Developmental Disabilities Bulletin, 2007, Vol. 35, No. 1 & 2, pp. 72-102

Inclusion and the Internet: Teaching adults with developmental disabilities to use information and communication technology

Susan Moisey
Athabasca University
Rhonda van de Keere
Northern Lakes College

Adults with developmental disabilities are often excluded from participating in a variety of online activities, which are part of everyday life in our digital, knowledge-based society, using information and communication technology (ICT). Numerous barriers are associated with their non-participation, including a lack of basic computer and Internet skills. In recognition of these limitations, 11 adults with developmental disabilities were provided with individualized training and assistive technology in order to learn how to use e-mail and access web-based informational resources. The outcomes revealed that the subjects gained basic ICT skills while engaging in recreational online activities, and that appropriate assistive technologies (voice e-mail and text-to-speech software) compensated for low literacy skills. The study contributes to the scarce literature on online inclusion, offers protocols for teaching e-mail and Internet searching, and advocates for the further inclusion of adults with developmental disabilities into the "global community" where ICT can be a life-enhancing and even a life-altering tool.

Introduction

Canada, the United States, and Australia are the three most "wired" countries in the world. After many years of huge increases, the number of new Internet users continues to grow steadily in these and most other countries worldwide (Fallows, 2004; Madden, 2003; Media Awareness Network, 2004). In 2003, 64% of Canadians (Statistics Canada, July 8, 2004, ¶2) and 63% of the U.S. population (Fallows, 2004; Madden, 2003)

were online. Madden (2003) contends that while the Internet was an interesting and "dazzling" novelty in the past, today it is a "normalized part of daily life" (p. 78). Fallows (2004) notes that the Internet has affected "children, families, communities, the work place, schools, health care and civic/political life," and that people of all ages have grown to "admire it and find it a useful tool" for everyday life, its appeal arising from "advantages in speed, convenience, time, and other measures of efficiency" for performing all kinds of everyday activities (pp. iv, viii, 4). The increasing availability of broadband access is partially responsible for transforming the Internet from "an occasional reference and communication tool" into what can be considered an "always-on" information appliance (Madden, 2003, p. 75).

As Fallows (2004) notes, Internet users commonly report that their online activities have changed the way they live. In a review of the research, he identified more than 50 ways in which people use online technologies in everyday activities and classified these activities into four major categories: information seeking, communications, transactions, and entertainment. Of the 50+ different online activities, the two most popular activities, in both Canada and the U.S., were e-mailing others and searching for information. Madden (2003) points out that using e-mail is a "seamless part of everyday life," that it is "hard to image life without it," and that "having an email address is the norm, and checking one's email inbox has become almost as routine as stepping out one's front door to check for 'snail' mail" (p. 8). In previous research, Madden (2003) concluded that people used e-mail and the Internet more seriously as they gained experience; over time, they increasingly used e-mail and the Internet at work, expanded the variety of online activities they performed, and conducted more transactions online.

While it is evident that information and communication technology is becoming more widely used and that people's dependence upon such technology is increasing, it is also evident that people with disabilities—all kinds of disabilities—have the lowest rates of usage (Kaye, 2000). Going online is not an everyday activity for many people with disabilities; in fact, the "computer revolution has left the vast majority of people with disabilities behind" (Kaye, 2000, p. 1). Few have the

opportunity to engage in recreational and serious online activities—to appreciate the Internet's speed and convenience. Enders and Spas (2000) illustrate how far the disabled population lags behind, indicating that "25% of Americans with disabilities own a computer and about 10% are online, compared with 50% computer ownership, and 40% online use in households with no disability" (¶2). Moreover, when people with disabilities live in rural areas, they are doubly disadvantaged and even less likely to use the Internet (Enders & Spas, 2000). Canadian research shows that "persons without disabilities were almost twice as likely as those with disabilities to have used the Internet in the previous year" (Canadian Council on Social Development, 2002, Internet Use section). However, the research also suggests that this lack of usage is not always a choice, as the "demand for access to the Internet by people with disabilities is steadily increasing" (Cullen, 2001, p. 5).

Basic human rights are also a concern in the lack of equitable access to ICT. Waddell (1999) describes online inclusion as a "civil right for people with disabilities" (IV section), and Abbott and Masterman (1997) contend that the right to communicate via ICT is now "recognized as constituting a distinctive 'third generation' of human rights" (p. vii).

Online inclusion, however, is influenced by an interplay between the principle of equity and the reality of economics, as well as the fundamental democratic belief that individuals, regardless of ability or disability, have the right to full membership within society and the right to live in ways similar to other citizens. Democratic countries encourage all citizens to reach their full potential and take pride in offering citizens a high quality of life. Social equity occurs when each citizen has a voice and similar economic opportunities (U.S. Department of State, 2005). Since information tools, such as the personal computer and the Internet are becoming "increasingly critical to economic success and personal advancement" (Enders & Spas, 2000, ¶1), these tools need to be accessible to all members of society. When citizens reach their potential and are happy and productive members of society, they contribute to the overall well-being of society. When members have reduced participation or are divided from mainstream activities, they do not reach their potential or achieve a high quality of life, and their contribution to the

country's resources is reduced (Jeffreys & Gall, 1996; Kaye 2000; Sciadas, 2005; Waddell, 1999).

Kaye (2000) calls the the online exclusion of people with disabilities especially alarming as this population is the "single segment of society with the most to gain from the new technologies of the electronic age;" a computer and an Internet connection are important tools for gaining "greater independence and social integration" (p. 13). Others agree that people with disabilities "stand to benefit the most from the new opportunities afforded by ICTs" (Sciadas, 2005, p. 195), and note that the strength of the Internet is that it "opens up channels of communication and access to information for people who have previously been excluded," namely, people with disabilities (Cullen, 2001, p. 5). Enders and Spas (2000) claim that "some of the problems that prevent rural Americans with disabilities from sharing in the benefits of the Information Age—isolation, unemployment, lack of education, and low incomes—may be the very problems that are solved when they begin to share in the Information Age" (Enders & Spas, 2000, Ensuring Access and Usability section).

Although much of the literature on Internet users and their Internet activities does not directly address persons with developmental disabilities, it reveals three points relevant to this study:

1. Going online is a popular, culturally-relevant activity, and an increasingly essential activity in the digitally-oriented world of today;
2. Even though increasing numbers of people of all ages are going online regularly, computers and Internet services remain "unattainable luxuries" for many people with disabilities (Enders & Spas, 2000, Ensuring Access and Usability section); and
3. Online exclusion is a violation of a democratic right.

Research on how people with developmental disabilities can use and benefit from web-based ICT is limited; however, the literature on people with disabilities in general is relevant and useful for illustrating the

benefits of online activity. When people with disabilities become electronically connected, their sense of well-being and quality of life may improve in many ways. Kaye (2000) reports that people with disabilities (developmental disabilities are not specifically mentioned) use the Internet primarily to send and receive e-mail as well as to search for information on news, weather, and sports. Some take online courses or use online resources to help with schoolwork. Others shop, pay bills, perform other business transactions, and look for employment online. Enders and Spas (2000) report that adults with disabilities, who use the Internet, "feel better informed and are connected to the world around them, and interact with others who have similar interests and experiences" (Ensuring Access and Usability section).

In Moisey's (2003) ongoing work with the NorthEast Community Online project in Alberta, adults with developmental disabilities and their families have access to a website and an online community that enables storytelling and social networking. Through a discussion forum, persons with developmental disabilities are able to "meet and maintain contact with others, express their views, share their experiences, and provide input into policy-making" (p. 3) in a safe virtual environment; they can "interact with each other in a mutually supportive manner, sharing information, experience, and encouragement" (p. 7). Both Moisey (2003) and Kaye (2000) note barriers that often put the potential benefits of going online and joining virtual communities out of reach. Moisey (2003) recommends further attention to the building of "facilitating factors" that enable virtual community participation (p. 20), such as increasing access to computers, providing users with basic computer training, promoting the use of e-mail within the community, and investigating other e-mail systems "to see if simpler, more easy to use platforms exist" (p. 23).

A study conducted at the University of Calgary (Triggs, Cormier, & Luterbach, 1998) revealed similar benefits when adults with developmental disabilities went online. Two subjects with developmental disabilities had been using computers in a lab for word processing and drill-and-practice activities designed to teach basic life skills (e.g., telling time, handling money, basic literacy skills, and numeracy skills). Triggs and her colleagues observed that social

connections were made when adults with developmental disabilities worked beside each other in computer labs and wondered if "these same social connections could be made via the Internet" (Triggs, Cormier, & Luterbach, 1998, ¶5). Using standard software, the researchers helped the subjects use the Internet to connect with others around the world, advocate for themselves, teach others, develop personally, and, most of all, to have fun. The subjects talked to other self-advocates using a mail list, virtually attended a People First video conference in Anchorage and a similar conference in Chicago, used ICQ and Internet Phone to meet new people and chat with them, and used e-mail (sending both voice messages and pictures) to communicate and network with others. Computer expertise, support, and training were provided throughout the study. The study's outcomes were positive although typical technology issues arose, such as slow networks, busy terminals, connection difficulties, data losses, equipment costs, and unreliable technology. Although no protocols were developed and no follow-up studies were reported, it was concluded that the study was successful.

Another ongoing research project, involving subjects with cognitive impairments resulting from brain injury, identifies additional benefits when people with special needs have access to online technologies. Funded by the U.S. Department of Education, the Think and Link (2003) project provides "universal access to electronic communication." Its website offers guidance, suggestions and encouragement on how to make the online world accessible. Since the initial study in 2000, the project has investigated "how to make email accessible to people with cognitive impairments and to study the effects of email use on people's sense of social connection" (Think and Link, 2003, Project Update section). In this latter study, four major benefits resulted from subjects having access to e-mail: (1) increased feelings of social connection; (2) increased self esteem due to participating in a modern, mainstream activity similar to non-disabled peers; (3) reduced boredom from having a new leisure activity; and (4) improved cognitive function as a result of the stimulation from e-mailing. Participants used e-mail to maintain existing relationships, to form new relationships and contacts, for organizational assistance (e.g., appointments, reminders, emergency contacts), to find information on topics of interest, for entertainment, for

cognitive stimulation, and for self-advocacy. Participants believed that e-mail was more advantageous than telephone or mail because it was efficient (e.g., faster, less expensive), and it had therapeutic benefits because e-mail was "something to anticipate, stimulates your brain" (Think and Link, n.d., Pilot Study section).

Sohlberg, Elhardt, Fickas, and Todis (2002) note that e-mail accommodates cognitive problems because there are no time pressures, prompts are provided, and written records are created. Participants believe that e-mail is "safer than face to face contact" and report "enthusiasm" about using computer technologies instead of experiencing "resignation that they will not be able to use a computer" (pp. 5-6). They experience "unqualified excitement at the thought of being able to do something currently thought impossible" (p. 6).

The literature described above shows that people with disabilities, including people with developmental disabilities, want to go online and can benefit from such activities. The benefits include the following:

- Going online is a way to obtain useful information; decision-marking is facilitated.
- Online technologies are useful as organizational tools.
- Social networking is increased; isolation is reduced.
- Going online is exciting, entertaining, and satisfying; it is fun and it reduces boredom.
- ICT training may result in personal advancement.
- Independence, social integration, and inclusion may be improved.
- Self-esteem is increased.
- Cognitive functioning may increase.
- Employment opportunities may increase; economic benefits may accrue.

As everyday living continues to involve increased use of digital technologies, people who cannot use ICT will become more noticeably disadvantaged. This digital disadvantage will continue to grow as the mainstream population increases its use of ICT and people with

developmental disabilities do not. If people with developmental disabilities are excluded by circumstances or by choice from online activities, they will be less able to participate recreationally, culturally, economically, educationally, socially, and politically in the modern world (Cullen, 2001; Enders & Spas, 2000; PIAC, 2000; Sciadas, 2005). Web-based ICT skills can increase communication capabilities, enhance lifestyles, enable Internet-based learning, and allow fuller participation in local communities and the global community.

Methodology

A multiple-case study design (Yin, 1999) was used to explore the general research question -- "What are the immediate and possible future outcomes when adults with developmental disabilities are given access to training and appropriate online technologies in order to build basic skills in the use of information and communication technology, particularly e-mail and Internet browsing?"

Subjects were obtained from a group of adults with developmental disabilities receiving services from an agency located in rural Alberta; all met eligibility requirements for funding from the Persons with Developmental Disabilities (PDD) program to provide services and supports. A total of 11 participants volunteered for the study, four men and seven women, between 25 and 45 years of age.

Subjects were not required to have computer skills, only an interest in computers, e-mail, and Internet training. Three of the subjects had previous experience with computers and regularly played educational games (stored on the hard drive, not accessed online); of these three, two subjects had used e-mail and accessed web sites in the past and wished to further develop their skills in these areas.

Training was conducted over a seven-month period, with each subject scheduled to receive a 30-minute training session once a week. However, some participants did not receive the full seven months of training, either due to having a later start date (subjects could enter the study when it was convenient for them to do so) or because of missed sessions.

Training was conducted at the host agency later in the day to ensure a quiet and private environment. The second co-author served as the computer coach.

To assist with planning the training, the ICT skills required to go online were identified (Table 1). Over the seven-month period of the study, approximately 62 hours of training was provided, in total, to the 11 subjects involved in the study. As the training progressed, nine protocols relating to training were developed and applied. Set-up, training preparation, and further details on the protocols and their development is provided in Van De Keere (2006). *Note: Training protocols are available upon request by contacting the first author.*

Assistive technology was incorporated into the training, depending on participants' individual needs (further details are included in protocols). To provide assistance with reading, Read & Write screen reader software made text-based information in web sites more accessible and allowed participants to listen to their e-mail messages. The ICanEmail audiographic (voice-based) e-mail software also facilitated online activity by allowing users to record their e-mail messages. The audio quality of these messages is similar to recordings on a telephone answering machine. Both the screen reader and voice e-mail allowed subjects to use their comparatively stronger modes of communication (i.e., listening and speaking, as opposed to reading and writing).

Upon completion of the training period, semi-structured interviews were conducted with the subjects and with others associated with them (i.e., parents, guardian, and support workers) in order to identify and evaluate the outcomes. In addition, subjects were asked about what they had liked about the training and whether they would like more training (if another computer coach could be found). Parents/guardians and support workers were asked about the benefits and drawbacks associated with participants' online activities, suggestions for improvements, and if further training should be offered.

Finally, Yin (1999) cautions that once a multiple-case study design is selected, it is critical to concretely define the case being studied and

ensure that each case is "comparable in some fundamental way" (p. 10). In this study, each subject was considered a case. The 11 subjects' experiences were comparable as they interacted with the same computer coach in the same location, used the same technologies, performed similar online activities, and were exposed to the same training methods. The multiple-case methodology resulted in a rich and detailed picture of the processes and outcomes that came about when several adults with developmental disabilities went online. As the next section illustrates, the final product is a realistic, but unique, "matter-of-fact portrait" (Creswell, 1994, p. 159).

Table 1
Tasks Associated with Computer Operations, Web Search, and E-mail Training

Basic computer operations training
Turn on hard drive and monitor and wait for desktop to appear
Find program's name on Start menu or desktop
Spot mouse pointer and cursor
Move mouse on mouse pad (lifting when necessary)
Single and double click
Move mouse to move mouse pointer
Use mouse to select text
Scroll (top to bottom, left to right)
Minimize and maximize windows
Input data using mouse, arrow keys and keyboard (letter keys, numbers keys, non-alphanumeric keys such as arrows, return, backspace, tab, caps, shift, space bar)
Insert, delete, or edit data using the mouse, arrow keys and keyboard (move cursor; select data; remove data by retyping or pressing delete or backspace key)
Turn on/off speakers and control volume
Print

Table 1 (cont'd)	
Exit/close windows and programs, return to desktop	
Shut down computer	
Recognize when frozen. Use Ctrl Alt Delete when frozen	
Use all terminology mentioned above	
Web search training	
Access high speed Internet by single or double clicking on Explorer icon	
Spot and use links (hand icon appears)	
Recognize that browsers takes user to home page	
Navigate from one website to another (type address or use bookmarks)	
Add website to favorites (create own bookmarks)	
Access websites using keyword searches in a search engine	
Web safety	
E-mail training	
Access e-mail by finding website and performing login (text e-mail with username and password or click on username in voice e-mail)	
Inbox: observe and understand information about number of e-mails, senders' name, date, and subject line	
Observe visual clues that indicate if a message has been read and/or answered	
Make decisions & take actions with e-mail (which order to read/hear, keep/delete message; forward or reply to message)	
Select, open and listen/read e-mail	
Delete a message either before or after opening	
Use Reply and Send commands	
Use Compose and Send commands (type recipient address or use nickname in address book)	
Navigate between Inbox and incoming/outgoing messages	

Table 1 (cont'd)	
Use forward command	
Open, view, close, and delete attachments (picture, wav file, e-card, word document)	
Access old mail. Replay e-cards or audio messages (exiting Real Player or Windows Media player when necessary).	
Scroll when necessary (left, right, top, bottom)	
Use and understand purpose for signing out	
Send an e-card	
Understand and use basic e-mail terminology	
Write down own e-mail address on paper from memory	
Safety issues regarding e-mail	
Operate more than one application at a time	
Delete part of original message when replying	
Use address book; add addresses to address book	
Open e-card	
Click on link in e-mail	

Source: Adapted from the computer operations, web search, and e-mail training occurring in Alberta elementary schools (Alberta Learning, Curriculum Standards Branch, 2000) and Illinois elementary schools (Waukengan Community Unit District, 2004). Note: The basic computer operations skills listed in Table 1 were not taught separately during this study; these skills were integrated into the teaching of web browsing and e-mail skills.

Results and Discussion

In this study, adults with developmental disabilities received training in basic ICT skills, coupled with assistive technology, so they could engage in two of the most popular online activities -- using e-mail to create a broader social network, and accessing information and other web-based resources.

Participant Profiles

Eleven subjects were involved; a brief description of each appears below (all names are pseudonyms).

Bob. The first to enter the study, this subject participated for all seven months. He attended 19 out of 26 sessions for a total of 11 hours of

instruction, missing only for health issues. He also observed two of Kendra's sessions. He was motivated to learn and was always eager to spend extra time working at the computer whenever possible. He was the only subject to contribute his personal story to the NorthEast Community Online web site. He performed some e-mail activities, but was unable to obtain committed e-mail correspondents during the study.

Stacy. This subject joined the study two weeks after it started and participated for 6 1/2 months. She was a motivated learner, but easily became upset with herself if she forgot procedures or made mistakes. She attended 19 out of 21 sessions for a total of 11 hours of training, gained many ICT skills, and was disappointed when her training and access to the Internet ended.

Kendra. This subject joined the study one month after it started and participated for the remaining six months. She attended 22 out of 23 sessions for a total of 13 hours of training, happily using the computer for extra training whenever other subjects were absent. She also observed two of Bob's training sessions. She had few e-mail correspondents and was primarily interested in performing web searches.

Wendy. This subject started 1.5 months in the study and participated for the remaining 5.5 months. She had transportation and mobility issues. She needed time to remove her winter garments and to position herself in her chair. She required a left-handed mouse and StickyKeys as she performed computer operations with her left hand only. She had to use the last few minutes of each session to call a taxi and use one arm to dress again for the outdoors. Her attendance was excellent, however, as she attended 19 out of 19 sessions and received a total of 10.75 hours of training. She regularly e-mailed family members residing outside of Alberta and outside of Canada. Wendy was the only subject who continued to send e-mail messages and e-cards to the researcher long after the study ended.

Carla. This subject entered the study with some rudimentary e-mail and Internet skills. She had an e-mail address and could independently check

for messages in her e-mail Inbox. She did not, however, have a strong interest in using e-mail, perhaps because she did not have any out-of-town correspondents or specific purposes for communicating via e-mail. She could also independently perform searches using the Google search engine. She enjoyed the one-on-one tutorial time. She attended 11 out of 15 sessions over the course of five months for a total of six hours of instruction. She learned how to operate the screen reader and immediately appreciated how it made the text in web sites (often information on a favorite movie star) more accessible and therefore more enjoyable.

Wade. This subject attended all 11 of his training sessions over the course of 2.5 months for a total of 5.5 hours of training. He did not speak much during his sessions and did not wish to make a choice when given options to choose from. However, he willingly performed the recreational online activities that the coach suggested for each 30-minute session and seemed to enjoy the activities.

Gary. This subject arrived early for training sessions, visited with the receptionists while he waited for his sessions to begin, and consistently elected to stop online activities after five minutes of training. He attended eight out of eight sessions over the course of 2.5 months for a total of 1.75 hours of training. He did not give input and asked the coach to direct the activities. His online activity was limited to conducting brief searches on the Internet using the Google search engine. At the end of each session, he continually expressed a desire to continue in the study, and he returned each week for additional training.

Louise. This subject quickly caught on to using e-mail. Her out-of-town relatives sent her many e-mails, and she expressed enthusiasm about training. She attended four out of 10 sessions over the course of three months and received a total of two hours of training. Her sporadic attendance may have been related to other factors (e.g., she was seeking employment and was considering relocation).

Doris. This subject seemed to enjoy activities while performing them. She attended four out of eight sessions for a total of 1.75 hours of training over the course of 2.5 months.

Barb. When she joined the study, Barb indicated her need for specific, short-term training. She had an e-mail address, but was having a problem with her e-mail account and wanted to learn a few new things about e-mail. She attended three out of seven sessions over the course of three months for a total of 1.5 hours of training. Barb took a very business-like approach to her sessions. She did not want to open or send private messages during sessions or engage in conversations unrelated to e-mail. She viewed the computer coach more an educational resource and technology problem-solver rather than as a social contact.

Mike. This subject joined the study several months after it started. He seemed to enjoy his sessions, but appeared to have difficulty remembering the scheduled times and dates. He attended three out of five sessions over the course of 1.5 months for a total of 2.5 hours of training. Thirty-minute training sessions were not long enough as he needed at least 45 minutes to position himself at the computer, express his thoughts, voice his preferences, and physically perform tasks.

Training Time and Activities

Over the seven-month period of the study, a total of approximately 62 hours of training was provided. Short-term or long-term participation in the study was determined based on which subject's needs, interests, and choice of online activities most closely matched the study's purpose. Four subjects (Bob, Stacey, Kendra, and Wendy) received between 10 and 13 hours of training. The remaining seven subjects received up to six hours of training.

Figure 1 shows how the subjects spent their training time, categorized according to three training activities (text-based e-mail, voice e-mail, and Internet browsing). As the graph shows, 10 subjects communicated with others via text e-mail, and three of these subjects also used voice e-mail.

Eight of the 11 subjects used the Internet for information-seeking purposes.

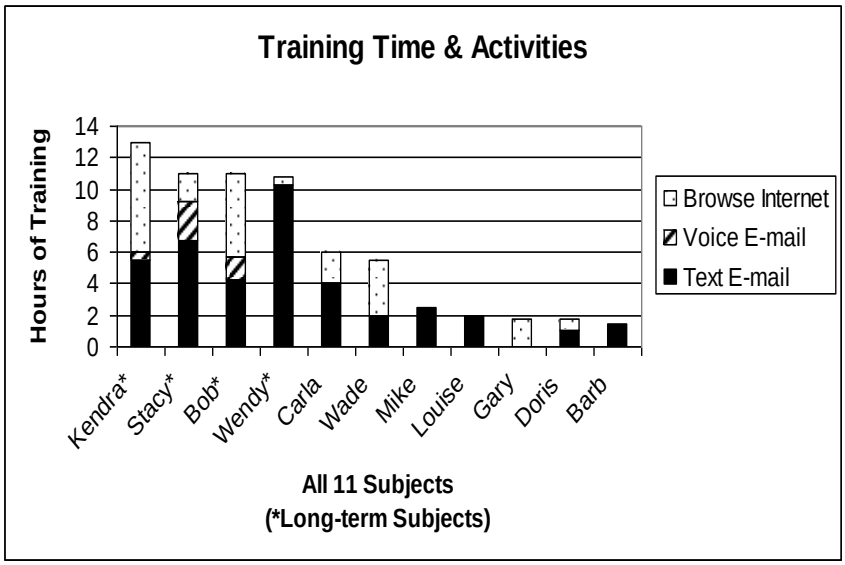

Figure 1. Training time and activities for each subject.

Results of Using Assistive Technologies

Eight of the 11 subjects (73%) displayed difficulties in reading, writing, spelling, keyboarding, and/or composing messages (expressing ideas as text). Of these, seven subjects participated in the study long enough to receive training in the use of voice e-mail and the screen reader.

The screen reader (Read & Write) made text-based information in web sites more accessible even though it required subjects to operate two programs simultaneously. With the assistance of Read & Write, subjects no longer had to ask the computer coach to read sections of text to them. Opening up the screen reader required several steps, but once it was started, subjects quickly learned how to use it, and it operated reliably. Subjects who used the screen reader performed computer operations through icons rather than text commands. They spent less time reading and writing, and more time listening and speaking. The subjects seemed

pleased with this assistive tool because of its novelty as well as the increased independence and privacy it afforded.

The ICanEmail voice e-mail software also facilitated online activity. Its operational simplicity allowed users to quickly record simple voice e-mail messages with little help. The content and audio quality of these messages was similar to that of voice mail recordings on a telephone. Even voice e-mails from subjects with speech difficulties could be easily understood by recipients who were accustomed to their speech nuances.

Skill Development

All 11 subjects learned to use the computer and experienced new online activities. The experience was enjoyable and entertaining. They paid attention during training periods, and laughed and smiled while performing activities. In addition to having fun, a significant amount of learning took place. All of the subjects gained basic computer skills, seven gained web browsing skills, and eight subjects gained e-mail skills. (See Table 2.) More than half of the participants were able to perform the full complement of online activities, however, only two subjects were able to do these activities independently, without assistance or prompting, at the end of the training period.

Table 2.
Skills gained during the training period

	Operations	Web browsing	E-mail
Kendra*	√	√	√
Stacy*	√	√	√
Bob*	√	√	√
Wendy*	√		√
Carla	√	√	√
Wade	√	√	
Mike	√		
Louise	√		√
Gary	√		
Doris	√	√	√
Barb	√	√	√
Total			
	100%	64%	73%

*Long-term subjects

ICT competencies develop over time. The four long-term subjects gained more ICT skills than those who participated for shorter periods of time. As training progressed, they needed fewer prompts, became more adept at performing commands, and were able to perform more online activities (e.g., navigate between and within websites, operate more than one program at a time, and compose longer e-mail messages). At the end of the study, all these subjects expressed a desire for more training.

Going online is meaningful. Eaton defines tasks as "meaningful" or worth doing "if someone without a disability would also do them" (as cited in Training and Technical Assistance Centers [T/TAC] Bulletin, 2001, Whose Collection of Evidence is it Anyways? section). The subjects with specific recreational purposes experienced the same kinds of satisfaction reported in other studies by other Internet users. Their enthusiasm and commitment was evident. For example, Kendra and Wendy called the researcher at home several times with questions about computers and e-mail. Subjects considered their activities to be important and were likely to become upset if the session ahead of them ran over and reduced their own training time. On the last day of training Stacey stayed behind to say "thank you," give a hug, and to tell the researcher that she was "special." Stacey was tearful because she felt that her online activities at the agency were ending and was doubtful that she would be able to use the library's computer on her own

Subjects' communication networks expanded. Due to lack of correspondents to e-mail, most of the subjects sent e-mail messages to each other and to the researcher. However, three subjects e-mailed friends and family who lived in other towns, provinces, or countries. An element of excitement surrounded this kind of e-mail activity, which was not present when e-mail was sent to or received from the computer coach or other local contacts. When people were separated in time and distance, the e-mail communication was more authentic. Wendy had a particularly successful and long-lasting outcome as she continued to e-mail the computer coach a year after the study ended.

Online inclusion was promoted. Having the skills and opportunities to do what other people do when they go online is a step toward greater inclusion. Subjects went online. By doing so, they became able to participate in conversations with others about online activities and know what is involved when they observe people using computers in homes, schools, and workplaces.

Conclusions and Recommendations

Conclusions

This multiple-case study provides a detailed description of the process and outcomes that occurred when 11 adults with developmental disabilities went online. The multiple data sources resulted in a wide range of rich data and allowed the researcher to "understand a particular situation from different perspectives" (Jacelon & O'Dell, 2005, p. 49). Based on this study, the researcher drew four conclusions about the subjects and their online activity:

1. The adults with developmental disabilities wanted increased access to training and appropriate online technologies; being on the excluded side of the Digital Divide appeared to be a matter of circumstances rather than choice.
2. ICT skill development was a challenging process. Individualized training, assistive technologies, and the application of a variety of instructional strategies were required to promote learning in this area.
3. Basic ICT skills enhanced the lives of individuals with developmental disabilities by expanding their recreational pastimes.
4. Subjects with a foundation of basic ICT skills were ready to use the Internet for more serious purposes.

Subjects Wanted To Go Online

Previous research has shown that people with disabilities use the Internet less than the general population; their reduced usage is the

result of many complex, interwoven issues. The adults with developmental disabilities in this study wanted to increase their participation in online activities. They chose to go online when given access to appropriate computer and assistive technologies, and (b) training. For them, an invitation to participate in either short-term or long-term web-based ICT training was a welcome invitation.

Developing ICT Skills was a Challenging Process

This study suggests that ICT skill development is a challenging undertaking, a finding that supports previous research (Cullen, 2001; Gurry & Larkin, 1999; PIAC, 2000; Think and Link, n.d.; Veenhof, Clermont, & Sciadas, 2005; Waddell, 1999; Williams, 2003).

Training is a complex and time-consuming process that involves assessing unique needs, identifying suitable technologies, and implementing individualized training. The participants in this study had diverse and unique needs. For example, some required accessibility features such as StickyKeys, Toggle Keys, an alphabetic keyboard, a reduced double-clicking speed, and a left-handed mouse. Three of the subjects had difficulty operating a standard mouse and would have benefited from an assistive mouse device or a specialized trackball. Six subjects needed a screen reader. Two of the four long-term subjects required a modified e-mail system that was voice-based rather than text-based.

Limited financial resources and limited training time appeared to affect ICT skill development. In this study, most subjects would require extensive additional training and assistive technologies in order to develop the ICT skills needed to use the Internet with little or no assistance. Some subjects' progress on gaining ICT skills suggested that going online would continue only as a facilitated and supported activity, which may translate to additional commitments of time and money and increased responsibilities for staff.

Another factor affecting the development of ICT skills and the ability of subjects to go online appeared to be community support. Many people

and organizations were involved in the subjects' lives; these people and organizations must place a priority on the development of ICT skills and resources, or training and the ability to go online will simply not occur. In this study, the subjects were able to obtain support to participate in the study, so they were able to use the Internet for a limited time and develop some new ICT skills. However, most subjects' online activities ceased when the study ended.

There are many possible reasons why training did not continue when the study concluded, such as the subjects' inability to find another computer coach or the agency's decision to wait for the next IPP review to verify that ongoing ICT training was desired. Another possible reason can be found in studies that identify attitudes as a factor explaining why some people do not use the Internet (Cullen, 2001; EKOS, 2001; PIAC, 2000; Sciadas, 2005).

However, the attitudes of the subjects themselves may be less of a factor in their non-use of the Internet than the attitudes of those within their support system. For example, although Kendra had a positive attitude towards ICT, her guardian did not perceive any value in online activities for herself or for Kendra. Similarly, despite Stacey's obvious enthusiasm, her support worker had little interest in the Internet. On the other hand, Wendy and her parents all held favorable attitudes toward web-based ICT, and Wendy's Internet activities continued long after the study had ended.

Previous research has identified another challenge in ICT skill development—that learning is often a complicated process for individuals with developmental disabilities (Jeffreys & Gall, 1996, p. 59). This study supports that finding. When people have difficulty communicating ideas, remembering information, and performing procedures, training is more involved and time-consuming. Although the assistive technologies used in this study allowed subjects to use their stronger modes of communication (i.e., listening and speaking), additional assistive technologies were required as the assistive technologies used in the study were not sufficient to overcome all learning difficulties or make learning easy.

ICT Skills Enhanced the Recreational Aspect of Subjects' Lives

This study showed that the subjects were likely to begin with Internet activities that were recreational in nature, a finding that supports other research on the activities of new Internet users (Madden, 2003). This study also suggests that going online primarily for amusement was a legitimate use of the subjects' leisure time, as online recreational activities provide both the context and motivation for gaining ICT skills. This finding supports other literature reporting that recreational activities are valuable for enhancing people's lives (Jeffreys & Gall, 1996; Parent Information Center of Delaware, 2004). Jeffreys and Gall (1996) note that the provision of services to adults with developmental disabilities should not always be about fixing problems, serving basic needs, and monitoring security. Solely attending to these aspects of life may mean that someone's "growth and potential" are "sacrificed or compromised" (pp. vii-viii). Jeffreys and Gall advocate moving beyond basic concerns, whenever possible, towards services that expand "lifestyle options" and offer an "improved quality of life" (p. 133). They view the enhancement of an "individual's journey of life" as "urgent business" and a "priority" (p. 118). New forms of recreation are especially important when people live in a system of routines and rigid expectations where every day could easily be the same and predictable (Jeffreys & Gall, 1996, p. 89).

This study suggests that the subjects' simple online recreational activities serve a similar purpose as their offline recreational activities. The online leisure-time activities performed by the subjects did not impact on the critical aspects of their lives (e.g., seeking food, shelter, and safety), yet the subjects' online activities were just as enjoyable as their other recreational pursuits, such as bowling, singing karaoke, and reading movie star magazines.

This study suggests that the subjects benefited from online recreational activities in three specific ways.

1. *Going online for recreation relieved boredom and provided fun.* With ICT skills, the subjects could pass the time doing ordinary things like e-mailing a friend to complain about a cold winter's day or asking relatives about their health. They discovered an online community of people with similar concerns (e.g., transportation issues), and were able to locate basic information, such as the date of the Oilers' next home game. These online activities, at a minimum, reduced boredom and isolation, added variety to their daily lives, and provided an enjoyable, intellectual exercise. ICT skills gave subjects additional ways to have fun and spend their time in an enjoyable manner.
2. *Going online for recreation resulted in learning.* The subjects in this study experienced cognitive stimulation similar to that described in the Think and Link (2003) research project. Participants recalled procedures, solved small problems, and memorized new information in order to perform a variety of recreational activities. Subjects' enthusiasm exemplified their joy of learning. They were excited about this new opportunity. Learning to use the Internet was enjoyable because learning to do new activities is enjoyable.

   Lifelong learning experts emphasize that all forms of learning are valuable, including "community based arts and recreation courses" that many people study primarily for entertainment (Alberta Learning, 2002, p. 13). Learning is still learning, even when the emphasis is on having fun. In this study, basic computer operations, such as opening and closing programs and using a mouse, were learned by playing simple computer games. Navigation skills and Internet terminology were acquired while surfing for information on rock stars. These simple recreational activities may lead to sophisticated and advanced skills that allow participation in a variety of online activities. But even if the skills and knowledge gained during these online recreational activities are never used for serious purposes or no advanced skills are eventually acquired, learning

occurred and the activities were meaningful to the individuals who performed them.

3. *Going online for recreation may have increased the subjects' inclusion within the community.* People of all ages worldwide are having fun on the Internet, using it to follow up on personal interests, to develop new hobbies and interests, and to make and strengthen social connections. The subjects in this study were happy and excited to join other members of their community who go online for recreation. Online inclusion enhanced their sense of well-being. When people in their community talk about having fun on the Internet, they feel a sense of belonging. They are familiar with terms and some have skills. They have higher self-esteem when they demonstrate their newly found ICT skills and knowledge. Even if they do not use a computer frequently, they derive benefits from having a new venue in which to interact in the community. ICT skills gave them access to places where they would not have been comfortable before, like an Internet café. This finding—that the ability to go online for recreation increased subjects' inclusion within the community—supports other research on inclusion (e.g., Jeffreys & Gall, 1996; Sciadas, 2005; Think and Link, n.d.).
4. *ICT Skills Could Improve Subjects' Lives in Critical Ways* This study identified the immediate outcomes of gaining ICT skills and speculated about future outcomes. All subjects used the Internet initially for recreational purposes, and many were gradually moving towards using the Internet for more serious purposes, a finding that holds true for the general population (Madden, 2003). Subjects' future serious uses of the Internet could realistically include the following:
    1. *Participation in lifelong e-learning.* Had this study continued, all of the four long-term subjects would have become ready to participate in either informal or formal e-learning. As Bob, Kendra, Stacy, and Wendy demonstrated, once learners can tell their computer coach what tasks they want to do and in what order, it is a small step to sign up for a personal interest online

course or participate in a formal e-learning course where someone else provides a list of activities and the sequence in which they are to be completed. When all forms of Internet-based learning become accessible, people can change and improve their lives, particularly rural dwellers where formal learning opportunities are comparatively scarce. Internet-based learning facilitates lifelong learning because it is flexible, convenient, and effective.

2. *Expansion of social and self-advocacy networks.* If this study had continued, all four long-term subjects would have been assisted to find e-mail buddies, and at least one of them would have begun participating in a virtual community, such as NorthEast Community Online (n.d.). For example, Wendy learned how to send e-mail to relatives internationally, so it would have been a small step for her to use e-mail to connect with new acquaintances who shared common interests. Bob accessed information on a virtual community's website and contributed a story about him and his life, so it would have been a natural progression for him to post messages on that online community's bulletin board and interact with other community members about common concerns.

Other research shows that going online for the serious purposes of learning and building networks are two ways that people can dramatically improve their lives (Enders & Spas, 2000; Jeffreys & Gall, 1996; PIAC, 2000; Think and Link, n.d.; Triggs, 1998; Veenhof, et al., 2005; Vincent, Edwards, Child, & Firminger, 1995; Waddell, 1999).

Although the four conclusions drawn in this study cannot be generalized to all other settings or to all adults with developmental disabilities, the study does add to the literature. It presents several case studies of adults with developmental disabilities who wanted to go online and found ICT skill development a challenging, yet achievable, process. It illustrates the need for assistive technologies. The study also contributes to the

literature by providing specific protocols for setting up and conducting training so that adults with developmental disabilities can build the basic and more advanced ICT skills needed to move towards more serious uses of the Internet, such as e-learning.

Recommendations

Actively Promote Online Inclusion

Inclusion efforts should continue through deliberate efforts to promote ICT use. Adults with developmental disabilities need to be invited to explore a wide variety of recreational and more serious online activities and offered appropriate human and technological assistance. While online, they should be encouraged to set personally meaningful goals so that they can discover "their abilities as they either attain the original goal, or fail to attain it and subsequently modify their expectations" (Jeffreys & Gall, 1996, p. 105). Self-determination and self-esteem will increase as learners become more competent in controlling their environment and feel pride in their accomplishments.

Online and offline inclusion efforts can occur simultaneously if community developmental activities and resources are used to ensure all citizens are included. Congregating or segregating (e.g., sheltered workshops) should be avoided. For example, Moisey's (2005) Inclusive Libraries Initiative provides computers equipped with a variety of assistive devices and software to public libraries in northeast Alberta in order to enhance the ability of libraries to attract and serve patrons with disabilities, including developmental disabilities. Cullen (2001) also states that libraries can make a significant contribution to the closing of the Digital Divide within and between nations by providing Internet access, promoting ICT skills, providing disabled-enabled web technology, and offering appropriate resources.

Include Internet-based Learning in IPPs and Lifelong Learning Plans

Formal e-learning for individuals with developmental disabilities is a realistic goal, especially if intermediate steps are taken to ensure

adequate preparation. For example, learners could experience informal e-learning by making trips to virtual museums and zoos (e.g., ThinkQuest's Virtual Zoo at http://library.thinkquest.org/11922), use educational CDs, access online tutorials, and participate in online communities—these preparatory activities could facilitate participation and success in formal e-learning courses.

Use Suitable Regular and Assistive Technologies

All Internet users need access to reliable, safe, user-friendly, and appropriate technologies; however, appropriate computer and assistive technologies are especially important for people with disabilities.

Technology is constantly changing and new technologies being invented, so developments in regular and assistive technologies should be monitored. Both should be selected carefully and thoroughly tested prior to use. Assistive technologies may facilitate independence; however, they need to be used discriminately. Feedback should be given on the technologies used in order to encourage technology developers to make valuable modifications.

Advocate for Web Accessibility

Many websites are not accessible or useful for people with special needs. Screen readers and other assistive software cannot work on improperly designed websites; assistive technology cannot compensate for poor design or lack of alternative modes of presentation. Accessible website design is essential for enhancing online inclusion.

Closing Comments

This study supports and extends the literature on Internet users and contributes a multiple-case study to the currently sparse literature on an understudied and under-represented online population, adults with developmental disabilities. This study contributes to the literature by giving practical suggestions to facilitate the development of web-based

ICT skills needed to use e-mail and browse the Internet, and thus enhancing inclusion.

Although commonplace and modified online technologies can be used for serious, life-altering purposes, all subjects and most participants in this study found that an acceptable and beneficial use of online activities is the pursuit of leisure-time interests. Subjects gained ICT skills and enhanced their recreational lifestyles in the short term. They began building the foundation necessary to support more complex and potentially life-changing online activities, such as e-learning. Ongoing access to appropriate regular and assistive technology and appropriate training would enable many of these adults with developmental disabilities to partake of lifelong learning opportunities and increase their participation in our digitally-oriented, knowledge-based society.

As Internet infrastructures grow and technological innovations occur, Internet technologies will continue to change people's lives, but only for those who have access and expertise. To be fully included in the global community, adults with developmental disabilities require ICT skills and knowledge as well as opportunities to participate, attainable goals as demonstrated by the subjects in this study.

References

Abbott, C., & Masterman, L. (1997). Media literacy, information technology. *Working Papers in Literacy, No. 2.* Available online at: http://www.centreforliteracy.qc.ca/publications/paper2/medialit.htm

Alberta Learning, Curriculum Standards Branch. (2000). *Illustrative examples for English language arts, kindergarten to grade 9.* Available online at: http://www.education.gov.ab.ca/k%5F12/curriculum/bySubject/english/grade4.pdf

Alberta Learning. (2002, May). *Final report of the MLA committee on lifelong learning: Helping adults return to learning to improve their employment potential and realize their career goals.* Available online at http://www.education.gov.ab.ca/reports/special/Report.pdf

Canadian Council on Social Development. (2002). *CCSD's disability information sheet: Number 7.* Available online at http://www.ccsd.ca/drip/research/dis7

Creswell, J. (1994). *Research design: Qualitative and quantitative approaches*. Thousand Oaks, CA: Sage Publications, Inc.

Cullen, R. (2001). *Addressing the digital divide.* Paper presented at the 67th International Federation of Library Associations' Council and General Conference. Boston, Massachusetts. (ERIC Document Reproduction Service No. ED459714)

EKOS Research Associates Inc. (2001). *Rethinking the Information Highway: Rethinking the dual digital divide.* Available online at: http://dsp-psd.communication.gc.ca/Collection/RH34-17-2001E.pdf

Enders, A., & Spas, D. (2000, August). *Rural facts: Rates of computer and Internet use: A comparison of urban and rural access by people with disabilities.* Available online at: http://rtc.ruralinstitute.umt.edu/TelCom/computer.htm

Fallows, D. (2004, August 11). *The Internet and daily life: Many Americans use the Internet in everyday activities, but traditional offline habits still dominate.* Available online at: http://www.pewinternet.org/pdfs/PIP_Internet_and_Daily_Life.pdf

Gurry, S., & Larkin, A. (1999, May 17). *Literacy learning abilities of children with developmental disabilities: what do we know?* Available online at http://www.lesley.edu/academic_centers/hood/currents/v2n1/gurry_larkin.html

Jacelon, C, & O'Dell, K. (2005). Demystifying nursing research: Case and grounded theory as qualitative research methods. *Urologic nursing 25*(1), 49 - 52.

Jeffreys, M, & Gall, R. (1996). *The learning journey: enhancing lifelong learning and self-determination for people with special needs.* Calgary, Alberta: Detselig Enterprises Ltd.

Kaye, H. (2000, March). Computer and Internet use among people with disabilities. *Disabilities Statistics Report (13).* Available online at: http://dsc.ucsf.edu/pub_listing.php?pub_type=report

Madden, M. (2003). *America's online pursuits: The changing picture of who's online and what they do.* Available online at: http://www.pewinternet.org/pdfs/PIP_Online_Pursuits_Final.PDF

Media Awareness Network, (2004). *Personal Internet use (Canada).* Available online at: http://www.media-awareness.ca/english/index.cfm

Moisey, S. (2003). *Final Report: A Virtual Learning Community for Adults with Developmental Disabilities and Their Families, Office of Learning Technologies, Project #20357.* Available online at http://cde.athabascau.ca/showcase/OLTmois1/olt_report.pdf

Moisey, S. (2005). Everybody's @ the Library: Enhancing community inclusion and library accessibility. Presentation at the 2005 Alberta Libraries Conference, May 1 – 3, 2005, Jasper, Alberta.

Parent Information Center of Delaware. (2004, May). *The Link, 4*(4). Available online at: http://www.picofdel.org/learn/newsletter/the_link_v4n4.pdf

Public Interest Advocacy Centre [PIAC]. (2000). *The dual digital divide: The Information Highway in Canada.* Available online at: http://dsp-psd.pwgsc.gc.ca/Collection/RH34-9-2000E.pdf

Sciadas, G. (Ed.) (2005). *The digital divide to digital opportunites: Measuring infostates for development.* Montreal, Canada: Orbicom. Available online at: http://www.orbicom.uqam.ca/projects/ddi2005/index_ict_opp.pdf

Sohlberg, M., Ehlhardt, L., Fickas, S., & Todis, B. (2002). *CORE: Comprehensive overview of requisite email skills*. Available online at: http://www.think-and-link.org/researchers/CORETech.pdf

Statistics Canada. (2004, July 8). *Household Internet Use Survey.* Available online at: http://www.statcan.ca/Daily/English/040708/d040708a.htm

Think and Link. (n.d.) *Email for individuals with cognitive disabilities.* Availkable online at: http://www.think-and-link.org

The Training and Technical Assistance Centers [T/TAC] Bulletin. (2001, Winter). *Virginia Tech and Radford University, 10*(2). Available online at: http://tac.elps.vt.edu/htmldocs/Newsletterv10n2.shtml

Triggs, S., Cormier S., & Luterbach, L. (1998, May). Connecting with the world: Self-advocates explore the Internet. *Rehabilitation Review, 9*(5). Available online at http://www.vrri.org/content/view/177/120/.

U.S. Department of State. (2005, March 9). *Delivering the benefits of democracy.* Available online at: http://www.state.gov/p/wha/rls/43521.htm

Van De Keere, R. (2006). Building basic skills for e-learning: Adults with developmental disabilities go online. Unpublished master's thesis, Centre for Distance Education, Athabasca University, Athabasca, AB. Available online at: http://library.athabascau.ca/drr/viewdtr.php?course=THES&id=205.

Veenhof, B., Clermont, Y., & Sciadas, G. (2005, December). Literacy and digital technologies: Linkages and outcomes. *Connectedness Series.* Ottawa: Statistics Canada, Science, Innovation and Electronic Information Division. Available online at: http://www.statcan.ca/english/research/56F0004MIE/56F0004MIE2005012.pdf

Vincent, A. (1995). Information technology and disabled students: Overcoming barriers to learning. In F. G. Lockwood (Ed.), *Open and distance learning today,* (pp. 87-97). London: Routledge.

Waddell, C. (1999). *The growing digital divide in access for people with disabilities: Overcoming barriers to participation in the digital economy.* White paper presented at the 1999 Conference on Understanding the Digital Economy: Data, Tools and Research, May 25 – 26, 1999, Washington, DC. Available online at: http://www.icdri.org/CynthiaW/the_digital_divide.htm

Waukegan Community Unit District. (2004). *Computer literacy skills*. Available online at: http://www.waukeganschools.org/it/stories/storyReader$22

Williams, J. M. (2003, April 8). Assistive technology: What it is and how it improves our lives. *National Organization on Disability.* Available online at: http://www.nod.org/index.cfm?fuseaction=page.viewPage&pageID=1114

Yin, R. (1999, December). Enhancing the quality of case studies in health services research. *Heath Services Search, (34)*5, 1209.

Author Note

Dr. Susan Moisey, Associate Professor, Centre for Distance Education, Athabasca University, 1 Athabasca Drive, Athabasca, AB, Canada T9S 3A3 E-mail: susanh@athabascau.ca