to use the Web for fear of seeming ignorant or unknowable" (Kearns, p. 4). This may be particularly true for people with learning or psychological disabilities, who already often approach new learning experiences with caution.

Following logically but devastatingly from these assumptions is a widespread lack of compliance with disability accessibility standards. Contemporary graphical and script-based web site designs present great challenges to those producing and using adaptive technologies. Most web site designers are more interested in flash—in competing with other web designers to use the newest technologies to impress the newest generation of web viewers (who can see the screen)—than in accessibility. The U.S. government insists that all of its web sites follow accessibility standards that make them functional to people with disabilities. Unfortunately, most web sites do not comply with these standards, making them partially or fully inaccessible to many people with disabilities. Until the culture underlying this thoughtlessness changes, and the cyber-world begins to police itself more stringently, a large percentage of the information and resources that some take for granted will be practically non-existent to others, even if they have access to the Internet.

Many facilities that house public use computers and computer labs, built before the passage of the ADA, are partially or practically inaccessible to people with some disabilities (Gorski & Clark, 2002b), exacerbating these access issues and raising questions about decision-makers' understandings of and sensitivity to, the inequities faced by the disability community. Due

to prohibitive costs and other factors, most public computer locations do not have adequate adaptive equipment for people with disabilities (Kearns, 2001). The assumption again seems to be that certain people are entitled to access to these technologies and that certain others must fend for themselves, or make due with the leftovers—an attitude that simply reflects institutionalized and systemic ableism.

DIGITAL DIVIDE SUMMARY

Considered independently, any one aspect or angle of the digital divide should raise serious concerns about equity, social justice, and cycles of oppression. Considered together, they weave a complex Web that mirrors patterns of power, privilege, and oppression in the larger society and in the U.S. education system. We will never fully understand the breadth and depth of the digital divide if we do not examine it within these contexts; and we will never end the digital divide if we do not fully understand it.

The first step in this process is to recognize the race, gender, socioeconomic status, language, and disability digital divides as symptoms of racism, sexism, classism, linguisticism, and ableism. The divides are a set of problems that cannot be fixed by introducing more computers or more, or faster, Internet access into an inherently inequitable system. Adding these resources does not transform teachers' attitudes and expectations of different students or the pedagogical gaps that have been observed with or without the presence of these technologies. The digital divide, like gaps in expectations and pedagogy, is sociohistorical, sociopolitical, and sociocultural in nature, and can only be dismantled through movements that address it on those levels.

Until the digital divide is understood, critiqued, and addressed through this lens—the lens of multicultural education—these technologies, which some refer to as social and educational equalizers, will at best uphold current inequities and at worst deepen them.

DISMANTLING THE DIVIDE

What Equitable Access Looks Like

Equitable access, where "access" is broadly defined, and the end of the digital divide can be imagined as those actions that lead to and maintain a present in future in which all people, regardless of race, ethnicity, sex, gender, sexual orientation, socioeconomic class, disability status, age, first language, education level, or any other social, political, or cultural identity:

1. enjoy equitably safe, comfortable, encouraged and encouraging, non-hostile, and valued physical, cultural, social access to information technology including software, computers, and the Internet;

2. enjoy equitably safe, comfortable, encouraged and encouraging, non-hostile, and valued physical, cultural, social access to educational pursuits in technology-related fields including mathematics, science, computer science, and engineering;

3. enjoy equitably safe, comfortable, encouraged and encouraging, non-hostile, and valued physical, cultural, social access to career and professional pursuits in these technology-related fields;

4. enjoy equitably affordable access to the resources they need, including adaptive and assistive tools, to take full social, cultural, educational, and economic advantage of computer and Internet technology;

5. play an equitable role in determining the sociocultural significance of computers and the Internet and the overall social, educational and cultural value of these technologies; and

6. are guaranteed that these conditions will be constantly monitored, examined, and ensured through a variety of perspectives and frameworks.

Practical Needs for a Systemic Shift

Clearly, these are not minor shifts; they are major changes that call for a major systemic shift in thought and action. One way to set that shift in motion is to begin putting measures in place to address the root of the problem (as

opposed simply to adding more computers to a classroom or school). These actions should include:

1. Providing more effective and more complete teacher training on how to use computers and the Internet in progressive, pedagogically sound ways.

2. Informing educators at all levels about the complexity of the digital divide so that they can develop strategies for examining their own employments of technology for inequities.

3. Ensuring that all students and teachers have equitable access to up-to-date software and hardware, and relevant training for how to use them.

4. Limiting costs of computers, Internet access (including high-speed access), and adaptive technologies through sliding scales, government subsidies, or other means.

5. Reestablishing government-funded digital divide research that includes all disenfranchised groups and establishes a broader interpretation of "access."

6. Extending government web accessibility standards to all web sites, perhaps even charging web developers who do not comply a tax or fee to help support those who do.

7. Drawing on existing legislation such as ADA and Title IX to insist upon greater access to computer instruction and courses for people disenfranchised by the digital divide.

8. Placing educational technology specialists in every school to provide support and computer and network maintenance.

9. Increasing the amount and scope of research on ways in which the application of computer and Internet technologies can enhance teaching and learning for all students.

10. Pressuring popular Internet portals such as *Lycos* and *MSN* to provide more non-English and limited literacy level content.

If these and other strategies are employed to diversify the online commu-

nity, the dynamics of supply and demand would necessarily change, at least to some degree, leading to better online content and communities for people of all racial, ethnic, gender, socioeconomic, language, and disability groups.

What Classroom Teachers Can Do

As we work toward these bigger shifts, what can I, as an individual classroom teacher, do to minimize the impact of the digital divide on my students and in my practice?

1. When I use computers and the Internet in my classroom, I will make sure that I have included all necessary adaptions for students with disabilities.

2. Recognizing the digital divide as a symptom of larger inequities, I will constantly reflect on the assumptions and expectations I have of different students and how that impacts the relationship I try to develop between them and computer and Internet technologies.

3. I will particularly encourage girls and women, Students of Color, students with disabilities, students for whom English is not a first language, and socioeconomically disadvantaged students to recognize the educational and professional potential of computer and Internet technologies.

4. Before I incorporate computers and the Internet into a lesson plan or unit, I will reflect on how, or whether, doing so will improve teaching and learning, ensuring that I am not using technology for its own sake rather than to provide the best possible learning experience for my students.

5. I will not replace opportunities for face-to-face communication and interaction with computer facilitated communication and interaction.

6. I will use technology for progressive, pedagogically sound teaching and learning, not to mimic rote learning techniques.

7. I will engage my students in critical discussions about the digital divide and the role of computers and the Internet in education and the larger society.

8. Until I am sure that all of my students have equitable access to these technologies, I will not assign any homework or out-of-school-time assignments that require computers or Internet access.

Though I should not fool myself into believing that these individual shifts will end the digital divide, I have a responsibility for improving conditions for the students in front of me while the larger shifts take shape. However, I must not become complacent. The most important thing I can do to end the digital divide is to confront every instance of racism, sexism, classism, linguisticism, ableism, and any other form of discrimination and oppression, that I witness or experience, or to which I contribute, whether or not it is directly related to computers and the Internet.

Equipped with a deeper understanding of the digital divide and the resulting context in which I teach and learn, I can now begin to think more practically about how computers and the Internet can contribute to progressive, engaging, multicultural education.

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