Computing Technologies, the Digital Divide, and "Universal" Instructional Methods

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Abstract
The Universal Instructional Design (UID) literature reflects a tendency to advance computing technologies as a means of achieving improved access to education for all students. In this chapter, I raise important critical questions about the “universal” benefits of UID methods that rely on computing technologies by situating the experiences of college students who are single mothers within relevant literature on the digital divide. In raising these issues, I hope to prompt additional research concerning the ability of UID to meet diverse student needs and, in doing so, encourage the continued development of teaching methods that effectively promote the principles of UID as well as efforts to improve access to computing technologies for all student populations.

With strong ties to the disability rights movement, Universal Instructional Design (UID) and other models such as Universal Design for Learning (UDL) challenge the construction of disability as an “illness” and, through a combination of “elements of the minority group model and social constructionist perspective” (Evans, Assadi, & Herriott, 2005), promote more inclusive educational environments for students with disabilities. Described by Johnson and Fox (2003) as a type of “curb cut” in the classroom, UID centers the needs and interests of students with disabilities. However, arguments concerning the benefits of UID frequently refer to the “universal accessibility” of UID-designed courses. Indeed, proponents regularly claim that courses designed using principles of UID will result in universal access and better meet the needs of all students.

In this chapter, I address what seems to me to be a gap between the theoretical promises of UID and the demonstrated achievements of the field. While I endorse the vision of UID and the ways in which it can help democratize access to education, I am concerned that the fervor surrounding UID overshadows the relatively small body of research that validates claims concerning UID’s ability to facilitate universal access, particularly in regard to technology-intensive pedagogical models. While technologies can aid learning, the success of such models hinges on an ideal scenario in which all students not only have access to computing technologies, but also have adequate knowledge of both hardware and software and have sufficient time to access and utilize such technologies. This ideal, sadly, is not the reality for many students.

Drawing on my own research on college students who are single mothers and situating that research within relevant discussions of the digital divide, I raise critical questions
concerning reliance on instructional technologies as a way to achieve universal access. I argue that while the use of instructional technologies may seem to reflect principles of UID, teaching models that are technology intensive do not necessarily meet the needs of all students, specifically those who find themselves on the far side of the digital divide. By attending to the social and material realities of single mothers attending college, I hope to contribute to discussions of diverse student learning needs. It is my belief that continued exchanges regarding these and related issues can help to further the aims of UID and are fundamental to the on-going development of teaching models and methods that enable practitioners to come closer to realizing the ideal of universal access to education upon which UID is predicated.

**Principles of UID**

UID reflects a holistic approach to education and has been influenced by a number of fields including architectural design, learning theories, and social justice education. Adopting the architectural concept of barrier-free design, UID promotes learning by creating a "design of [learning] products and environments usable by all people, to the greatest extent possible, without the need for adaptation or specialized design" (The Center for Universal Design 1997, p. 1). Brain research has also had a significant influence on UID, prompting increased attention to the different ways in which people learn (Gardner 2000; Rose & Meyer, 2002). Finally, UID reflects central tenets of social justice education, particularly in relation to "social responsibility, student empowerment, and the equitable distribution of resources" (Hackman & Rauscher, 2004). Consequently, UID both recognizes and celebrates the diverse experiences and identities of student populations and, thus, is ideally positioned to transform education through the promotion of multiculturalism (Barajas & Higbee, 2003). Though a relatively young model, UID has been successfully adapted to a broad range of academic disciplines, including both introductory and advanced-level courses (Brothen & Wambach, 2003; Bruch, 2003; Ghere, 2003; Higbee, Chung, & Hsu, 2004; Kinney & Kinney, 2003; Lightfoot & Gibson, 2005; McAlexander, 2003; Miksch, 2003).

The recognition of student diversity and diverse learning needs is central to the UID model and has enabled educators to challenge traditional pedagogical methods. As Burgstahler (2005) described it, UID means "rather than design your instruction for the average student, you design for potential students with a broad range of abilities, disabilities, age[s], reading levels, learning styles, native languages, and other characteristics" (p. 1). It is this conscious move away from an imagined generic, neutral, or "average" student that has led to a broad range of UID classroom strategies and modes of instruction intended to meet student needs more effectively and produce a more inclusive educational environment. Examples include modification of accommodation statements, the creation of learning communities and learning laboratories, inclusion of student-generated discussion, tactile activities, and enabling students to demonstrate knowledge in multiple ways (Bruch 2003; Higbee, Chung, & Hsu, 2004; Jehangir, 2003; Pedelty, 2003).
Another central theme reflected in the literature is the belief that UID enables instructors to make education more accessible to all students, including those with disabilities and those without. Rose and Meyer (2002) argued that Universal Design of Instruction (UDI) offers a “flexibility in methods and materials [that] maximizes learning opportunities not only for students with identified disabilities, but for all students” (p. 3). Similarly, Estes (2004) contended that instructors can “maximize learning for all students through the implementation of . . . principles of universal design for learning” (p. 87). Pliner and Johnson (2004) offered a similar assessment, indicating that “the concept of UID as it relates to instruction is an approach that benefits all students at the same time that it serves students with disabilities” (p. 105). And the Council for Exceptional Children (2005), while acknowledging that Universal Design for Learning (UDL) grew out of concerns specifically related to the needs of students with disabilities, maintained that all students benefit from the application of UDL principles and methods:

The ultimate goal of UDL is to appropriately challenge and effectively engage the full range of students: those with disabilities and those without, those who are average, as well as those who are below and above average. This does not imply that UDL is a “one-size-fits-all” or a “do-it-yourself” solution to learning problems; it is not a panacea but is an achievable process that promotes success for all students working in the general education curriculum and classroom. (p. xii)

**UID and Technologies**

Recent research suggests that computers, media, and assistive technologies can affect learning in positive ways (Alavi, 1994; Chapelle, 2001; Piccoli, Ahmad, & Ives, 2001; Strijbos, Kirchner, & Martens, 2004). Thus, it is not particularly surprising that many UID practitioners advocate for the use of these types of technologies as a way to enhance teaching, learning, and assessment. For example, Knox, Higbee, Kalivoda, and Totty (2000) pointed out that “technology will allow those with disabilities to achieve fuller participation in the academic venture” (p. 153). Indeed, screen readers, voice input devices, assistive listening devices, specialized software, alternative keyboards, real-time captioning, and other types of assistive technologies continue to improve access to education for individuals with disabilities (Johnson & Fox, 2003). Yet support for computers and technology among UID advocates extends well beyond concerns related specifically to students with disabilities. Rose and Meyer (2002) argued that in the “digital age,” communication technologies are increasingly available and can enable educators to “maximize learning opportunities not only for students with identified disabilities, but for all students” (p. 3). Similarly, Bowe’s (2000) discussion of the ways in which the seven principles of UID can help serve the needs of nontraditional students relies almost exclusively on computer and technology-related examples including personal computers, listservs, and Web sites. Others offer similar praise for computers and technologies, suggesting that instructors can increase educational access by posting lecture notes on the Internet, promoting Internet research, adopting CD-ROMs rather than traditional print texts, using computer simulations or computer-based testing, or offering courses partially or entirely online (Boyd & Moulton, 2004; Brothen & Wambach, 2003; Campbell, 2004; Center for Applied Special Technology, 2003; Ketterlin-Geller, 2005; Kinney & Kinney, 2003; Lightfoot & Gibson, 2005; McAlexander, 2003).
The “Digital Divide”

The demonstrated ways in which technologies have enabled instructors to incorporate UID into their classrooms are certainly impressive as is the clear desire among many UID advocates to formulate teaching methods that more effectively enable educators to meet students’ needs. Yet I am concerned both by what seems to be an over-reliance on computing technologies as well as related claims about the universal benefits of models such as UID, UDI, and UDL. In this section, I discuss the “digital divide” as it exists for a particular college student population: students who are single mothers. Drawing on ethnographic research I conducted at three postsecondary institutions in the Midwest, and situating that research within relevant literature on the digital divide, I illustrate how the challenges these women face result in limited access to computing technologies. In doing so, I hope to demonstrate that teaching models that rely on computer technologies as a seemingly effective way to promote “universal” access can, in fact, exacerbate the digital divide and further marginalize members of this particular student population.

The tendency toward computers and computing technologies within UID literature is, in many respects, quite understandable. Computers have become smaller and more affordable in recent decades. Additionally, the Internet continues to expand and influence patterns of work, commerce, travel, social interaction, and other aspects of society. Higher education has also gone “high tech,” something that is evident in the fact that student computing labs, classroom computers and Internet connections, and computing-related workshops have become regular features of the campus landscape. In fact, U.S. higher education has reached a point where it seems that students simply must have access to computing technologies in order to participate fully. They need computers to send and receive email, to complete research papers, to conduct research, to explore library databases, to participate in courses via WebCt or Blackboard, and to complete other course-related activities.

Despite the increasing centrality of computing technologies in higher education, it is imperative that educators consider the ways in which incorporation of these technologies into the classroom and course-related activities may place some students at a disadvantage. Put quite simply, the expansion of technologies has contributed to a digital divide, a situation which the National Telecommunications and Information Administration (2000) has recognized and defined as “the disparity between the ‘have’ and ‘have nots’ in the technology revolution.” Yet the digital divide is, as Pippa Norris (2001) has explained, much more complicated:

[T]he digital divide is a multidimensional phenomenon encompassing three distinct aspects. The global divide refers to the divergence of Internet access between industrial and developing nations. The social divide concerns the information gap between the rich and poor in each nation. And … the democratic divide concerns those who do, and do not, use the panoply of digital resources to engage, mobilize, and participate in public life. (p. 4)
Thus, when I use the phrase digital divide, I am referencing not only the disparities in access to and knowledge of how to use technologies, but also the ways in which such disparities are connected to economic, social, and political systems, both reflecting and replicating them. Research confirms that social inequalities including those related to gender, age, race, ethnicity, class, and ability are particularly relevant to this discussion as they shape both access to information technologies and patterns of cyber-participation (Kennedy, Wellman, & Klement, 2003; Merrifield, 1997; Mossberger, Tolbert, & Stansbury, 2003). Accordingly, women, low-income populations, and members of historically-oppressed racial and ethnic groups are among those most likely to find themselves on the far side of the digital divide. Furthermore, individuals facing multiple or “interlocking oppressions” (Young, 1990), especially poor women and women of color, may find their access to computing technologies especially limited (Gilbert & Masucci, 2005).

Challenges Facing Single Mothers in Higher Education

College students who are single mothers are certainly among those individuals facing a digital divide. For the past 5 years, my research has focused on the experiences of women who are attempting to balance their dual roles as sole, custodial mothers and college students. Relying on a combination of surveys, participant observation, and one-on-one interviews, I have sought to understand the reasons single mothers pursue a college degree, the specific challenges they face, and the ways in which they respond to such challenges. To date, over 100 individuals have participated in this research, including college students who are single mothers as well as faculty and staff members at three different institutions in the U.S. The first institution is the University of Iowa (UI), a major research institution located in Iowa City, Iowa. The largest postsecondary institution in the state of Iowa, UI offers undergraduate, graduate, and professional degrees. The second is Kirkwood Community College (KCC). In addition to a main campus located in Cedar Rapids, Iowa, KCC operates 12 satellite campuses and learning sites throughout a seven-county area in central Iowa and offers high school completion, GED, 2-year associate degrees, and job training programs. Texas Woman’s University (TWU), the final institution included in the research, operates four campuses, offers undergraduate, graduate, and professional degrees, and enrolls approximately 12,000 students annually, approximately 90% of whom are female.

Although these three institutions differ in size, academic programs offered, and degrees available, the single mothers who participated in this research have a number of things in common. They are predominantly poor and struggle to make ends meet. They tend to describe the pursuit of a postsecondary degree as an avenue to achieving financial independence and self-sufficiency and take their student responsibilities very seriously. Most have only one or two children and prioritize their parental responsibilities over other things in their lives. And perhaps not surprisingly, they face some significant challenges as they attempt to reconcile their multiple and often competing roles as students, parents, and, in many cases, employees.

 Paramount among these challenges is economics. Passage of the Personal Responsibility and Work Opportunities Reconciliation Act of 1996 (U.S. Congress, 1996), more commonly
known as PRWORA, dramatically reduced the availability of state assistance available to poor populations pursuing postsecondary degrees. As a result, many poor single mothers have found themselves “shut out” (Polakow, Butler, Deprez, & Kahn, 2004) of colleges and universities across the U.S., with enrollment among welfare recipients dropping by nearly 80% at some institutions (Applied Research Center, 2001; Kates, 1998). Consequently, almost all of the women who participated in this project were deemed ineligible for cash welfare grants and were forced to rely on other sources of income. These sources included wages, child support, cash gifts from friends or family members, and even cash earned from selling personal belongings. Most often, however, they turned to student financial aid. While scholarships and need-based educational grants do comprise a portion of their total student aid, student loans constituted the primary source of income for the majority of participants. Indeed, it was common for them to take out the maximum amount available to them each year in student loans in an attempt to meet basic living expenses and pay for child care, tuition, and books. Yet even with “maxing out” student loans, many regularly fell behind on their bills and simply could not make ends meet.

A second major challenge facing college students who are single mothers is time constraints. As they attempt to juggle the multiple, often competing demands of single motherhood and higher education, participants frequently find there is simply not enough time in the day to get everything done. Those who have secured either part- or full-time employment in order to earn much-needed income must contend with even more complicated scheduling issues. Although they do attempt to manage their time in various ways, most often they sacrifice sleep, something that leaves them exhausted and, in turn, can affect their academic performance as well as the quality of the time they are able to spend with their children.

Child care is the third challenge. Finding child care that is high-quality and conveniently located can be a difficult task, particularly in university communities where the demand for such services is high. And although some colleges and universities facilitate on-campus or campus-affiliated child care centers, the waiting lists can be extensive or services may be limited to days and times when classes are in sessions and, thus, are not appropriate for mothers who both work and go to school. For those who are able to locate child care, affordability is another issue entirely. To put it quite plainly, child care is expensive and can cost $500, $600, and even up to $900 per month for one child, depending upon the type of care and the child’s age. Some students who are single mothers attempt to reduce their child care expenses by only registering for classes that meet either 2 or 3 days per week. In doing so, they are able to reduce their reliance on child care, even part-time child care can be very costly and is often not much less expensive than full-time care. Other students recruit family members or friends to help with child care, an arrangement which may help save money but frequently proves unreliable. And regardless of how secure child care arrangements may be, a child’s bout with the flu, an ear infection, or other illness can necessitate that a single mother forego her student responsibilities as she stays home and tends to her child.
Lastly, college students who are single mothers must contend with the “chilly” climate of higher education. While research suggests that the climate of postsecondary institutions marginalizes women in general (American Association of University Women, 2004; Sandler & Hall, 1982, 1986), students who are single mothers experience a particularly harsh climate (Duquaine-Watson, 2007). They encounter disparaging comments from faculty, staff, and other students both in and out of the classroom that reflect the type of conservative “family values” rhetoric that drove welfare reform in the first place. In addition, institutional policies seem to ignore their particular needs. For example, campuses may lack family housing. Where such housing exists, it may be geographically separated from the rest of the campus, the quality may be poor, and availability limited. In addition, these women are likely to find that institutional programming does not take their particular needs into account. For example, while institutions typically offer student groups, workshops, lectures, social organizations, or events designed to appeal to and meet the needs of a broad range of student populations, those aimed specifically at students who are single mothers are rare.

**Intersecting Challenges: Single Mothers and the Digital Divide in Higher Education**

How do the challenges facing members of this particular student population relate to UID? Do the barriers they face in relation to higher education more generally also affect their ability to enjoy full and equal access in courses that rely predominantly on computing technologies as a means of reflecting UID principles? Each of the challenges previously discussed is, of course, important in and of itself. However, these challenges also intersect with one another in ways that contribute to a digital divide for students who are single mothers and make it difficult for them to access the types of computing technologies they need in order to complete assignments and other school-related activities (Duquaine-Watson, 2006). Given the strong inclination among many UID advocates to turn to computing technologies in an effort to make their courses more accessible, it is worth examining how the digital divide may render such efforts ineffective in meeting the needs of this particular student population.

First, and most obviously, the cost of a personal computer is simply beyond the budget of many students who are single mothers. Those who own computers often indicated that the machines were old and either not functioning or only capable of running outdated software. And even among those participants who did own a functioning computer, Internet access was a luxury they typically could not afford. As a result, most participants relied on campus computing resources to complete assignments and conduct research.

Second, while campus computing centers are open to all students attending a particular institution, challenges relating to child care, time constraints, and institutional climate tend to limit the ability of students who are single mothers to utilize these resources. Limited access to child care can leave these women with little “free time” on campus, time they might use to access campus computing centers. While some participants will bring their children with them to campus computer labs while they check e-mail, write
papers, and engage in similar activities, this arrangement can be frustrating for both child and parent. Campus computing centers are not particularly "child friendly." They are spaces designed with the needs of college students in mind, not those of infants, toddlers, or school-aged children. Participants reported that their children quickly get bored in these situations and may respond by becoming loud or behaving in inappropriate ways. And such responses, of course, can be stressful for the mother and make it difficult for her to focus on computing activities. Yet even when the children are well-behaved, other students make it clear that they do not approve of children being brought into that space. Participants reported that the climate of campus computing labs is especially "chilly" as they encounter disapproving looks and negative comments concerning the "inappropriateness" of bringing children into the computer labs. Some were even approached by computer lab staff and asked to leave, including one single mother who was told that the presence of her sleeping infant in the computer lab was making it difficult for other students to concentrate. In fact, some campus computer centers prohibit the presence of children or other non-students.

Computing technologies seem to fall nicely into line with the principles of UID. Indeed, Bowe (2000) indicated that through the use of computing technologies, educators can make their courses more accessible, accommodate a range of student abilities, increase effective communication, and minimize physical effort, thus making education more universal including to nontraditional students. Computing technologies may help educators better meet the needs of some student populations. However, it is simply inaccurate to suggest that turning to computing technologies and putting course materials online facilitates universal access and better meets the needs of all students. As indicated in the above discussion, the challenges facing college students who are single mothers are significant and contribute to a digital divide that can make it difficult for these women to access computing technologies. Thus, teachers who believe they are adhering to the principles of UID by posting lecture notes, assignments, and other course materials online, using CD-ROMs rather than textbooks, or offering their courses either partially or completely online may, in fact, be making it more difficult for these students to succeed.

Yet single mothers are not the only students who may find themselves on the far side of the digital divide. As noted earlier, the digital divide mirrors broader social inequalities of gender, age, race, ethnicity, class, and ability. Thus, other student populations also have limited access in regard to computing technologies. Students who are female, poor, members of historically-oppressed racial and ethnic groups, or those with disabilities as well as students attending school part-time or who work part- or full-time are especially vulnerable (Kennedy, Wellman, & Klement, 2003; Merrifield, 1997; Mossberger, Tolbert, & Stansbury, 2003).

Computing technologies can promote increased access to education for some students, perhaps even the majority of students. However, it is important to recognize that increased access overall does not mean equal access for all. Any method of teaching may undoubtedly serve the interests of some while simultaneously failing to address the particular needs.
of others. Consequently, we must remember that claims regarding the universal benefits possible through UID may not only be inaccurate but also overshadow attention to the diverse needs of our students and, consequently, contribute to the types of educational disparities and inequalities that UID proposes to eliminate in the first place.

**Conclusion**

In raising these issues, I do not mean to take away from all that UID has to offer. On the contrary, I fully support the aims and principles of UID. Yet I also recognize that the goal of universal access in education is quite complicated, most certainly beyond what can be addressed by simply relying on computing technologies to enhance traditional modes of instruction. On an individual level, it is imperative that educators continue to engage in critical self-reflection and examine the potential as well as the limitations of all teaching methods, including those they have adopted in an effort to foster universal access for their students. UID would also benefit greatly from quantitative and qualitative research designed to assess the relationship between particular teaching methods and the realization of UID principles. This type of data would provide a foundation to substantiate claims regarding improved access to education and, when such improvement does not occur, demonstrate the limits of particular teaching methods. Of equal importance, such data would provide a foundation for the continued development of a wide variety of teaching methods designed to meet the needs of single mothers and other students with similarly complicated lives and correspondingly diverse learning needs.

Finally, educators must become more aware of and sensitive to issues of computer access and use that knowledge to help address the digital divide and increase student access to computing technologies. Several models currently exist. For example, the Student Parent HELP Center, established in the 1960s at the University of Minnesota (UMN), offers a variety of “programs and services that are designed to promote access, retention, and academic success for … undergraduate students who have children” (*About the Student Parent HELP Center, 2006*). This includes providing a space on campus with four Internet-linked computers specifically for use by UMN student parents. The Women’s Resource and Action Center (WRAC) at the University of Iowa provides another model. Recognizing that student parents face challenges that may limit their access to campus computing centers, the WRAC collaborated with the Office of the Provost, campus technology centers, and the Office of Family Services to create CAPRA: Computer Access Promoting Retention and Achievement. Instituted during the 2005–2006 academic year, CAPRA provides desktop and laptop computers for checkout from semester to semester for low-income student parents, thereby enabling them to take the computers home and use them at times that best fit their class, employment, and child care schedules (*Duquaine-Watson, 2006*). While both of the above programs may help increase access for student parents, other institutions have adopted more wide-reaching models that improve access for all students. The comprehensive technology program at Wake Forest University (n.d.) is one such program. Facilitated by the campus Information Systems office, the program provides a new notebook computer and color printer to all incoming and transfer students. Students “trade in” the computers every 2 years and, upon graduation, are
permitted to keep both the computer and printer. By learning more about these and similar models, UID educators can work toward developing similar programs on their own campuses and, in doing so, promote universal access for all of their students, thus ensuring that computer-intensive models of teaching reflect both the spirit and aims of UID.

References


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