Distance Learning in Adult Basic Education: A Review of the Literature

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Introduction

The purpose of this literature review is to provide background information about distance learning (DL) in adult basic education (ABE), specifically, to identify program design and policy implications to inform the use of DE for GED® students in rural Pennsylvania. Adult educators have long sought to encourage greater participation in, and more equitable access to, educational opportunities for adult learners. This literature review examines how DE can help adult educators address issues of equity and participation, especially in rural areas with restricted educational opportunities. In Pennsylvania, for example, rural residents tend to have lower educational attainment and more limited access to adult education services than their urban counterparts.

According to the 2000 Census, 19% of rural Pennsylvanians aged 25 or older had less than a high school education (Center for Rural Pennsylvania, 2003). In 2005-2006, 1.5% (3,721) of rural Pennsylvania students dropped out of high school (Pennsylvania Department of Education, 2008). Rural Pennsylvania's low level of educational attainment reflects these trends: "Only 45% of rural adults (ages 25-64) today have more than a high school degree versus 56% in urban areas" (Keystone Research Center, 2008). These figures, however, underestimate the number of rural residents who need a GED, as they do not include individuals under age 25. Nationwide, 16- to 24-year-olds accounted for 39 percent of all participants in state-administered adult education programs, including adult basic education (ABE), GED, and ESL (U.S. Department of Education, 2006). In 2008, 64% of all rural and urban GED test-takers in Pennsylvania were 16 to 24 years old (GED Testing Service, 2009). However, GED® Testing Service (2009) data reveal that adult education services are not reaching potential GED candidates, as only 1.5 percent (23,645) of the 1.6 million Pennsylvanians without a high school education took the GED Tests in 2008.

DE provides adults who cannot attend traditional, face-to-face adult education programs with an opportunity to participate in education, to integrate learning into their daily lives (Askov, Johnston, Petty, & Young, 2003; Garrison, 1989), and to obtain a GED diploma, which is a prerequisite for enrolling in higher education and for obtaining stable, higher-wage employment. DE also enables rural adult education agencies to serve a larger geographic area. As such, DE holds great potential for reaching learners who would otherwise be unable to enroll in a GED program or attend classes regularly, including people who live in remote areas, who do not have reliable or affordable transportation, who have young children and limited access to childcare, who have physical disabilities, and whose work schedules preclude class attendance.

Definitions of Distance Learning

Distance education (DE) and distance learning (DL) are often used interchangeably, although the two terms reflect different points of view. DE takes the view of the educator and educational institution providing the learning opportunity, whereas DL takes the view of the student and refers to a learners studying in a non-classroom setting (Askov, et al., 2003). The most straightforward definition of DE is an instructional mode in which the teacher is not in the same place at the same time as the student (Casey, 2008).

The emergence of new technology and communication methods marked a new era in distance education as they made it easier to reach out to adult learners and provide increased access and support (Garrison, 1989). The shift in emphasis in the literature from "distance education" to "education at a distance" (Garrison, 1989) is significant because it implies that the newly available technologies of communication rendered distance education almost identical to traditional education in terms of access and support for learners. In fact, a review of studies comparing online and classroom-based courses indicated that, by and large, there are few differences in satisfaction and quality of the learning experience, as measured by test scores, course grades, and student ratings (Askov, et al., 2003).

Twenty years of technological innovation may have fundamentally changed the ways DE programs are planned and delivered to learners; however the same "contentious issues" (Garrison, 1989) still exist, including the level of participant control and voice in DE programs and rates of participation by those who have not been served by face-to-face adult education programs. With a more critical perspective regarding the contribution of technological advances to the quality of DE programs, Gibson (2000) defined DE as education or training offered by an agency or organization with an educational mission to serve learners at remote locations via print, audio, video, computer or a combination of these technologies. In DE courses, "students may complete all or part of an educational program in a geographical location apart from the institution hosting the program" (United States Distance Learning Association, 2008) via the aforementioned media. As discussed below, adult education programs utilize various media to implement distance education.

DE in Adult Basic Education

Askov and colleagues (2003) posited that distance education for ABE learners is so different from traditional classroom programs that it is equivalent to "reinventing the school" (p.31). It requires that agencies look for students from different populations and find new ways to teach and interact with them, practices that require transformation of the ABE system. Fortunately, research studies and opinion papers on the use of technology and DE have proliferated (Quigley, Folinsbee, & Kraglund-Gauthier, 2008).

DE Models and Delivery Systems

Approaches to DE in ABE are as varied as the institutions providing the programs (Fleischman, 1998). These approaches differ mainly in their instructional goals, delivery models, and curricula. DE can be adapted to best meet the needs of the populations served by individual agencies and states (Petty, Johnston, & Shafer, 2004). Petty (2005) identified three models of delivering distance education in ABE. The *pure distance model* does not require face-to-face contact between teachers and students. Students are assessed, are assigned to teachers, and work, all at a distance. In *supported distance* education, student come to an adult provider for intake, assessment, and orientation, but the instruction and study occur at a distance. As in pure distance, student-teacher communication occurs via email, phone, and regular mail. *Blended distance learning* is a combination of the first two, with limited face-to-face interaction. As in supported distance learning, intake, assessment and orientation occur in a face-to-face setting and the primary instruction takes place at a distance. Unlike supported distance, however, blended models provide

supplemental support for students through face-to-face contact, as needed. This blended model can be valuable for supplementing instruction since it allows students to review, and for advanced study of the subject presented (P. Porter & Sturm, 2006). In each of these models, electronic technologies may provide additional tools and increased opportunities for two-way communication between the learner and the instructor or educational agency (California Adult Education, 2006).

Each agency must choose a distance learning model, a curriculum, and the technology to deliver DE that will best meet the needs of its learners (Petty, Johnston, et al., 2004). Distance delivery takes many forms, from a stand-alone instructional program on television or online, to a set of videotapes that support and expand classroom learning. Adults can learn anytime, anywhere, and at their own pace by using electronic technologies, prepared print packets, or other materials (Parke & Tracy-Mumford, 2000).

Porter and Sturm (2006) reported two key differences between on-site versus distance learning delivery and methodology. The first was in terms of the kinds of delivery methods employed by DE programs serving literacy students in rural Ontario, Canada. Not surprisingly, distance learners depended much more on technology and non-face-to-face delivery of instruction including printed materials given to learners by the programs. This delivery model had implications for the instructors as they had to view themselves more as facilitators of learning, and the learners had to work more independently. The second difference was in the way instructors spent their time. Instructors for distance learning spent more of their time in preparation and supporting the learners, as opposed to instructors in face-to-face programs where they utilize more of their time in direct instructional delivery. Porter and Sturm posit that while planning the delivery model of choice, factors such as the curriculum to be taught, the known learner needs and abilities, and the availability of computer technology and other resources need to be taken into account.

Adult education programs have long sought the most effective ways to deliver distance education in ABE settings. This goal seems as elusive today as it was a decade ago when Fleischman (1998) observed that no one technology or methodology had been identified as the most effective delivery system. Furthermore, despite the crucial role of technology (i.e., computers and the Internet) in the design of DE delivery systems, ABE professionals have little support—other than individual teachers' suggestions and personal experiences—for learning to use technology effectively (Cromley, 2000). This fact points to the need for professional development and support for the use of various technologies in DE.

Online Distance Education

The expansion of the Internet and broadband access has created new possibilities for innovative types of DE. Askov and colleagues (2003) defined online distance education (ODE) as education in which all or part is built on resources available on the Internet. Through use of the Internet, ODE can provide an interactive experience as well as "anytime, anyplace" learning. Although ODE is not a new idea, it has not been widely used to serve ABE, adult secondary education/GED, or ESL learners, primarily because they tend to have limited access to and familiarity with computers and the Internet (Askov, et al., 2003). Like the 34% rural Pennsylvanians without Internet access (Center for Rural Pennsylvania, 2008), the typical GED student is also likely to have low levels of income and educational attainment. Despite the challenge of restricted computer and Internet access, some

states, such as Pennsylvania, California, and Missouri, are experimenting with online programs for adult learners, including GED courses. In addition to allowing students already enrolled in adult education programs to study at times and in places suitable for them, ODE as part of distance education also offers the prospective of serving other students who, for a variety of reasons, cannot or do not want to enroll in face-to-face classes (California Adult Education, 2006).

The success of ODE depends on several factors. First, federal and state governments affect DE indirectly through policies that expand or limit the availability and affordability of high-speed Internet (Atkinson, 2008), a topic discussed in more detail in the "digital divide" section, below. ODE also requires adequate preparation, training, and support for teachers, staff members, and students. Students can only receive the full benefit of Web-based DE curricula if they have adequate computer and Web navigation skills. Before enrolling in a DE program including an online component, students' computer and Web usage skills should be checked and supplemented with additional training, if necessary. Teachers must be thoroughly trained in both curricular content and delivery methods. Since online instruction is new territory for many teachers, they need to be guided so that, in turn, they can successfully guide their students (Askov, et al., 2003).

Examples of DE Services for ABE Instruction in Pennsylvania and Beyond

Although higher education and K-12 school districts in the U.S. have used distance education for several decades, it is a relatively new instructional method for adults with basic skill needs (Parke & Tracy-Mumford, 2000). Since 2000, many more states have added distance education programs for ABE learners. Pennsylvania was one of the first states to implement a centralized model that allows agencies either to provide distance instruction for learners or refer learners to a centralized distance learning center (Petty, Shafer, & Johnston, 2004). Since then, several other states including Arizona, Ohio, and Massachusetts have followed a similar model in implementing distance education for ABE students. Pennsylvania's distance education efforts have focused on adult basic education, GED preparation, and workplace skills. Other states are using distance education solely for ESL instruction. North Carolina and Texas use online distance education programs for ESL learners. Pennsylvania has begun to expand the distance learning opportunities for ESL over the past two years.

Pennsylvania's efforts to make use of DE for GED and ABE students have been a part of Project IDEAL (http://www.projectideal.org), a consortium of states that have been working together since 2001 to develop effective distance education programs for adult learners. The founding group of 15 states has grown to include 27 current and alumni members. The Project IDEAL Support Center at the University of Michigan provides member states with technical assistance for program planning, teacher training, and program evaluation. It also develops training materials, online courses, and Web-based research tools that member states use to manage and improve their programs.

California is another state experimenting with the use DE to expand educational opportunities for adults. The Adult Education Office of the California Department of Education sponsored the California Distance Learning Project (http://www.cdlponline.org) from 1995 to 2007. The California State University System was responsible for the project, and OTAN, the Outreach and Technical Assistance Network of the Sacramento County Office of Education, was the subcontractor for all Internet and information distribution activities such as website management (McCain, 2009). On

July 1, 1993, AB 1943 became law (Education Code 52522), allowing adult education programs, after approval by the California Department of Education, to use up to 5% of their block entitlement for innovative techniques and nontraditional instructional methods with new technologies. The resulting "Innovation Programs" continue to grow, while other adult education programs remain relatively static. In program year 2005–06, more than 59,000 adult learners participated in Innovation Programs, all of which were distance learning in nature (Stiles & Porter, 2007). Innovation Programs are permitted to offer multiple classes, for instance, several levels of ESL, an ABE course, and a parent education course. Learners and teachers maintain contact throughout each distance learning course. Student orientations, assessments, demonstrating student progress, tutoring, advising, and explaining new assignments are all part of the continuing relationship between the teacher and learner. Some aspects of the relationship are maintained through communication technologies while others happen face-to-face. Innovation Program applications show the estimated average cost per learner per course varies from $97 to $2,298, with a statewide average of $485 and a median of $444.

Iowa, a state whose 99% GED pass rate was ranked first in the nation in 2008 (GED Testing Service, 2009), piloted a DE project for GED students in 2008-2009 (Iowa Department of Education, 2009). Blended DL courses were offered through the community college system, which provides all state-funded adult education services in Iowa. The pilot project featured "GED on Demand, a video-based instructional support program that uses GED Connection videos and workbooks" (p. 3), as well as other state-approved curricula such as Fast Track, GED Satellite Series, and Ed2Go.com.

Missouri, another state with a large rural population, provides free online GED[1] and ESL[2] courses. Students are required to be Missouri residents; "go to an onsite class to take the placement tests"; "study and communicate with your online teacher regularly"; and "return to an onsite class to re-test after 90 days" (Missouri Adult Education and Literacy, 2010). The GED class utilizes Blackboard, an online course management system, to deliver a curriculum created by Missouri adult educators. Skills Tutor and Tutorsystems curricula are used with less academically prepared students (Missouri Department of Elementary and Secondary Education, 2009c). In 2009, GED OnlineClass served 2,844 students. (A rural-urban breakdown was not provided.) An ESL online class, piloted in 2009, is now offered statewide (Missouri Department of Elementary and Secondary Education, 2009b). This course uses "Rosetta Stone software, as well as free links to citizenship and other English instruction websites" (Missouri Department of Elementary and Secondary Education, 2009c, p. 8).

An innovative aspect of Missouri's DE system is the assignment of all DE teachers to one of five geographically based mentoring groups (Missouri Department of Elementary and Secondary Education, 2009a). The mentoring program, coupled with ongoing professional development and the assistance of three state support staff, helps ensure high-quality DE instruction.

Like Missouri, Virginia recently launched an online GED course (Sebastian, 2007).[3] Managed by the Virginia Adult Learning Resource Center, eLearn Virginia is available to state residents aged 18 or

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[1] http://www.gedonlineclass.com/
[2] http://www.eslonlineclass.com/
[3] http://www.elearnva.com

older who have completed a standardized assessment and an "online learning tutorial."[4] The tutorial—a distinctive feature of Virginia's online DE services—provides an overview of online learning, explains its benefits, and includes a 9-question self-scored assessment to help potential students determine how well online learning meets their needs. The rest of the tutorial includes helpful information such as time management, online communication, computer and Web browser terminology, and related topics. This screening tool assists adult learners in understanding online study entails and what it will require of them.

Program Quality and Effectiveness

The existing U.S.-based studies suggest that although the quality of DE services is highly variable, DE can be as effective and cost efficient as traditional education for ABE students (Drummond, 1993). The U.S. Department of Education's (Means, Toyama, Murphy, Bakia, & Jones, 2009) meta-analysis of online learning, for example, found that, on average, online students "performed better than those receiving face-to-face instruction" (p. ix) and that online instruction are effective "across different content and learner types" (p. xv) including adult students. Although the meta-analysis did not include research with ABE students, the findings suggest online learning holds promise for use with this population.

An evaluation of California's DE initiative (D. Porter, 2004) showed that compared to traditional (face-to-face) learners, in 2001-2002 ESL distance learners had similar retention rates, were more likely to complete the course, and showed substantial learning gains. Research on quality highlights the importance of consistent, two-way communication between teachers and learners, selection of high-quality instructional content (Fleischman, 1998), and careful consideration of policy issues such as assessment of students' "readiness and pre-service training/orientation needs" prior to enrollment in DE (Hooper, 2003, para. 9), assessment of student participation in DE, and assessment of student progress. For example, the Massachusetts ABE Distance Learning Project has created intake tools to assess learners' "computer literacy and independent learning skills," and provides an orientation that allows students "to relate their technical skills to the specific learning program, or to develop skills which are assessed as weak or missing at intake" (Hooper, 2003, para. 15). Such assessments enhance student retention and their likelihood of success in the DE program.

Based on a longitudinal study exploring the possibilities for distance and flexible delivery of the Literacy and Basic Skills (LBS) Program in the Province of Ontario, Canada, Porter and Sturm (2006) observed that retention is related to strong orientation programs and to learners establishing close relationships with teachers. They found that much more orientation time is necessary with distance learners than face to face learners. From the DE perspective the need to "stop out" from learning is less as long as the reasons for the break in learning are not disastrous in nature. Learning can continue thanks to asynchronous distance lessons that place the learner in charge of the pace and place of instruction (Bartlett, et al., 2006). It seems that with help from the programs, the potential participants can make an informed decision if DE is suitable for them as learners. According to the Home Study coordinator, Sandra Fernandez in a GED program in Florida, "Most students know [by the end of the interview] whether or not they have the self-discipline to successfully participate in

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[4] http://www.elearnva.com/tutorials/elearnva/introduction.htm

the program. We refer those who don't to the classroom. There are three ABE/GED outreach study centers and three campus sites across Seminole County" (Schoneck, 2006, p.12).

Equitable Access to DE

DE programs are not immune to problems and challenges, both those encountered by face-to-face programs and those unique to DE. As such, DE educators and administrators need to consider issues such as assuring inclusivity by broadening access to underprivileged segments of society and being sensitive to learner needs (Gibson, 2000). A common critique of DE is that, like traditional ABE programs, DE reflects the Matthew Effect: it provides greater educational access to people who can already take advantage of other educational opportunities. That is, DE tends to increase access for those who are already being served rather than broadening it to underserved groups (Grill, 1999). However, in theory DE has the potential to expand educational access, especially for adults who are isolated due to geographic location or socioeconomic factors and when a combination of delivery methods is used (Drummond, 1993). Thus, the available research reflects both the possibilities and challenges of technology use and DE for ABE (Quigley, et al., 2008), suggesting that adult education programs need to find effective ways to reach those groups with least access to face-to-face *and* distance education. For instance, Porter and Sturm (2006) reported that in addition to academic skills gains, distance learning encourages the expansion of learners' technology skills. They observed that although distance learning students enrolled in a Canadian program tended to start with higher technological skills, their skills nevertheless increased significantly during their participation.

State and Federal Policy

Although DE programs can address many of the difficulties adult learners face in traditional programs, such as transportation, program availability, and lack of child care, DE has its own set of policy challenges (Parke & Tracy-Mumford, 2000). Policies that are designed for classroom-based programs (e.g., assessment, accountability) may not be helpful in guiding DE and may be difficult to adapt to DE settings. For instance, "seat time"—the amount of time participants are engaged in a given learning activity—is easily measurable in face-to-face programs, but may require much deliberation in DE policy making (Petty, Johnston, et al., 2004), as DE may include a combination of "face-to-face contact with teachers," independent study, and instructional support at a distance via e-mail, phone, and postal mail (Hooper, 2003, para. 16). Thus, state administrators must determine whether and how to adapt each adult education policy and program performance standard for DE.

As suggested by evidence from Project IDEAL, states may take different approaches to developing DE policies for adult education (Petty, Shafer, et al., 2004). One Project IDEAL member state adopted a "top down" administrative approach by forming an advisory board that created a tentative policy for the state. Two states relied on pilot test sites to guide DE policy making. A fourth state waited for more data on DE before deciding on the necessity of DE-specific policies, and the fifth state had already included DE in their statewide funding formula for adult education.

Successful DE provision requires a new infrastructure to infuse distance learning into the state's adult basic education and literacy system (Parke & Tracy-Mumford, 2000). Policies related to managing, supporting, and instructing learners in a distance format are needed to establish this infrastructure. Such policies need to address (a) allocation of resources for developing and

implementing distance education; (b) increased technology needs; (c) adjusted reporting structures for cost reimbursement and measuring student "attendance;" (d) effective models and program quality; (e) intensive training of staff, including effective DE theory, methods, strategies, and ways to support learners; and (f) student recruitment.

Researchers at the Project IDEAL Support Center interviewed the state directors of adult education in New York, North Carolina, Ohio, Pennsylvania, and Rhode Island about DE policy issues for adult learners (Petty, Shafer, et al., 2004). At the time of the study, each state had well-established DE experiments or programs in place. The directors posited that states needed to create policies concerning funding, staffing, training, technology, assessment, and accountability. A subsequent report (Petty, 2005) provided questions to guide policy development in each of these areas. The U.S. Department of Education (2003) has encouraged state governments to promote "the use of technology-facilitated learning and distance learning to accelerate student achievement and expand access to adult basic and literacy education" (p. 10). The directors expected federal policy makers to provide guidelines for service delivery, the development of and support for distance technologies, appropriate strategies for learner assessment, and identification of characteristics of adults that could most profit from DE. Both state and federal officials emphasized the need for further research on the use of DE with adult learners to help guide the development of policies.

Accountability and assessment are among the most challenging aspects of DE implementation (Petty, 2005). Beginning in 2000, states were required to implement the National Reporting System for Adult Education (NRS) guidelines, which determine how adult learners' participation and educational achievements are reported. The aim of the NRS is to provide systematically collected data for aggregation and analysis to aid Congress and other federal agencies. Federal incentive grants depend on a state's ability to meet or exceed expected outcomes for its adult students. The NRS requires states to collect measurement data in three areas: descriptive, participation, and outcome (Young, Johnston, & Hapgood, 2002). The characteristics of DE delivery systems, however, require programs and state and federal government agencies to identify assessment tools and methods that are appropriate for DE. Responsibility for policy making, funding, and administration of the ABE system is shared by federal, state, and local government (Chisman, 2002). As such, adult education administrators and policy makers at each level must coordinate to determine how to apply accountability standards to DE. For instance, Petty (2005) reported that states wishing to use DE in adult education wanted to know what OVAE (Office of Vocational and Adult Education) considered acceptable ways to report distance learners' outcomes for NRS.

In collaboration with Project IDEAL, NRS drafted a policy for DE reporting in 2006 and approved the revised policy in July 2007. The policy "includes a definition of distance learners, guidance on how to measure contact hours for these learners and describes assessment and reporting requirements" (OVAE, 2007, p. 1). In addition, it provides states with guidance for developing their own policies, for example, specifying which curricula may be used, funding procedures, and training requirements for DE instructors (OVAE, 2008).

Several assessment-related policy issues for DE were highlighted by Hooper (2003).

1) Policies need to establish "when and how frequently assessments are administered" to DE students." Such policies "should reflect the unique criteria used to measure

participation and intensity of services" in DL (para. 16). Because face-to-face "seat time" is not an accurate measure of DE learner participation and instructional intensity, the timing of assessments requires the creation of new measures. Massachusetts, for example, created a specific protocol to count DE learner participation and intensity.

2) Policies should ensure that initial assessment for newly enrolled DL learners is a "low anxiety, non-threatening event" (para. 17). Adult educators and administrators must decide at what point after intake a DE student will be "familiar enough with the teacher and the services to be comfortable taking the initial assessment" (para. 17).

3) Policy makers need to examine how well assessment instruments for DL learners "'match' the contents and scope of their instructional program" (para. 18). Since DE programs often use commercial curriculum packages that are not aligned with state curriculum standards, policy makers and program administrators should pay attention to the "content match" between multimedia DL curriculum, assessment instruments, and state ABE curricular standards, guidelines, or frameworks.

4) Policy makers should consider whether and how to incorporate "distance assessment" tools that meet state adult education standards (e.g., Tests of Adult Basic Education scores) and that also enable learners to complete the assessments at a distance (para. 18). Such tools would increase the likelihood that learners, many of whom already face barriers to attending face-to-face classes, will enroll and persist in the DE program.

Porter and Sturm (2006) provided more specific suggestions for programs based on their observations distance and flexible delivery of the Literacy and Basic Skills (LBS) Program in the Province of Ontario, Canada in assessment of learners participating in DE (p.74).

1) Internet and computer-based assessments facilitate distant assessment.

2) Learners should be assessed both on academic progress and on other associated skills such as technology competence and attitude toward learning.

3) In the early stages of a distance delivery program, staff time should be tracked so proper allocations of time can be made to enable staff to fulfill their unique roles.

4) Proctoring and confidentiality of standardized assessments need to be looked at carefully when assessment takes place in non-centralized locations.

The Digital Divide

Although DE does not require the use of new technologies, advances in technology have historically prompted new forms of DE provision. For instance, the invention of the printing press enabled the first rudimentary vocational courses, delivered via U.S. postal service (Casey, 2008), and extension courses from Oxford and Cambridge in 1857 (Gibson, 2000). The parallels between the development of DE and the expanding role of technology in mass communication suggest that technology is the most salient factor in DE (Casey, 2008).

DE programs for adult learners in the U.S. and abroad still employ many "old" delivery methods such as correspondence courses and radio; however, many states in the U.S. use new technologies (Petty, 2005). These have the potential to transform the way adult education programs are planned and implemented (Lewis, 1989), yet delivery systems such as those utilizing computers, the Internet, or audio and video equipment have historically served better educated, more affluent, and less geographically isolated learners (Kasworm & Londoner, 2000). For instance, the Internet has the potential to provide GED instruction to people who cannot or do not wish to attend face-to-face classes, but adults living in remote rural areas may be unable to access a fast, reliable Internet connection or to afford the necessary technological equipment.

This "digital divide" refers to the gap between those who possess technologies such as computers and Internet access, and those who do not. ABE students are disproportionately represented in these groups. The National Institute for Literacy (Warschauer & Liaw, 2010) reports:

> According to the most recent national data, only 26.8 percent of households with a family income under $15,000 have Internet access, compared with 91.4 percent of households with income over $75,000 (National Telecommunication and Information Administration, 2008). Only 24.4 percent of households headed by someone without a high school diploma have Internet access at home, compared with 84.1 percent of households headed by someone with at least a bachelor's degree. (p. 2; see also Warschauer & Matuchniak, 2010)

This gap matters because the groups who can use emerging technologies are also able to control their development, use, and distribution (Lewis, 1989). This illustrates a central paradox in DE: New technologies create rich educational opportunities, but by increasing the resources required to participate, they also make such opportunities less accessible to people with limited incomes (Gibson, 2000). For example, the use of rich graphics, audio, video, and other Web 2.0 tools (see Sebastian, 2009) require a broadband Internet connection and a computer with newer software and hardware. As new technologies in DE proliferate and as ABE programs make use of cutting-edge commercial and proprietary software and hardware, adults will need more resources to participate in DE. Although research suggests that computer use, computer ownership, and Internet access among high school dropouts has increased over time (Strawn, 2008), policy makers, government officials, and educational administrators must still devise ways to ensure that adult learners can access such resources.

The case of broadband illustrates the limited availability of technological resources to less affluent, less educated, and more geographically isolated individuals. Government efforts have expanded broadband access in urban America; however, investment in new infrastructure in rural America has not kept pace, as companies have invested disproportionately in larger urban markets (Parker, 2000). According to a survey conducted in North Carolina (Wilson, Wallin, & Reiser, 2003), rural, minority, and female respondents were less likely to have home computers or to be connected to the Internet. Although the effects of rural residence and gender disappeared after accounting for socioeconomic variables, African Americans were still less likely to have home computers or Internet access. Second, although rural households have caught up to their urban counterparts in *dial-up* Internet access, they still lag behind in *broadband* (Cooper, 2008), a phenomenon that shows how economic, cultural, and social capital shape the acquisition and use of information and communication technologies (Selwyn, 2004). A national survey (National Telecommunications and

Information Administration, 2008) revealed that 68.2% of rural households had Internet access (58.3% had access in the home and 38.8% had broadband) compared to 71.7% for urban households (62.6% with home access, 53.8% with broadband). Among rural households with less than a high school education, only 12.7% had broadband access at home, compared to 19.0% for urban households.

GED programs serving rural areas must recognize how the digital divide influences adults' ability to participate and succeed in DE courses. Furthermore, programs need to differentiate between availability and access, since the *presence* of broadband connection in a rural area does not necessarily make it *accessible* to residents. Similarly, access should be considered when making decisions about innovative teaching methods. For example, a GED program could use "podcasting," a new means of distributing content over the Internet, to disseminate curricular materials. This delivery system, however, would only be practical if students had access to computers, fast Internet connections, and mobile audio players. To integrate new technologies into DE for GED students and other adult learners, federal, state, and local governments must make a concerted effort to bridge the technological gap, particularly in poor and rural communities (Atkinson, 2008).

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