Exploring Culture in the Design of New Technologies of Literacy

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The rapid appearance of new information and communication technologies (ICTs) has complicated the literacy needs of all students, but especially poor and ethnically diverse learners. This has dramatically increased the importance of teacher training, raised academic standards for students across grade levels, changed the delivery of instruction, introduced multimedia curricula, and increased the importance of learning in school settings as well as out of school settings. In essence, the demands imposed by many new technologies of literacy have acutely altered the nature of literacy and what it means to be a literate person in the 21st century (Leu, 2000). Most importantly, equitable access to both technologies, in a general sense, and to learning technologies, in a specific and culturally sensitive sense, continues to be a challenge.

Given this context, the literacy achievement of ethnically diverse learners has become an increasingly important issue. The last 23 years of educational research that intersects issues of race, ethnicity, culture, technology, and literacy has often focused on access and equity as matters that have challenged the academic achievement of ethnically diverse learners in grades K–12 (Becker, 1983a; Hueftle, Rakow, & Welch, 1983; Martinez & Mead, 1988; Office of Technology Assessment [OTA], 1987; U.S. Department of Education and National Center for Education Statistics [NCES], 2005a). In technology, this phenomenon has been labeled the "digital divide" and has been identified as

one aspect of technological and literacy inequities between the "haves and have nots" (Monroe, 2004; Warschauer, 2003).

Increased awareness and understanding of the inequities that divide us has generated policy initiatives, such as the No Child Left Behind Act of 2001. However, achievement scores on national assessments and high school dropout rates indicate a breakdown in educating a large population of ethnically diverse learners to the levels required by an information age (U.S. Department of Education and NCES, 2005b, 2006). Black and Hispanic students ages 9, 13, and 17 have not fully adapted to taking standardized exams or to the content in these exams as evidenced by student performance indicators (U.S. Department of Education and NCES, 2005b). High school dropout rates remain higher for Black students and youth from lower incomes (U.S. Department of Education and NCES, 2006). These data suggest that some of the outcomes of new pedagogies, professional development, improved curriculum, school restructuring, social programs, interventions, and other reforms do not yet meet the needs of all learners. A basic education to function in society is not yet fully accessible for many ethnically diverse learners. This raises an essential question: How can students who require our assistance the most be fully prepared for the literacy and learning challenges of a technological age?

Researchers have examined culture as a factor to help ethnically diverse learners bridge their understanding and adapt to the academic needs of schools and schooling (Banks & Banks, 2003; Gutiérrez & Rogoff, 2003; Ladson-Billings, 1994; C. D. Lee, 2003; Nieto, 1996). This adaptation has been both educational and technological as the integration of culture would situate learners in their "cultural frame of reference" when learning (Branch, 1997; Gay, 2000; Lave & Wenger, 1991; Mazyck, 2002; Powell, 1997; Thomas, Mitchell, & Joseph, 2002; Young, 2001). In some cases, as explored by this chapter, researchers and practitioners have created programs, products, or online environments to meet the academic needs of ethnically diverse learners (Eglash, 2006; Gates, 1999; Pinkard, 1999a). They have found ways to integrate culture in their designs, and they have done so through the use of technology. This chapter examines how race-, ethnicity-, and culture-related issues have evolved with the new technologies of literacy.

Leu, Kinzer, Coiro, and Cammack (2004) defined new technologies of literacy as the range of ICTs including word processors, World Wide Web browsers, weblogs (blogs), e-mail, instant messaging (IMing), presentation software, listservs, plug-ins, bulletin boards, and so forth. This review further evaluates the meanings behind integrating culture into the design of new literacy technologies and evaluates how the intersection of race, ethnicity, culture, and ICTs changes these meanings.

Finally, what does the future hold for the integration of culture in the design of ICTs? Raising this question is not to advocate that the integration of culture alone would solve the achievement problems of the day; however, researchers

keep returning to this important factor for answers (Au, 1980; Gay, 2000; Ogbu, 1995a, 1995b). Au (1980) researched speech events in Hawaiian culture. Gay (2000) posed culture as a factor to improve pedagogy, curriculum, and student achievement. Ogbu (1995a; 1995b) examined culture and its relation to ethnically diverse learners' academic achievements and adjustments in school. In looking forward to what the new technologies of literacy should be and should speak to, it seems necessary that the vision for technology be inclusive of diverse perspectives, ideologies, and epistemologies.

The body of this review of literature examines the last decade or so of new technologies of literacy through exemplary programs, products, and online environments. This review covers both United States and international examples; however, there are more U.S. examples because they meet all of the following requirements. The focus is on how culture is represented in each example and, further, on how it can be replicated in the design of national and international ICTs. The criteria for selection of the programs, products, and online environments in this review were that they needed (a) to be designed for ethnically diverse learners or have ethnically diverse learners as participants; (b) to be situated in school or out of school for grades K–12 or ages 5 to 19; (c) to engage learners in literacy activities using ICTs; and (d) to focus on culture in a generic design or a specialized design.

Borrowing from the field of human-computer interaction (HCI), this review uses two important constructs: generic designs and specialized designs. Generic designs are culture neutral; they seek to eliminate and neutralize culture, generating a more universal design. Specialized designs are culture specific; they tailor products to the needs of a target audience (Horton, 2005). The generic and specialized qualities of the programs, products, and online environments are both included in this review.

The chapter begins with a theoretical frame based in culture, design, and learning. Next, a historical section looks at a series of national studies that laid the ground work for discourse on the digital divide and evaluations of poor and ethnically diverse learners' computer use and access. Then, an examination of exemplary programs, products, and online environments has focused on the academic needs of ethnically diverse learners in relation to ICTs. The review concludes by looking at issues from a more online and globalized point of view.

Theories of Culture, Design, and Learning

Research in the new technologies of literacy benefits from what Labbo and Reinking (1999) referred to as "multiple realities perspective" (p. 481), which offers intersecting or layered hypotheses to inform both research and practice. These hypotheses can be theoretically and methodologically based and seek to enhance and enable discussions across disciplines. This chapter, therefore,

operates in this vein by applying multiple theoretical perspectives to the study of race, ethnicity, and culture in the new technologies of literacy. By doing so, this enriches our understanding of the questions asked and explanations offered (Labbo & Reinking, 1999).

This review also draws from theoretical perspectives on culture (e.g., race and ethnicity), learning, instructional design, and HCI. This multiple theoretical lens serves to demonstrate how disciplines have approached similar questions and challenges. This layered complexity may help us to understand how ideologies overlap and how one theory can aid in explaining another's practice. This multiple realities approach serves to advance research in new literacies.

Cultural Perspectives

Culture means many things. Geertz (1973) interpreted culture as a "historically transmitted pattern of meanings embodied in symbols, a system of inherited conceptions expressed in symbolic forms by means of which men [sic] communicate, perpetuate, and develop their knowledge about and attitudes toward life" (p. 89). In the area of cultural studies, culture is concerned with how meanings are interpreted and created in a society (Gray & McGuigan, 1997; S. Hall, 1997). R. Williams (1958) believed that "culture is ordinary" (p. 74). It is made in the human mind making effort, examination, and explication possible. That is, culture is what is known (tradition) and what comes to be known through investigation and invention (creativity). These meanings of culture demonstrate its importance as a theoretical construct to explain the composition of humankind but also its malleability as a construct to define or redefine through technological tools.

Theorists have proposed that learning is influenced by culture (Bruner, 1996; Vygotsky, 1978) and that culture is significant to how learners acquire new understanding (DuBois, 1903). These perspectives help us to understand how learners see the world and themselves in it. Learning takes place in a context that is specific to the environment and content information (Bednar, Cunningham, Duffy, & Perry, 1992; Brown, Collins, & Duguid, 1989; Bruner, 1985; Resnick, 1987; Rogoff & Lave, 1984). Thus, learning should be situated from the learner's perspective (Lave & Wenger, 1991; Vygotsky, 1978). In Bruner's (1985) examination of the relationship between learner and learning, he understood that learning is acquired in a variety of ways and that learning happens in a variety of ways. Bruner further argued that learning is "context sensitive" (p. 6). It follows that learning takes place in a context situated from the learner's cultural perspective or a cultural context.

Research supporting a cultural context has been articulated as culturally responsive, relevant, mediated, accommodating, compatible, and congruent (Au & Kawakami, 1994; Gay, 2000; Hollins, 1996; Jordan, 1984; Ladson-Billings, 1994) and multiculturalism (Banks & Banks, 2003; Bennett, 2001; Sleeter & Grant, 1988). These perspectives about culture challenge mainstream

notions of teaching and learning, bringing culture to the nexus of discussions and enactments (e.g., what people do and how they do it), and they seek to align teaching and instruction to the cultural contexts of ethnically diverse learners. Gay (2000) argued that "culturally responsive pedagogy" focuses on the needs of ethnically diverse learners by allowing them to use their prior knowledge; situates learning from learners "cultural frames of reference;" incorporates learners' ways of being, seeing, and doing; and integrates learners' histories, language, and learning styles while affirming and validating them (p. xix). Au and Kawakami (1994) hypothesized that cultural congruence is required when ethnically diverse learners perform poorly in school based on the mismatch between school culture and home culture. Ladson-Billings (1994) proposed that culturally relevant teaching assists in sustaining the culture of the learner and transcending norms of the dominant culture; this pedagogy empowers learners using cultural referents that bridge home and school cultures. Hollins (1996) contended that culturally mediated instruction is characterized by the homogeneity of the curriculum, instruction, teacher, and learner—that is, all share the same culture. However, in cultural accommodation the teacher and learner do not share the same culture; academic learning is facilitated through the moderate integration of the student's culture. Cultural compatibility, as defined by Jordan (1984), assumes that there are relationships between the culture of the school and the culture of ethnically diverse learners and that those connections need to be identified, developed within a cultural context, and used to promote academic achievement. Banks' (1995) definition of *multiculturalism* as a theoretical construct provides learners from diverse racial, ethnic, and socioeconomic levels with an equitable educational experience and opportunities for academic achievement and socioeconomic advancement. Collectively, these theories focus on the needs of a target audience, integrate culture, and situate learning from and through the learner as integral to the educational process. They further highlight the usefulness of culture in educating all children.

Design Perspectives

Research in the fields of instructional design (ID) and HCI can best provide the grounding of how to use ICTs to design instruction. ID proposes that learning occurs in a systematic-oriented manner producing measurable outcomes and that there is a process to facilitate this learning (Reigeluth, 1983; Richey, 1986). This process is usually grounded in a generic system of analysis, design, development, implementation, and evaluation, or the ADDIE model. Instructional design translates principles of learning theory and instruction, that is, from the works of John Dewey, Robert Thorndike, B. F. Skinner, Jerome Bruner, and David Ausubel (Saettler, 1990; Seels, 1989; Tennyson, Schott, Seel, & Dijkstra, 1997), into a plan for the design of instructional products, activities, and evaluations (Smith & Ragan, 2005). This process approach is

significant for the design of new technologies of literacy because it provides a systematic or structured methodology that all practitioners might follow in the design process. By systematizing or organizing the design of products or online environments, they are more apt to be well-built and researched instruction. This type of "designed instruction" is integral to meeting the needs of learners (Gagne, Briggs, & Wager, 1992, p. 4).

The research in HCI offers a way of classifying and interpreting existing and new technologies of literacy. For almost 20 years, researchers and practitioners in HCI have been examining the cultural differences that inhibit and support the design process (P. A. V. Hall & Hudson, 1997; Taylor, 1992). They have come to realize that meeting the software needs of foreign and domestic markets can be a challenging task and that there needs to be specific frameworks or guidelines to enable product development (Aykin, 2005; P. A. V. Hall & Hudson, 1997; Taylor, 1992). Therefore, there has been a focus on the internationalization and localization of products. Internationalization focuses on globalizing the design process or making it accessible to cross cultural target audiences (Aykin, 2005). The point of internationalization is to eliminate culture (e.g., cultural symbols, religious references, etc.), making the product a more universal design (Horton, 2005). For example, Aykin and Milewski (2005) proposed more than 50 strategies, guidelines, and suggestions that aid in the design of Web pages and product evaluation. They contended that these guidelines are cross-cultural and provide a better understanding of various ways of life. Under the category of guidelines for writing practices that can make the translation of a language easier, Aykin and Milewski suggested the following: "Eliminate culture-specific metaphors; avoid acronyms and abbreviations; avoid jokes, humor and idioms; avoid colloquial language; and avoid gender specific references" (p. 34). Internationalization seeks to create a homogenous technological product that is useable across cultures or that is culture neutral. Localization seeks to specialize products and/or services, making them acceptable to target groups through "culture-specific" design (Aykin, 2005; Degen, Lubin, Pedell, & Zheng, 2005, p. 314).

Culture specific design focuses on meeting the needs of a target audience through authentic or true representations. Establishing an authentic design can be assisted through the use of qualitative research methods where the target audience is studied in their natural settings (Bogdan & Biklen, 1992; Denzin & Lincoln, 2000). Foucault, Russell, and Bell (2004) incorporated ethnographic methods in finding out about their target audience Chinese consumers; in an effort to "develop culturally sensitive or culturally appropriate products, services and technologies" (p. 1481). This ethnographic fieldwork consisted of visiting and interacting with the target audience in their country, gathering nonfiction materials that documented the target audiences history and culture, and creating video documentaries of the history of the region.
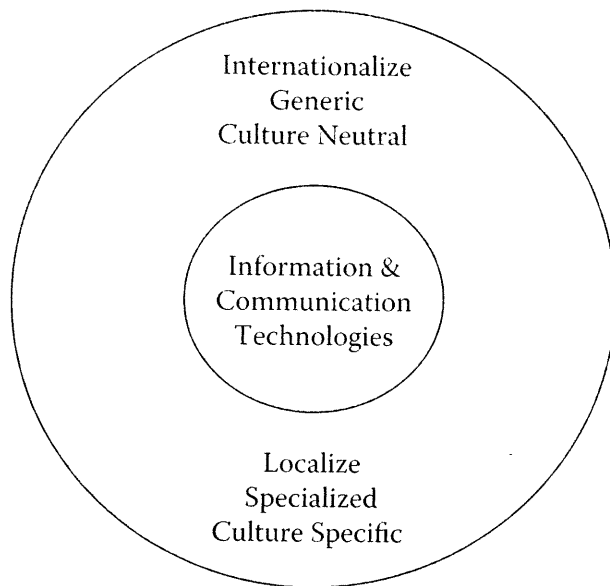
Figure 12.1 Culture-based circumference for use when designing ICTs.

If the goal of the project is to internationalize, then the design specifications are often generic and culture neutral (Figure 12.1). Generic features can be generalized across cultures but they are still culture based. If the goal of the project is to localize, then the design specifications are specialized and culture specific. Specialized features focus on meeting the needs of the target audience, and they are also culture based. For practitioners, this means that culture based design specifications exist within a circumference of the generic to specialized; therefore, there is a much broader palette in which to design (Young, in press-a; Young, in press-b).

A focus on multiple realities can advance the field of new literacies by providing direction for the design of new technologies of literacy. Theories and methods about culture provide a foundation to concepts of culture. Learning theory informs what is known about educating all children and how this education can be improved upon. Research in ID presents an example of a generic model for understanding the design process—that is, moving systematically or methodically from idea to innovation. HCI offers the concepts of generic and specialized designs, thereby classifying and evaluating designs for improvements or reinventions.

Early Studies on Ethnically Diverse Learners and ICTs

National studies of student performance have had an important impact on the fabric of American society (Becker, 1983a, 1983b, 1983c, 2000; Martinez & Mead, 1988; U.S. Department of Education and NCES, 2005a, 2005b;

OTA, 1987). In particular, the outcomes of these studies have influenced the lives of poor and ethnically diverse learners and their acquisition of knowledge and other opportunities. Large-scale educational surveys have altered the direction of public policy, funding for poor and minority communities, school improvements, district and school reforms, pedagogical practice, and instructional content. The history behind these studies chronicles a path of difference and deficit.

In examining these studies, the tests apparently changed, but the outcomes remained the same. Poor and ethnically diverse learners have the least access and use of ICTs but have the greatest need. This represents one version of history, but it does not seal the fate of academic achievement for ethnically diverse learners.

The initial studies focusing on student performance and ICTs began in the early 1980s where preliminary data appeared for what has come to be known as the digital divide (Becker, 1983a, 1983b, 1983c). Becker's reports examined inequities in access and computer use. Becker (1983a) sought to determine the number and main uses of microcomputers in public, private, and parochial elementary and secondary schools. The data indicated that, by January 1983, 51% of elementary and 56% of secondary schools had more than one microcomputer out of a national sample of 2,209 schools. However, public schools in poorer communities were less likely to own a computer. This study suggested that the number of computers used in schools was sparse and that poor communities most likely had little to no access to computers.

Becker (1983b) reported on the frequency of use of microcomputers by teachers and students in elementary and secondary schools. Only one or two teachers even used the microcomputer regularly in a little less than 50% of the 1,082 reporting schools. In a week, student use of microcomputers was very low at 16% in elementary and 13% in secondary; student time on the microcomputer was 12 to 19 minutes for elementary students and 11 to 55 minutes for secondary students. Elementary schools used the microcomputer for mostly drills and remedial work (54%); secondary schools used the microcomputer for mostly writing programs and computer literacy (81%). Becker concluded that computer use served to provide a better understanding of the computer than of subject matter. This is indicated in that students had limited time on the computer and the unknown effectiveness of computer programs. School use of computers apparently focused mostly on drill and practice in elementary and programming on the secondary level, and student time on the computer was very limited.

Becker (1983c) focused on school ownership and use of computers and found that minority students engaged in drill and practice activities 33% of the time while White students spent only 9% of the time on drill and practice. In contrast, minority students spent 10% of the time on programming activities while White students spent 49% of the time on programming. Elemen-

tary schools in minority communities used computers to improve the academic achievement of students whereas equally poor White communities used computers for individualized instruction in computer programming that supported the academic achievement of the best and brightest students. Becker's (1983a, 1983b, 1983c) studies chronicled the limited computer access and use in elementary and secondary schools. When computer technology was available, poor and ethnically diverse learners received a remedial education through the use of ICTs. Computers functioned as rote teaching machines for some but sophisticated teaching and learning tools for others.

The evolving data of difference and deficit continued into the late 1980s. However, these studies provided more comprehensive data in support of a digital divide (Martinez & Mead, 1988; OTA, 1987). The National Assessment of Educational Progress [NAEP], as authored by Martinez & Mead (1988), 1985 to 1986 reported on computer competence among students in grades 3, 7, and 11 and across Black, White, and Hispanic ethnic groups. Martinez and Mead's (1988) findings indicate that most of the students in grades 7 and 11 had little or no engagement with computers. Given these findings, how was competence judged without engagement in the activity? For example, Martinez and Mead asked, "How often do you use a computer to: write letters, stories and reports; make graphs and make a database" (p. 23)? Therefore, the results would have yielded lower levels of competence amongst ethnically diverse learners, which it did. To judge computer competence, learners must first have access.

OTA (1987) issued a report on computer use in schools and found an 18 to 20% increase in the number of computers in American schools from 1981 to 1986. In terms of equity and access, in 1985, Black students were more likely than White students were to attend schools that did not have computers. During 1985, students in poorer schools spent more time with drill and practice than students in richer schools. OTA found that teachers who worked at elementary and secondary schools with low socioeconomic status (SES) were less likely to use computers than teachers at other schools. In addition, 69% of the software available focused on drill and practice, 35% tutorial and 20% games; these limitations also attributed to the use of software programs for remediation versus academic advancement. The OTA report illustrated the imbalance in access to computers and technologically under prepared teachers. Further, limitations were apparent in the lack of academically suitable computer software to move ethnically diverse learners out of drill and practice activities and on to educationally appropriate tasks. One could assume that teachers used the software that they had available or that their schools could afford.

The continued search to understand student access to computers in school and at home is evident in Becker's (2000) examination of three national surveys in the late 1990s (e.g., *Teaching, Learning and Computing: 1998-A National Survey of Schools and Teachers;* Center for Research on Information

Technology and Organizations, 2000) and the Supplements from the *U.S. Census Bureau's Current Population Survey Computer Ownership* (U.S. Census Bureau, 1997, 1998). The conditions of low SES schools and the ethnically diverse learners who attend these schools remained similar to those of 1983. Low SES schools had slower or no Internet connections. Computer to student ratio averaged 1 to 12, and modernizing technology was difficult. Teachers from low SES schools reported a high frequency or weekly computer use; however, this use was mainly for remediation and mastering basic skills. Becker found that how teachers judged a class's ability influenced teaching and learning. That is, a class of students considered low achieving received more drill and practice activities, whereas a class of students considered high achieving received spreadsheet and e-mail activities. Overall, Becker argued that school computer use failed to provide a high level of competency.

For better or worse, poor and ethnically diverse learners were seemingly limited to drill and practice, received limited access to computers and limited time in use, suffered from technologically underprepared teachers, obtained a lower quality education and would not ultimately be prepared for technological positions in society (Becker, 1983a, 1983b, 1983c, 2000; Martinez & Mead, 1988; OTA, 1987; Sutton, 1991). These reports describe what the future of computer literacy appeared to be for poor and ethnically diverse learners; they highlighted the existing racial and economic divides between the "haves and have nots" (Sutton, 1991). If the data of the past 23 years are the only indicators of student performance and the potential success of ethnically diverse learners and poor school communities, then the stigma of difference and deficit will continue to inhibit educational innovation in the new millennium. It may be best to see standardized assessments as one history and not a given to the situations plaguing the academic performance of ethnically diverse learners. Examples of the types of reinvention needed to alter educational futures are demonstrated in the following exemplars where ingenuity, culture, learners, learning, and ICTs intersect.

New Envisionments

Leu et al. (2004) proposed that the deictic nature of literacy includes "envisionments of new literacy potentials within new technologies" (p. 1591). These envisionments are constructed when new technologies are used for "literate acts" (p. 1592; see also Leu, Karchmer, & Leu, 1999). Envisionments can be programs, products, or online environments as envisionments require a vision, the construction of that vision, and sharing the creation with others. The last decade has seen the enactment of these envisionments for ethnically diverse learners in a variety of ways and means. This section explores the meanings behind the integration of culture in the design of new technologies of literacy, and how the intersection of race, ethnicity, culture, and ICTs changes these

meanings. Although most of the envisionments represented here focus on United States examples, the intersection of culture and ICTs is significant for the design of national and international products and meeting the needs of ethnically diverse learners worldwide.

These envisionments are categorized according to programs, products, and online environments. All of these envisionments focus on technology, culture and ethnically diverse learners and most are supported by empirical data. Highlighted in each review are its cultural contexts and meanings and what the data suggests for educating ethnically diverse learners.

Programs

The programs reviewed here include both in school and out of school where ethnically diverse learners engage in structured activities designed to improve academic achievement (see Table 12.1). The ICTs used in these programs included video, audio, Internet, online games, and CD-ROMs. The programs focused on meeting the needs of ethnically diverse learners in grades K–12 or ages 4 to 19. Three out of four programs were specialized and one was generic.

Hull and Zacher (2004) found that after school programs can offer learners opportunities to use multimedia technology, develop learners identities, provide opportunities for linguistic and cultural expression, and engage in social relationships and practices. This is exemplified in the Digital Underground Storytelling for Youth (DUSTY, 2007) program that is a partnership between the University of California and several community and school organizations. In the DUSTY after-school program, multiethnic middle and high school students create digital poems as part of a multimedia (e.g., computers, video, and music) project (Hull, 2003; Hull & Zacher, 2004). Hull and Nelson (2005) analyzed Randy Young's, a DUSTY participant, digital story. Randy's "Lyfe-N-Rhyme" multimodal project is a compilation of images and video with music and voice narration; it combines the language of social critic using poetry, rap, and autobiography. Hull and Nelson examined the images and language of "Lyfe-N-Rhyme" to understand the "meaning-making affordances of multimodality" (p. 239). Specifically, they looked at the technical (e.g., titles, subtitles, font, and color) and linguistic symbols (e.g., written and spoken) of the digital story. Hull and Nelson found that the meanings produced and the perceptions of viewers via multimodal compositions are unique and different. Through the digital story, Randy expressed his personal identity as a young Black man, his visions of African American history, and his lived culture using symbolic images (e.g., Malcolm X, Tupac Shakur, and Marcus Garvey). These "authentic symbols" resulted in a multisemiotic experience (Hull & Nelson, 2005) between the medium and the message (McLuhan & Fiore, 1967). The cultural context in the lives of learners is readily apparent as learners engage in activities where they are allowed to express themselves.

Table 12.1 Programs

Author/ year	Program name	Location/goal	ICT	PROGRAMS Participants race/ethnicity	Grade level	Generic	Specialized
Hull & Zacher (2004)	DUSTY	After school Use multimedia to promote literacy	Multimedia formats	Multiethnic	7–12	Students bring their cultural frame to the program	n/a
Vasquez (2003)	La Clase Magica	After school Use technology to promote academic achievement and self-esteem	Computer	Latino	K–12	n/a	Uses content and context specific to Latino history and culture
Dickerson et al. (1995)	Saturday Science Academy	Weekend Science enrichment using technology	Computer, games, and simulations	African American	7	n/a	Uses culturally sensitive, social context to learning, holistic education
Gates (1999)	MLK, Jr. After-School Program	After school Use technology to learn the history of Africans throughout the diaspora	Computer Internet	African American	7–12	n/a	Uses content and context specific to African American history and culture

Ethnically diverse learners fall back on their cultural frame or schema and bring forth cultural and creative expressions particular to their identities, languages, and families and their communities' ways of being, acting, and seeing the world. This research suggests that learners bring their own meanings to ICTs and their interactions with technology changes the outcomes and the intended meanings. These changes in outcomes can be good in that they offer learner and educator opportunities for new understandings.

La Clase Magica (2007) is a Fifth Dimension (Fifth Dimension Distributed Literacy Consortium, 2007) based learning model that is a collaboration between the University of San Diego and the Latino community. The Fifth Dimension is a network of national and international sites. La Clase Magica is an afternoon school program that uses computer-mediated activities to help Latino learners in grades 7 through 12 improve their academic skills and self-esteem. An online maze game (El Laberinto Mágico) is an integral part of the program; in this task, students use their reading, writing, and problem-solving skills to answer questions related to Mexican history and culture (Vásquez, 1994, 2003). Vásquez's (2003) findings, from almost a decade of research, indicate that, for such programs to be successful and culturally relevant, attention must be made to the local language, social contexts, and maintenance of financial resources, and they must offer flexibility in educational opportunities. In terms of the Mexican students in this study, Vasquez found that there is a need to consider the cultural and linguistic assets of learners. Learners' lived experiences aid them in creating meaning, and this meaning making, in turn, enables learning to happen. These data suggest that the needs of the target audience must be central to build and sustain a culturally relevant after-school program. Further, ICTs can be developed within cultural contexts. La Clase Magica was able to accomplish this culturally relevant context through their bilingual and bicultural online maze and by providing an environment that nurtured Latino culture. This programs' format is consistent with Ladson-Billings (1994) theory that culturally relevant teaching assists in sustaining the culture of the learner.

Dickerson, Bernhardt, Brownstein, and Copley's (1995) study of African American seventh graders in a Saturday Science Academy at Clark Atlanta University concluded that creative writing enabled the students to articulate their attitudes and ideas about science, mathematics, and computers as they were engaged in the practical applications of these content areas. The findings indicate that through creative writing students found meaning, gained understanding, and articulated the science, mathematics, and computer principles and methods. Inherit in the design of the program was the educational philosophy that "all children can learn" (Dickerson et al., 1995, p. 142). Instruction was guided by a holistic type of education where interdisciplinary pursuits were integrated into the curriculum such as creative expression and computer science. Researchers and historians who write about the his-

tory of education for African Americans describe this education as being holistically based (Ihle, 1990; Webber, 1978; Whiteaker, 1990) in that it is defined in terms of community life, social gatherings, family life, and things learned outside these personal settings (Young, 1999). More specifically, creative expression was seen as a conduit to learning, and computers were seen as a tool that could aid in this learning (Dickerson et al., 1995; M. W. Lee, 1986). There was a focus on being culturally sensitive to their students, and literacy skills were situated in a "social context" aligned with the background of the student (Dickerson et al., 1995, p. 152). The entire functioning of the program centered on a cultural context. This research suggests that a comprehensive learning environment can be designed around the cultural needs of a target audience. This is consistent with Jordan's (1984) research on cultural compatibility in that there are relationships between the culture of the school (or learning environment) and the culture of ethnically diverse learners; those connections need to be identified, developed within a cultural context, and used to promote academic achievement.

One program designed to bridge the digital divide and to present ethnically diverse learners with content from a Black perspective is the Martin Luther King, Jr. After-School Program: Content to Bridge the Digital Divide (http://www.mlkafterschool.org). This multisite project is founded by The National Netcasting Foundation and the W. E. B. DuBois Institute for African and African American Research at Harvard University. The cultural context of the program is to provide middle and high school learners with historical and cultural content specific to people of African descent. The program is housed in Black community centers and churches where computers are set up with Internet access. Integral to the program is the CD-ROM encyclopedia *Encarta Africana,* which also provides content about Africa and African people throughout the diaspora (Gates, 1999). (This software is discussed further within the following section about products.) The format of the Martin Luther King, Jr. After-School Program is consistent with Hollins (1996) research on cultural accommodation where academic learning is facilitated through the integration of the student's culture. Goldsmith and Sherman (2002) conducted a formative evaluation of the Martin Luther King, Jr. After-School Program with the goal of providing insight into future directions. This evaluation took place at the Boston, Massachusetts location. The findings indicated that 80% of the 51 students who participated in the program came from families that owned computers. Of the students, 60% reported using the Internet at home, and only 7% reported using the computer in school. According to Goldsmith and Sherman, these students were unlike those found in national studies in that they owned computers and used the Internet; this is indicated in Becker's (2000) national surveys, which found that African American and Hispanic children were "far less likely to have a computer or Internet access at home than other children" (p. 57). Goldsmith and Sherman speculated how repre-

sentative the students were of the poor and ethnically diverse learners in the larger community and, further, how students with less access might fair in the program. Although students reported having computer access and use, Goldsmith and Sherman found that student skill level varied in terms of navigating the Internet, operating the computer, and accessing and saving computer files. The Martin Luther King, Jr. After-School Program format integrated the learning of computer technology in a structured academic program focused on African American history and culture. The program effectively provided a "context for learning" (p. 43) about and through technology and created authentic examples to motivate student interest in technology. Oddly, Goldsmith and Sherman recommended the use of drill and practice to help students with learning the keyboard and short activities that focused on a single skill (e.g., importing music into a PowerPoint presentation). The Martin Luther King, Jr. After-School Program's state-of-the-art equipment enabled student learning to operate smoothly. High parent interest and participation also supported the program. One important piece of data missing from the Goldsmith and Sherman study was the SES of students; this would have brought clarity to the relationship between computer ownership and student access and use in the home. That is, just because students have computers at home does not mean that they actually use the computers. The study suggests that programs with a focus on meeting the needs of ethnically diverse learners may have to develop creative recruitment and retention plans. Otherwise, the point of bridging a digital divide will not be accomplished.

The structure of the Martin Luther King, Jr. After-School Program is also somewhat controversial in that there is a student dress code, homogenous classes, and a parent requirement to attend monthly meetings over the 12-week course period (Goldsmith & Sherman, 2002). Will this type of structure meet with the needs of poor and ethnically diverse communities? If not, then how will those who are most in need acquire the technological skills needed for the 21st century? According to national studies, like Becker's (2000), computer use and access is isolated among low SES and minority children. Could it be that ethnically diverse learners across socioeconomic levels are not receiving the technological skills they need?

Programs can supplement the curricula provided by in-school settings or provide a totally unique learning experience. They can offer a cultural and technological experience unlike that in schools. Cummins (2005) found that the most innovative ICTs for ethnically diverse learners are found in out-of-school settings because of the standardized and assessment driven focus in schools. Further, research from the *Harvard Family Research Project (HFRP): Out-of-School Time Learning and Development Project* (HFRP, 2007) at Harvard University has found that programs with a technology focus do attract and engage students. However, they have experienced some challenges in getting older students to move into programming, updating and obtaining

new software to keep students interested, and locating technology of interest for diverse learners. These programs are also challenged by the financial means to maintain Internet connections, the ability to update and repair equipment, being able to retain and recruit staff with adequate technology skills, and being able to provide programs with both technology and academic enrichment (Wimer, Hull, & Bouffard, 2006).

Products

Products refer to instructional products that incorporate ICTs. These products can be used for in-school or out-of-school settings. The products in this review seek to improve the academic achievement of learners (see Table 12.2). All of the products are computer-supported applications some with or without Internet links. Finally, all of these products focus on meeting the needs of ethnically diverse learners in grades K–12 or ages 5 to 19. Three of the four products were specialized and one was classified as generic.

Pinkard (1999a, 1999b) created two instructional products that were culturally responsive computer-mediated environments—*Say, Say Oh, Playmate* (Pinkard, 1998) and *Rappin' Reader* (Pinkard, 1996). These programs sought to use students' oral language to improve their literacy skills and draw on their cultural experiences to enhance learning. *Rappin' Reader* used the lyrics of rap songs to engage learners in a reading task. In a study of 30 students in grades 1 through 4, Pinkard (1999a) found that the use of *Rappin' Reader* increased students' sight word recognition between pre- and posttests. Moreover, African American students, across grade levels, made equal or greater gains in sight word recognition than European American students. The second program, *Say, Say Oh, Playmate,* used African American clap routine lyrics, performed by an avatar, as a basis for reading acquisition; the clap routines are rooted in African American hand-clapping songs (Gaunt, 2006). In a study of 12 first and second grade students, Pinkard (1999a) field-tested *Say, Say, Oh Playmate* to determine students' sight word-recognition learning. Students gained, on average, 2.4 more words than students who used *Rappin' Reader.*

Pinkard (1999a) argued that ethnically based differences on national assessments such as NAEP could be explained by the reading material selections. That is, most reading selections prevalent in standardized assessments are based on Eurocentric views; therefore, culturally relevant reading selections might aid in helping ethnically diverse learners perform better on standardized assessments. Pinkard found that the culturally responsive elements in these reading programs included the audience, rap music, hand-clapping games, language use, and the motivational intent.

This research is supported by Gay's (2000) theorizing that culturally responsive pedagogy (and learning) focuses on the needs of ethnically diverse learners by allowing them to use their prior knowledge, situates learning from learners cultural frames of reference, incorporates learners' ways of being,

Table 12.2 Products

			PRODUCTS				
Author/year	Product name	Goal/purpose	ICT	Participants race/ethnicity	Grade level	Generic	Specialized
Pinkard (1999a)	Say Say Oh Playmate and Rappin' Reader	After school Improve reading skills and motivate learners	Computer	Multiethnic	1–4	n/a	Content of software specific to African American cultural experience
Leonard et al. (2005)	Underground Railroad	In school Improve science and mathematics achievement	Computer	African American	4	n/a	Content of software specific to African American historical and cultural experience
Gates (1999)	Encarta Africana	After school Improve computer skills and knowledge of Africa and people of African descent	Computer Internet	Multiethnic	K–12	n/a	Content of software specific to African and African American historical and cultural experience
Cummins (2005)	e-Lective Language Learning Program	In school/after school Improve academic language learning	Computer	Multiethnic	9–12	Content of software allows learner to input their language samples	n/a

seeing and doing; and integrates learners' histories, language, and learning styles while affirming and validating them. Pinkard's (1999a) results showed improvement in the literacy skills of students; however, further experimental research is needed. These data suggest that culturally responsive computer-mediated environments have the potential to aid in the academic achievement of ethnically diverse learners. However, the design of such environments must be specialized to the cultural needs of the target audience.

Leonard, Davis, and Sidler's (2005) implementation of a culturally relevant software program called *The Underground Railroad* (Leonard & Leonard, 2002) found that students were engaged and interested throughout their time on the computer. (There were no significant results between the experimental and control group; both groups did well in the final assessment.) *The Underground Railroad* incorporated mathematics and science in a text-based computer environment where students read stories and responded to science and math questions before they could move onto the next task. The goal was to create a cultural context through the use of African American history and culture and characters that looked like the students or people in their families. This cultural context helped students feel affirmed and able to use their prior knowledge. The implications of this research offer support for the design of interdisciplinary ICTs that might provide learning opportunities in multiple content areas, thereby offering learners a holistic educational experience where one subject area connects naturally to another (e.g., seeing the relationships in mathematics, science, and physics). In this example, Leonard et al. (2005) used history to teach science and math; however, there were extensive reading and writing experiences included as part of the software's design.

Appiah and Gates (1999) edited *Microsoft Encarta Africana,* a computer-supported encyclopedia on Africa and people of African descent throughout the diaspora. This CD-ROM explores 4 million years of Black history from ancient Africa to the civil rights movement. Some features of the CD-ROM are its film and audio footage, photos, sound recordings, virtual tours, interactive maps, Internet links, primary source documents, and a digitized set of over 140 books written by Africans and African Americans between 1773 and 1919. The print version is entitled *Africana: the Encyclopedia of the African and African American Experience* (Appiah & Gates, 1999). The CD-ROM is used extensively with the Martin Luther King, Jr. After-School Program (Gates, 1999). Goldsmith and Sherman (2002), in their study of the first year of this program, found that students were enthusiastic about the multimedia and reference capabilities of *Encarta* and in their own projects students sought to emulate the multimedia features of *Encarta*. The emulation of technological skills seems to be an important outcome of student interactions with ICTs. Further, it may point to a direction for the design of future instructional products. That is, products could reflect multimedia that students can reproduce in classroom settings. Another important aspect for consideration is

that Goldsmith and Sherman found that students had difficulty reading the software. In designing ICTs for school age students, considerations should be made for the entire design of the ICT including readability.

Chascas and Cummins (2004) created the *e-Lective Language Learning* program, a computer-supported tool that enables learners to translate text into a language they understand (http://www.e-lective.net/index.html). The program is useful for 9th to 12th grade English language learners (ELL) as it helps them access the academic language of schooling. The cultural context focuses on the language needs of learners. *E-Lective* is based on research and theory in the areas of language learning and teaching, English as a second language (ESL), and computer-assisted language learning (Cummins, 2002, 2005). In a case study of 46 5th grade students in a Canadian school, Cummins, Ardeshiri, & Cohen (2007) found that e-Lective supports learners language and literacy development. This was evidenced in a reading activity that required vocabulary development and retention, reading comprehension, and overall language acquisition. E-Lective promoted academic success equivalent to that of the traditional hard copy instructional process. Therefore e-Lective has great potential as a complementary tool for teaching and instruction. *E-Lective* provides support to students in acquiring another language and this support is specific to academic content designed for schools. In this case, the design of ICTs can provide cross-cultural support to ethnically diverse learners who speak a variety of languages and who come from a variety of cultures. This type of generic design allows for a broader use of the product and its representation across contexts (e.g., in school, out of school, and at home).

The development of ICT products is a delicate and deliberate act as there are many factors to consider. Also, the need to evaluate the effectiveness of these products is important so that learners are provided with effective and efficient educational tools. At present, *Encarta Africana* (Appiah & Gates, 1999) and *e-Lective Language Learning* (Chascas & Cummins, 2004) are available to broader audiences for purchase. The other products discussed provide evidence that further design and development are needed. Young (1999) argued that localized products, in particular, have always had difficulty with financing and maintaining any type of longevity on the market. As an example, when Gates sought funding for *Encarta Africana*, he received 25 rejections before finding funding through Microsoft Corporation and the Carnegie Foundation (Frank, 2000). Funding localized products for ethnically diverse learners has been a challenging task; however, this does not negate the need for such products.

Online Environments

Online environments refer to those accessible via the Internet; this can include e-mails, Web sites, games, and so forth (see Table 12.3). The examples chosen

Table 12.3 Online Environments

Author/year	Online name	Goal	ONLINE ENVIRONMENTS				
			ICT	Participants race/ethnicity	Grade level	Generic	Specialized
Barab et al. (2005)	Quest Atlantis	In school/after school Engage in educational tasks	Online virtual environment	Multiethnic	3–6	Help children learn about other cultures. Use of ethnically diverse characters in online environment	n/a
Eglash (2006)	Culturally Situated Design Tools	In school Understand standards based mathematics	Online environment	Multiethnic	7–12	Content of online environment is multiethnic, historical, and cultural	n/a
Massey et al. (2005)	International Children's Digital Library	In school/after school Provide a multicultural digital library	Online environment	Multiethnic	preK–6, ages 3–13	Content of online environment is multiethnic, multilingual, and multicultural	n/a
L. C. Williams (2003)	Kidlink	In school/after school Provide a global online learning environment	Online environment	Multiethnic	K–10, ages up to 15	Students bring their cultural frame to the online environment	n/a
Abbott (2005)	iEARN	In school/after school Provide a global online learning environment	Online environment	Multiethnic	K–12, ages 5–19	Students bring their cultural frame to the online environment	n/a

are used in both in-school and after-school settings. Across these examples, the goal seemed to be engaging learners in an interactive educational task. The Internet provided access to an online 3-D world, virtual games, computer simulations, a digital library, and international online learning environments. These online environments focused on meeting the needs of ethnically diverse learners in grades preK–12 or ages 5 to 19. All of the examples are generic designs because of their cross-cultural focus.

Quest Atlantis (QA) is an online, 3-D, virtual environment where students engage in interactive educational activities (http://atlantis.crlt.indiana.edu/start/index.html). It has been implemented in multiple sites both nationally and internationally. QA is part education, part entertainment, and also a socially responsive game (Barab, Thomas, Dodge, Carteaux, & Tuzun, 2005, p. 86). Students, usually third to sixth grade, engage in literacy practices through experiential and inquiry based learning. Other online literacy supplements include comic books, a QA novel, activity charts, and trading cards. The cultural context is addressed through the variety of virtual universes with their ethnically diverse characters and discourses. QA hopes to help students learn about and from other cultures, thereby fostering a "multicultural appreciation" (Barab et al., 2005, p. 104). Barab et al. believed that QA could help build school and community relations, as students must use real world examples to complete quests. This may foster cultural compatibility of home and school connections (Jordan, 1984). Barab et al.'s findings reveal that QA can be motivational to students and provide meaningful educational experiences. This intervention has been successfully implemented with both in-school and out-of-school settings (e.g., classrooms in Australia, Denmark, Malaysia, and Singapore and two after-school programs in the United States). Some of its design specifications lead to this effectiveness as it provides a "flexibly adaptive" innovation that functions well in multiple learning contexts, connects to educational standards, uses an online game structure, supports 3-D technologies, infuses interdisciplinary curriculum content, and builds connections with the real world (Barab et al., 2005, p. 103). The specific quantitative academic gains in science, math, reading, social studies, and language arts are not specified in these studies (Barab et al., 2005; Barab, Thomas, Dodge, Squire, & Newell, 2004). This research provides an example of the type of virtual online environments needed to appeal to a highly visual and technology-oriented youth population. Addressing the needs of target audiences across cultures requires captivating graphics, sound, characters, content, and maybe an interactive game-like learning environment. Innovation in designing ICTs will cost much more than traditional designs (Bates, 1995). However the investment has greater potential for longevity because online environments can be revised and updated without fully reproducing the original design.

Eglash, Bennett, O'Donnell, Jennings, and Cintorino (2006) examined culturally situated design tools (CSDT) to teach mathematics through culture

(http://www.rpi.edu/~eglash/csdt.html). This research disclosed the mathematical properties in indigenous designs that are specific to African, Native American, Latino, and African American cultures. The meanings behind these designs are unique to each culture. These CSDT are "computer simulations of indigenous and vernacular artifacts and practices" (Eglash, 2006, p. 347). Eglash et al. (2006) believed these products have the potential to impact the academic achievement of ethnically diverse learners and preliminary research supports this hypothesis. In particular, the findings reveal that CSDTs bridge the cultural barriers that exist between ethnically diverse high school students and subjects related to science and technology careers. The use of this online tool provides both virtual and physical engagements for learners and opportunities to explore literacy through history, social science, mathematics, and technology. This research demonstrates the design of interdisciplinary ICTs that address the academic needs of learners and provides opportunities for ethnically diverse learners to learn about other people and cultures. It uses simulations to teach about mathematical properties. Simulations, if economically feasible in the design of educational products, could be an important method to demonstrate concepts in all subject areas. Instead of static textbook images, simulations bring to life academic content, provide opportunities for review and relearning, foster individualized instruction, and aid in instructional practices (Huppert & Lomask, 2002).

The International Children's Digital Library (ICDL), a research collaboration between the University of Maryland College Park and the Internet Archive, is a comprehensive multicultural digital library comprised of international children's literature (http://www.icdlbooks.org). The cultural context in which ICDL operates is to understand student's perceptions of other cultures through their interactions with the digital library. Massey, Weeks, and Druin (2005) examined student's attitudes toward libraries, books, technology, and culture; participants were from Wellington, New Zealand; La Ceiba, Honduras; Munich, Germany; and Chicago, Illinois. The findings indicated that the students expressed a variety of emotions from sad to scared when reading the children's literature, and the students were influenced by adults who helped them answer the research questions. Massey et al. also realized that their rating system was ineffective and failed to yield useful results. Overall, the cultural context proved inconclusive, as the researchers did not design the study to yield such results. Given this preliminary study, the ICDL may have the potential to be a resourceful reference for learners and educators; however, further research is needed. Massey et al.'s research suggests that designing for youth should include obtaining information from the target audience before, during, and after the design process. This information might consist of demographics (i.e., age and gender), interests, history, and languages that would permit aligning the project to an appropriate age and academic level. Other design considerations could include accessibility, functionality, colors, graph-

ics, icons, multiple languages, and so forth (Aykin, 2005; Hutchinson, Rose, Bederson, Weeks, & Druin, 2005).

Two examples of exemplars in international online environments include International Education and Resource Network (iEARN; http://www.iearn. org/) and Kidlink (www.kidlink.org). iEARN is a telecommunications or globalizing online environment where students become empowered through engaging in interactive project-based learning. These learning opportunities are multifaceted in that they provide students with opportunities to address issues on local, national, and international levels. iEARN involves over 100 countries, focuses on learners ages 5 to 19, and seeks to improve the "quality of life on the planet." Abbott (2005) studied the knowledge that eight teachers acquired when their ethnically diverse learners engaged in curriculum-based, online projects. In the case study of Mary, Abbott found that Mary's students demonstrated an increased interest in writing activities through their engagement with iEARN projects, and students were regularly involved in online dialogs through e-mail with their international peers. Similarly, Kidlink is an online, user-owned organization that seeks to help students ages 5 to 15 engage in global dialogs to know themselves better, determine their life goals, and collaborate with their peers around the world. By providing free educational programs, Kidlink helps teachers to integrate student interests with their standard curriculum guidelines. In a case study of Terry, Abbott found that students were motivated to produce a higher quality of work because they knew other children were going to read their work.

L. C. Williams (2003) examined teachers' initial use of online projects like Kidlink and others (e.g., ePals Classroom Exchange, Global SchoolNet, Oz-TeacherNet, 2Learn, The Electronic Emissary Project). The findings indicated that online projects should be integrated in the curriculum and tied to educational standards. These online projects enabled teachers and students to become learners. Students were inspired to produce quality work and the engagement itself brought a depth of understanding to topics. Teachers became more knowledgeable about technology (i.e., Internet use and e-mail) and believed online projects aided in their professional development. L. C. Williams (2003) concluded that online environments allowed students opportunities to develop an appreciation for people of diverse cultural backgrounds. The cultural contexts of these sites foster a global online environment that is multicultural, or as Banks (1995) argued in his definition of multiculturalism, an equitable educational experience. These data suggest that the Internet can be used as a global educational infrastructure that builds relationships between ethnically diverse learners, schools, and communities worldwide while it provides avenues for authentic learning opportunities; connects learners and educators for the betterment of society; fosters international relations between people of diverse cultures; develops opportunities for collaborative research and product development; and offers an avenue to dispel myths, stereotypes, and misin-

terpretations across cultures. These international sites provide an important context for globalized learning and thinking.

Online environments are versatile forms of technology that can provide access and use to ethnically diverse learners around the world. This type of globalized learning appears to enhance teaching and instruction and provide opportunities for an in-depth understanding of diverse peoples. The possibilities are many—as students are able to interact with an educational game, virtual world, simulation, or reference Web site.

A Summary

Learners respond and interact with technology based on their cultural frames of reference (Gay, 2000), and thus, these interactions are neither predictable nor fixed. When ethnically diverse learners interact with ICTs, the outcomes change and meanings are changed because their lived reality, in most cases, is different from the design of the programs, products, and online environments.

Building on these cultural frames of reference begins with the creation of generic or specialized designs. The programs, products, and online environments in this review were categorized according to whether they provided a more generic or specialized design. In Tables 12.1, 12.2, and 12.3, the generic designs appear to provide a culture neutral educational experience where ethnically diverse learners bring their cultural frame to the context. The infrastructure of DUSTY is culture neutral because it is designed for a broad audience and student participants bring their cultural frames to the program. Hull and Nelson's (2005) research found that students pulled from their life experiences to interact and engage in educational tasks.

The *e-Lective Language Learning Program* is also culturally neutral. Learners bring their language samples to the e-Lective program for translation. In addition, the online environments described here also represent culturally neutral infrastructures. QA replicates a fictionalized culture in an online 3-D environment with ethnically diverse avatars that provide a cross-cultural experience for learners (Barab et al., 2005). CSDT uses simulations to teach learners mathematical concepts inclusive of both historical and societal traditions of multiple ethnic groups (Eglash et al., 2006). ICDL provides learners with a digital children's library that is multiethnic, multilingual and multicultural (Massey et al., 2005). With Kidlink and iEARN, learners also bring their cultural frames to these online environments, and they engage in mostly teacher lead educational activities and projects (Abbott, 2005; Willliams, 2002).

Specialized designs are culture specific because they focus on the needs of the learner or the target audience; make the ethnicity of the target audience integral to the design; incorporate the target audiences' histories, learning styles, and preferences; and provide a culturally supportive environment in which to learn. In Tables 12.1 and 12.2, specialized designs provide a setting where the cultural needs of the target audience are specified. La Clase

Magica, according to Vásquez (2003), focuses on the needs of the Latino community and its student participants. The Saturday Science Academy, according to Dickerson et al. (1995), created an environment infused with holistic learning experiences that imparted a cultural sensitivity toward African American students. The Martin Luther King, Jr. After-School Program incorporates African and African American history throughout all program components (Gates, 1999). *Say, Say Oh Playmate, Rappin' Reader* (Pinkard, 1999a, 1999b), and the *Underground Railroad* (Leonard et al., 2005) focuses on content specialized to African Americans, their history, and their cultural experiences. *Encarta Africana* contains content specific to Africa and people of African descent (Gates, 1999). The next section elaborates further on culture in the design of ICTs.

Culture, Design, and ICTs

The integration of culture in the design of ICTs has the potential to improve learning for ethnically diverse learners (Cummins, 2005; Lee, C. D., 2003). However, the exclusion of culture in the design of ICTs apparently happens for several reasons. First, there may be a need to clarify understandings of what is means to design with culture in mind. Culture, as defined in Dickerson et al.'s (1995) study, focused on the social and individual aspects of culture. This perspective on culture is consistent with that of physical anthropologists who study humans and human behavior (Haviland, 1987). For the practitioner, an examination of an individual's culture could include understanding, studying, or replicating human characteristics. In Squire, MaKinster, Barnett, Luehmann, and Barab's (2003) study, culture is perceived environmentally as the culture of the classroom. This perspective on culture is consistent with that of cultural anthropologists who examine a society's ways of life (Haviland, 1987). For the practitioner, an examination of environmental cultures could include understanding, studying, or replicating a society's way of life. The design of ICTs includes the reproduction, simulation, or virtualization within the space of design; therefore, a complete picture of designing with ICTs must be inclusive of environmental and physical definitions of culture. That is, people and place must both be considered.

A second issue in the design of ICTs is how to represent culture in the design process, what to look for, and what to include. Traditionally, as evident from this review, the integration of culture has focused on features such as identity (Hull & Zacher, 2004); language and language use (Cummins, 2005); community (Vásquez, 2003); cultural sensitivity (Dickerson et al., 1995); cultural responsiveness (Gay, 2000); culturally relevant teaching and learning (Ladson-Billings, 1994); histories (e.g., educational, ethnic, familial, social, and ancestral) (Eglash et al., 2006; Gates, 1999; Leonard et al., 2005); attitudes (Massey et al., 2005); institutions (e.g., schools, church, family, and

work); and religion, traditions, race, ethnicity, socioeconomic status, and gender (Pinkard, 2004). This is a good beginning. However, what these terms mean in the design of ICTs and, further, how they should translate into design specifications is unclear.

Sometimes, the inclusion of cultural contexts may not have been seriously considered as an important factor in the design process. Most designs of programs, products, and online environments focus on a generic—culturally neutral design. Generic designs can reach broader audiences where as specialized designs are much more narrow. However, targeting designs to the needs of specialized audiences appears to be where the design of ICTs is headed (Aykin, 2005). There is much to consider as the integration of culture in ICTs must be an explicit goal throughout the design process.

Globalized Learning

If knowledge were globalized, then the inclusion of culture within the design of ICTs would seem a natural course. As it stands in many western circles, culture seems an abstract concept devoid of design considerations, confused in teaching situations, and tolerated as a learning strategy. In a globalized society, culture would be at the forefront of e-learning. This focus is exemplified in the recent publication of *Globalized E-Learning Cultural Challenges* (Edmundson, 2006). Scholars around the world are trying to figure out how to internationalize and localize design. It is imperative that literacy educators find a space for this work in the new millennium.

Cheng (2002) argued that globalized learning means that learning is provided through many avenues including national and international resources. This type of learning provides access to instructional materials, educators, peers, and experts around the world; this approach appears to advance scholarship, learning, and instruction in the new literacies.

The integration of culture in the design of ICTs is a move to improve learning and instruction. The design of culture based ICTs is more than simply helping students with their identities or helping learners with examples that come from their cultures (Eglash et al., 2006). It is much broader in that the design of culture based ICTs aids learners in bringing their creativity to educational tasks, taking responsibility for their learning, seeing themselves as producers of knowledge, and globalizing their learning experiences. Learners need to reach and interact with the world and begin to understand and appreciate differences and similarities. It is about creating a world community through the engagement of technology where this type of instantaneous connection, information, and education was never possible before in history. Education does not have to be limited to the classroom and textbooks because the Internet provides opportunities for worldwide educational access and activity (Leu et al., 2005; Leu, 2002).

Concluding Thoughts

The last 23 years of surveys in the United States would have one to believe that the academic fate of ethnically diverse learners is a losing battle and that digital, economic, and social divides continue to exist. The numbers do not speak to the grassroots efforts of after school programs in communities that are trying to address the digital divide by providing a culturally enriching environment, academic assistance, and hands-on computer technology exposure (Dickerson et al., 1995; Hull & Nelson, 2005; Vasquez, 2003). Other innovators are developing products that meet the needs of specialized audiences of students in order to incorporate culture in the teaching of academic content (Cummins, 2005; Gates, 1999; Leonard et al., 2005). Online environments have been generated by national and international organizations to begin the process of globalized learning (e.g., Kidlink; iEARN). More of these grassroots, in-school, out-of-school, and online efforts are needed to supplement classroom instruction and improve teaching and learning.

The integration of culture in the design of technologies of literacy is not a new idea. However, it is a concept that has not maintained any longevity or consistent support. Young's (1999, 2001) research identified primary source documents created through print technology, dating back to 1792, as evidence that African Americans created culture based technologies of literacy to educate their own. These early documents were produced in many forms such as newspapers, magazines, religious matter, and later textbooks used in historically Black colleges. These materials exemplify the feasibility of ICTs in creating localized products. More contemporary examples are the Rough Rock English-Navajo Language Arts Program (RRENLP) that focused on improving student achievement through bilingual and bicultural language arts instructional strategies (McCarty, 1993). The program included teacher made authentic Navaho children's literature written in the Navaho language. The findings of this program, from 1990 to 1991, saw gains of 12 percentage points for students in grades K–3. During 1992, the K–3 median California Test of Basic Skills (CTBS) scores doubled in the area of vocabulary, although these scores were still below national averages. Further, teachers became confident in themselves and the work they were doing (Dick, Estell, & McCarty, 1994).

Another important culture based technology of literacy was *Bridge: A Cross-Cultural Reading Program* (Simpkins, Holt, & Simpkins, 1977). *Bridge* was developed as an intervention reading program that sought to improve the reading levels of Black junior and senior high school students in America's public schools. *Bridge* was extensively tested in 1975 in Chicago, Illinois; Phoenix, Arizona; Washington, DC; Memphis, Tennessee; and Macon County, Alabama. Using the Iowa Test of Basic Skills in Reading Comprehension level 12 as the final assessment, students who received instruction in *Bridge* made higher gains than those who received instruction via the basal reader (e.g., grade 7 experimental gain 4.9 and control gain 2.8; grade 8 experimental gain

9.3 and control gain 3.5; grades 9–12 exhibited gains of 5.2 months and control loss of 4.9 months; Simpkins, 1976, 2002; Young, 1999). These studies suggest the opportunities inherent in integrating culture based ICTs that can improve the academic achievement of ethnically diverse learners. Whether it is old or new technology, the integration of culture in the design of technologies of literacy has potential to improve the academic performance of all learners. This chapter has attempted to demonstrate that possibility.

Thinking Ahead

The significance of culture in the design of new technologies of literacy will be important as national and international relationships increase and the need to know and interact with other ethnic groups becomes imperative for human survival. This globalization illustrates the need to internationalize our thinking in terms of meeting and exceeding the educational needs of our students. In the final analysis, issues of race, ethnicity, culture, and technology are not local but global concerns. Taken in these terms, there is much work to do. New envisionments must provide both internationalized and localized products, programs, and online environments. Innovation must be at the forefront of this thinking for all learners to be fully prepared for life in a global, online world.

According to Aykin (2005), the "concept of cross-cultural design" (p. xx) needs to become a priority issue. Important new questions lie ahead of us: How can educators begin to see culture as an integral part of the design of new technologies of literacy? What changes in mindset, instructional practices, curriculum, and/or policy need to take place before we systematically integrate globalized, culturally sensitive thinking into the curriculum? How will the integration of culture be a contributing factor to improve learning experiences in all technologies of literacy?

In a Vygotskyian (1978) interpretation, change is not limited only to technology but also to society. In that sense, change must begin with people. People must change in mindsets and then those changes will be reflected in our uses and interactions with technology. Perhaps that is our greatest challenge. Our duty as educators is to be transformative (Hooks, 1994) and initiators of this forward thinking.

It is clear that equity and access will not cease to be issues in the social fabric of the technological revolution. Nor will these issues be resolved in the next generation. Therefore, finding alternative interventions, preventions, and conventions seems to be a proactive step in making the margins the middle. The content of new technologies of literacy can replicate the past or transform the future. Ultimately, it will take a conscientious effort to change ways of thinking, ways of doing, and ways of believing. If new technologies of literacy are to transform, they must first begin with its creators, builders, and soothsayers. Only then can issues of equity and access be bridged.

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