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Building Basic Skills for E-Learning:
Adults With Developmental Disabilities Go Online

BY

RHONDA VAN DE KEERE

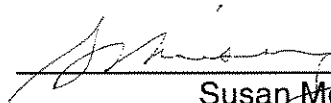
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The undersigned certify that they have read and recommend to the Athabasca University Governing Council for acceptance a thesis titled BUILDING BASIC SKILLS FOR E-LEARNING: ADULTS WITH DEVELOPMENTAL DISABILITIES GO ONLINE submitted by RHONDA VAN DE KEERE in partial fulfillment of the requirements for the degree of MASTER OF DISTANCE EDUCATION.


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ABSTRACT

Adults with developmental disabilities are often excluded from participating in a variety of online activities, including e-learning, which are part of everyday life in our digital, knowledge-based society. Numerous barriers are associated with their non-participation, including a lack of basic computer and Internet skills. In recognition of these limitations, a multiple-case study was conducted; 11 adults with developmental disabilities were provided with access to individualized training and appropriate regular and assistive technologies so they could go online, using e-mail to increase social networks and accessing web-based informational resources. The study contributes to the scarce literature on online inclusion by offering protocols for setting up and conducting e-mail and Internet training. The outcomes show that the subjects gained basic information and communication technology 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. This study makes recommendations for future research 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.

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CHAPTER I

Introduction

Why do people go online? The answers are many and vary across the age span. For example, youngsters visit Barbie's website (www.barbie.com) to design doll clothes or help Bugs Bunny hit home runs (<http://looneytunes2.warnerbros.com>). Teenagers go online to cast their votes for reality television program contestants, to download music, and to chat on MSN with friends. Young parents and homeowners use the Internet to find parenting tips, search for recipes, consult consumer guides, and play games competitively. Middle-aged men and women purchase and download calorie counter programs for their Palm Pilots, watch clips on professional sports, and virtually tour show homes. Senior citizens go online to play games, e-mail their grandchildren, research holidays, and book reduced-rate green fees at golf courses. These are but a few of the many reasons why people go online. What all these users have in common, however, is that they are using online technology to perform leisure-time activities that are meaningful to them. These hobbies and interests and dozens more could be pursued offline, but doing them online is captivating, productive, and variety-filled, and doing them online does not seem to be a passing fad.

People also use online technologies for more serious purposes. They obtain information on parenting, learn about health conditions, pay their bills, search for low mortgage rates, trade stocks, update professional certifications, take or teach online

courses, do homework, and seek employment. While these important tasks could also be done offline, many people find that the *electronic superhighway* offers an easier route. Doing these work-related tasks on the Internet is more convenient and efficient. The process may be less labor-intensive and time consuming while producing higher quality work.

Increasing numbers of people are finding that web-based information and communication technology (ICT) is essential for daily living (Fallows, 2004; Madden, 2003), so much so, that when regular computer users have computer or Internet problems, they feel disappointed or disadvantaged.

Not everyone wants to go online, of course, which is understandable—work, learning, and recreation can be done without ICT. However, some people who want to be online are excluded, such as adults with developmental disabilities (Enders & Spas, 2000; Kaye, 2000; Madden, 2003; Moisey, 2003; Sohlberg, Ehlhardt, Fickas & Todis, 2002; Waddell, 1999). They are offline by circumstances rather than choice.

Problem

Web-based ICT is becoming “a foundation of our societies and economies” (bridges.org, 2003/2004b, Digital Divide section). Given that the integration of ICT into “society, work, and governance is pervasive and inevitable...people need to be competent in communication and technology in order to be full participants in society” (EKOS Research Associates Inc., 2001, p. 56). ICT skills are becoming “increasingly important” for the general population, yet some researchers believe that ICT skills will be especially “critical for those who are already marginalized in society due to other social and economic factors” (EKOS Research Associates Inc.,

2001, p. 56). As digital technologies become more essential and beneficial for everyone, people without web-based ICT skills will be unable to participate in the daily business of living, playing, learning, and working in the ways that technologically savvy people participate (Cullen, 2001; Public Interest Advocacy Centre [PIAC], 2000). Not being able to perform ordinary, everyday activities—even going online for amusement or to join an online community for fellowship and to exchange information—leads to the excluded people’s alienation, isolation, and passivity (Jeffreys & Gall, 1996).

The disadvantage that arises from being unable to use web-based ICT in the “global digital information age” is referred to as the *Digital Divide* (Cullen, 2001, p. 2). Bridges.org. (2003/2004b), an organization devoted to using ICT to improve lives of people primarily in developing countries, defines the Digital Divide as a “wide division between those who have access to ICT and are using it effectively, and those who do not” (bridges.org, 2003/2004b, Digital Divide section). EKOS Research Associates Inc. (2001) takes a broader view and states that the Digital Divide “encompasses the ability of individuals, social organizations, businesses and communities to effectively respond to changes in an ‘information society’ and participate successfully” (p. 2). Studies have repeatedly shown that the excluded side of the Digital Divide tends to comprise people with disabilities, rural dwellers, females, older citizens, various ethnic groups, individuals with limited education, the unemployed, people with low literacy levels, sole parents, individuals with lower incomes, and citizens of developing countries (Cullen, 2001; PIAC, 2000; Veenhof, Clermont, & Sciadas, 2005).

Unequal access to the modern technologies that enhance and facilitate life in a rapidly changing world is also undemocratic and economically unsound (Sciadas, 2005). It is unfair that excluded people are losing the opportunity to improve their lives, even if the improvements are merely expansion of leisure-time pursuits. Economic concerns arise from the fact that marginalized people have become “information have-nots,” denied opportunities to participate in “new ICT jobs, in e-government, in ICT-improved healthcare, and in ICT-enhanced education” (bridges.org, 2003/2004b, Digital Divide section). Society pays a price in actual dollars and cents when it excludes some members from making valuable contributions to the overall well-being of a country.

A closer examination of the Digital Divide reveals that it can affect the lifelong learning process of people who have disabilities. Learning is a “natural process throughout life for all individuals, regardless of social status, age or any other human variable” (Jeffreys & Gall, 1996, p. 19). Lifelong learning includes basic tasks such as learning how to read and write, solve everyday problems, engage in fun activities, and explore personal interests (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2003b). Lifelong learning allows people to gain the knowledge and skills they need to survive in, contribute to, and enjoy a rapidly changing world. Internet-based learning is an effective, convenient, and increasingly popular way to meet people’s diverse learning needs throughout their lives, yet people with disabilities have limited access to ICT and limited chances to gain ICT skills. All avenues to lifelong learning, offline and online, need to be accessible to people with all forms of disabilities as statistics show that they tend to have lower

levels of education in all areas—Grades 1 through 12, trade schools, colleges, and universities—than people without disabilities (Office for Disability Issues, 2003).

Adults with developmental disabilities who live in rural Alberta—the subjects in the study—are doubly disadvantaged when it comes to lifelong learning. First, as rural dwellers, they have fewer educational opportunities throughout their lifetimes than city dwellers. Second, a developmental disability makes learning more complex and challenging. Instruction and educational systems must be modified to meet their individual needs. Both disadvantages could be addressed through Internet-based learning—students could reside in rural areas and access a wide variety of individualized, self-paced, and flexible e-learning opportunities.

Background

In 2001, two distance education institutions and two community inclusion organizations in Alberta began a project called NorthEast Community Online. The project was designed to help adults with developmental disabilities, their families and their support workers go online to “build a larger social network” (Moisey, 2003, p. 21) and to find information on topics such as inclusion, community living, and disabilities. Within two years, the project team achieved progress towards two of its initial goals. It developed and launched an accessible and informative website, NorthEast Community Online (www.ne-community.com), for adults with developmental disabilities, families, service providers, funding agencies, policy-makers, and advocates and thus created a virtual learning community. The project team also developed strategies to make online technology more accessible to the targeted users wherever they resided throughout northeastern Alberta.

Although the website was successfully launched and online technology and training became more accessible, primarily through accessibility-enhancing presentations at public libraries and mini-training sessions at conferences and public libraries, Moisey (2003) found that certain barriers prevented some adults with developmental disabilities from going online and participating in a virtual community specifically designed to meet their informational and social needs. In some cases, low-level literacy skills hindered access to web-based ICT. Some individuals had memory problems and could not recall essential information such as passwords and e-mail addresses. Some did not know that the community existed or did not know how to join it. Other barriers included limited access to computers, a lack of transportation, the costs associated with going online, and a lack of computer training. Although the project increased access to online technologies, more needed to be done to facilitate online activity for this population. This study addressed two of the accessibility issues identified by the NorthEast Community Online project's team—a lack of ICT training and low literacy levels.

Purpose and Research Questions

A group of adults with developmental disabilities in rural Alberta was offered training in how to go online to create social networks through e-mail and how to access informational resources through the Internet. Assistive technologies (i.e., voice e-mail and a screen reader) were used to facilitate online activity by compensating for low literacy levels.

The general research question was, "What are the outcomes when adults with developmental disabilities are given access to training and appropriate online

technologies in order to build the basic computer, e-mail, and Internet skills needed for e-learning?” The sub-questions were:

1. What factors should be considered prior to training?
2. What processes and protocols are most effective for training users to use e-mail and to access information on the Internet?
3. What are the immediate outcomes and possible future outcomes when adults with developmental disabilities have access to online technologies?

Importance of the Study

This study is important because it investigated practical ways to facilitate ICT skill development so that people with developmental disabilities could use two of the most popular electronic tools of today—e-mail and the World Wide Web.

Studies investigating how to increase online inclusion for those with developmental disabilities could affect a significant number of people. For example, at the time of the study, approximately 520 people in northeast Alberta had a developmental disability and received funding from the Northeast Alberta Community Board for Persons with Developmental Disabilities (PDD), a subset of the approximately 8,700 adults in Alberta who received services and PDD funding in 2005 (Persons with Developmental Disabilities [PDD], n.d., PDD Fact Sheet section). Census data shows that approximately 0.5% of Alberta’s 2001 population (11,550 people) had developmental disabilities (Office for Disability Issues, 2003, p. 52). Of the entire 2001 Canadian population with disabilities over 15 years of age, 3.5% (120,140 people) had developmental disabilities (Office for Disability Issues, 2003, p. 52).

Assumptions

The researcher entered the investigation with several assumptions, as described below.

- that the target population would be interested in using online technologies;
- that the target population's online activities would be worthwhile and meaningful;
- that literacy barriers and a lack of ICT training hindered online activity;
- that assistive online technologies were useful for the target population;
- that assistive technologies appearing on the market had been tested for reliability and usefulness;
- that the host agency, a support agency for adults with developmental disabilities would, as a whole, and its employees, as individuals, would support a study that enabled clients to participate in online activities;
- that the host agency's employees were personally familiar with using the Internet for e-mail and as a reference tool, both at home and at work;
- that support workers would continue helping subjects use the Internet and access their e-mail if subjects were unable to use online technologies independently by the time the study ended;
- that trained subjects would use e-mail and browse the Internet on other computers outside the host agency;
- that the advantages and benefits of using the Internet and e-mail outweighed the disadvantages;

- that risks to the target population, a population considered vulnerable by the research community, could be minimized and managed; and
- that some subjects would be ready for e-learning by the end of the study.

Definitions

Terms commonly used when discussing developmental disabilities, web-based ICT, and learning appear throughout this thesis. Below are definitions drawn from experts in each field.

PDD

In this thesis, the acronym *PDD* stands for *Persons with Developmental Disabilities* and refers to a community governance structure in Alberta that consists of a provincial board and six regional boards. PDD's provincial and regional boards develop, implement, and evaluate the delivery of supports provided to adults with developmental disabilities throughout the province of Alberta. The provincial PDD board has additional responsibilities of coordinating, funding, monitoring, and assessing the regional boards' activities (PDD, 2005).

Developmental Disability

The Alberta government defines a developmental disability as “a state of functioning that begins in childhood and is characterized by significant limitations in both intellectual capacity and adaptive skills” (PDD, 2005, FAQ section). The three factors determine eligibility for PDD supports:

- a) The developmental disability must commence before 18 years of age;
- b) The individual must be “significantly below average intellectual capacity.” Intellectual capacity is assessed by the Weschler Intelligence Scale (WISC)

Revised 3rd version. A person who obtains an Intelligent Quotient score between 65 and 75 (70 plus/minus 5) would be considered to have a significant limitation as this score is two standard deviations below the mean (S. Moisey, personal communication, October 24, 2005); and

c) The individual must have “related limitations in two or more of the following adaptive skill areas: communications, self-care, home living, social skills, community use, self-direction, health and safety, functional academics, work, and leisure” (PDD, 2005, FAQ section).

Alberta’s definition is similar to that applied in the United States. U.S. legislation defines developmental disability as a severe, chronic disability that

- a) is attributed to a mental or physical impairment or combination of mental and physical impairments;
- b) is manifested before the person attains the age of 21;
- c) is likely to continue indefinitely;
- d) results in substantial functional limitations in three or more of the following major life activity areas: self care, receptive and expressive language, learning, mobility, self-direction, capacity for independent living, and economic self sufficiency; and
- e) reflects the person’s need for a combination and sequence of special and interdisciplinary or generic care, treatment, or other services which are of lifelong or extended duration and individually planned and coordinated. (Lockert, 2001, p. 1-10)

Developmental disability is synonymous with terms such as *mental retardation, mental disability, intellectual delay, and cognitive impairment*. Alberta's Persons with Developmental Disabilities community prefers "persons with developmental disability" or similar phrasing that places individuals ahead of their disabilities.

Inclusion

Inclusion is "a concept which connects with the most natural elements and ideals of the democratic society in which we live" (Jeffreys & Gall, 1996, p. 115). It involves including all people into community life "from the start," rather than integrating or "putting them back in" after separating them (Jeffreys & Gall, 1996, p. 38). With inclusion, there is no segregation of people with overt differences (such as race or gender), nor separation of people with hidden differences, such as intelligence or health conditions (Jeffreys & Gall, 1996). With inclusion, there is no need to qualify for membership because membership is already a basic right (Jeffreys & Gall, 1996). According to Second Century Communities, a paper that discusses issues affecting persons with developmental disabilities in Alberta and offers a vision for the future, inclusion is about finding commonalities rather than focusing on differences (PDD, 2005, Background Information section).

Inclusive Community

McMahon, Sullivan and Shelton state that an inclusive community or society is not so much a geographical area as a "way of life in which all people are welcomed" and a place where differences are "celebrated, not shunned"; inclusion adds "color, texture and richness to the fabric of the community" (as cited in Jeffreys

& Gall, 1996, p. 116). An inclusive community includes persons with developmental disabilities in “community life as equal and valued members of that community” with rights to full membership and participation (NorthEast Community Online, n.d., Inclusive Community section). All members of the community or society are viewed as interdependent contributors and consumers (Jeffreys & Gall, 1996, p. 113).

Full Participation

Full participation is a goal for all members of society, those with and those without disabilities. Statistic Canada reports that

Full participation means different things to different people depending on each individual's potential....Canadians with disabilities as a whole would be participating fully if each one were able to maximize his or her potential. In other words, if each Canadian with a disability was achieving his or her full potential for success in learning, work, and community life, we would have achieved a state of full participation. (March 12, 2004, Vision section)

Self-advocacy

Self-advocacy occurs when people stand up for themselves and their rights (NorthEast Community Online, n.d., Self-advocacy section). Self-advocacy is a fundamental goal for all people because it provides personal power over one's life. In other words, self-advocacy occurs when people make decisions about matters that affect their lives and take responsibility for the decisions.

Digital Divide

The Digital Divide refers to the discrepancy between ICT users and non-users with a particular emphasis on the “uneven diffusion of the Internet” (Sciadas, 2005).

Canada's Public Interest Advocacy Centre (PIAC) views the Internet as an "optional" rather than "essential" service, yet at the same time it notes that "in the future many Canadians will need access [to the Internet] in order to benefit fully economically and socially" (2000, p. 9). The Digital Divide will become a more pressing concern as "advanced interactive communications will pervade our social and economic activities over the long term" and "technological access and proficiency will be necessary for individuals to maintain a competent level of participation in society and to derive the benefits thereof" (PIAC, 2000, p. 46). Many democratic countries have placed a priority on closing the Digital Divide because they believe a "greater-skilled and more-informed citizenry" will strengthen their countries (Market competition would increase Web access, 2005, p. 61).

Recent studies have shown that some individuals are Internet non-users and have "no interest in the Internet or other aspects of the Information Highway" whereas other non-users "desire to be connected (to meet very real educational, literacy, skills, economic and social needs) but face serious obstacles" (PIAC, 2000, p. 46).

Researchers around the world differ in their approaches to measuring and reducing the Digital Divide, but all agree that it is a valid concern. Internet users tend to be "information-rich" and thus have educational, social, economical, and democratic advantages over the non-users who tend to be "information-poor" (Cullen, 2001; PIAC, 2000; Sciadas, 2005, p. 11). PIAC (2000) notes that

access to the Internet will not, on its own, overcome the social and economic inequalities and cleavages in society or community. In fact, it may aggravate

them. But the ability to use the new technologies as tools and resources, and to have a chance to realize potential opportunities, means that some amelioration of some disadvantages and inequalities is possible. (p. 46)

Internet

Also known as the *Net*, the *Information Highway*, and the *Electronic Superhighway*, the Internet is a “global network connecting millions of computers” throughout the world, which enables the sharing of “data, news and opinions,” and is “not centrally controlled by any one organization, nor is it operated for profit” (Wēbopēdia.com, 2005, search Internet). Users pay a subscription fee to an Internet service business or provider in order to access dial-up, broadband, cable, satellite, or wireless Internet services.

Canada recognized the importance of the Internet in the 1980s. It began laying out the “groundwork for an Information Highway to facilitate the development of an information society...to facilitate Canada’s transition to a knowledge society” so that by 2000 Canada would be the “most connected nation in the world, and to realize economic growth and competitiveness domestically and internationally” (PIAC, 2000, p. 11). Canada also developed policies “geared to address the needs of those Canadian at particular risk of being marginalized or left behind in the new information-based society and economic,” identifying people with disabilities as one marginalized group (PIAC, 2000, p. 13).

World Wide Web (WWW)

The WWW is a system of Internet servers that support documents formatted in a markup language called HyperText Markup Language (HTML). A web browser

such as Netscape Navigator or Internet Explorer retrieves hypertext information, known as *web pages*, from web servers, known as *websites*, and displays the information on the screen. HTML allows users to navigate from one document to another by clicking on links. The term *WWW* is not synonymous with the *Internet* and “not all Internet servers are part of the World Wide Web” (Wěbopēdia.com, 2005, World Wide Web section).

Application Software

Application software, as well as the terms *application*, *program*, and *software*, refers to the written instructions that enable computers to perform tasks. Typical applications are operating systems, word processors, database programs, spreadsheets, games, graphics programs, communication programs, and media players. This study used the following application software: Windows '98, Windows XP, Read & Write, Internet Explorer, Voyager Desktop Suite, and ICanEmail.

E-mail

E-mail, a communication tool developed in the 1960s (Sperling, n.d.), is used as an alternative to conventional mail, now called *snail mail* (Madden, 2003). It requires a computer, an Internet connection, a browser, and e-mail application software. Sending e-mail messages to others over communications networks is the most frequently-used service on the Internet. Users enjoy the speed and efficiency of e-mail because messages can be “sent any time, any where and the recipient can read it at his or her convenience” (Learn the Net, 2005, Why Use E-mail section). Although e-mail is has drawbacks, for the most part, it is “fast, flexible, and reliable” (Wěbopēdia.com, 2005, E-mail section).

Information and Communication Technology (ICT)

ICT often refers to all kinds of information processing and communication technologies (e.g., computers, televisions, telephones, radios) that people use for both serious and recreational purposes; however, its meaning for this thesis is narrowed to include only those “technologies such as desktop and laptop computers, software, peripherals, and connections to the Internet that are intended to fulfil information processing and communications functions” (Statistics Canada, April 1, 2005, ICTs section). *ICT* will be used interchangeably with *online technology*, *web-based technology*, and *Internet technology*.

Assistive Technologies

The Canadian government defines assistive technology as “enabling technologies” (Government of Canada, 2005, Definition of Assistive Technology section). Aids include “any hardware, software or system that overcomes or reduces the barriers inherent in standard technology...by providing alternate modes of input and/or output suited to the abilities of different users.” The assistive technologies used in this study were Read & Write’s text-to-speech software, Voyager Desktop Suite’s and ICanEmail’s voice e-mail software, and Voyager Desktop Suite’s Web Trek web search software.

Voice E-mail

Voice e-mail refers to e-mail systems with an audio component. Users speak and record messages and then e-mail the messages to others as audio file attachments. Voice e-mail users listen to incoming text-based messages because

the voice e-mail software converts the text to audio (Wěbopēdia.com, 2005, Voice Mail section).

In this study, subjects used voice e-mail to record their voices through computer microphones, and the resulting audio files were e-mailed. Two voice e-mail application software were used—AbleLink’s 2.0 standard version of Voyager Desktop Suite and R.J. Cooper and Associates’ ICanEmail version 2.06.

Text-to-speech Software / Screen Reader

These two terms are used interchangeably in this thesis. Screen readers convert “words from a computer document (e.g., word processor document, web page) into audible speech spoken through the computer speaker” (Adaptive Technology Resource Centre, n.d., Technical Glossary section). This study used Read & Write 5 as it is software that is “specifically designed for people with reading and writing difficulties, especially dyslexia. It is a vocabulary support package which talks, types, checks spellings, corrects mistakes and has word prediction” (Adaptive Technology Resource Center, n.d., Windows Based Software section). With Read & Write 5, users select text, click on a play/speak button, and listen while the words are both highlighted on the screen and read aloud.

Virtual Community / Online Community

The National Learning Infrastructure Initiative defines virtual community as “a group of people (and the social ‘place’ that they collectively create) that relies primarily (though not necessarily exclusively) on networked communication media to communicate and connect” (EDUCAUSE, 2005, Key Themes section). People in virtual communities use “words on screens to exchange pleasantries and argue,

engage in intellectual discourse, conduct commerce, exchange knowledge, share emotional support, make plans, brainstorm, gossip, feud, fall in love, find friends and lose them, play games, flirt, create a little high art and a lot of idle talk” (Rheingold, 1998, n.p.) The NorthEast Community Online website (www.ne-community.com) is one example of a virtual or online community.

E-learning

E-learning has been defined as “the use of Internet technologies to deliver a broad array of solutions that enhance knowledge and performance” (Rosenberg, as cited in Kruse, 2003, ¶15). It commonly refers to formal Internet-based learning that is sponsored and sanctioned by educational institutes. But it also includes the *informal* or *non-formal* learning that Knowles (1980, July) maintained was a crucial part of adult learning (p. 41). Informal e-learning can occur either intentionally or incidentally when people visit health education sites, participate in virtual community forums, complete free online courses and tutorials, or surf the Internet.

Virtual (Online) Learning Community

The National Learning Infrastructure Initiative draws on Paloff and Pratt’s work when defining learning communities as “communities in which people are joined together by mutual interest to intensively examine a particular theme, are able to learn together and exchange existing knowledge and work on aspects of problem solving together” (as cited in EDUCAUSE, 2005, Key Themes section). Russell and Ginsburg (1999) define an online learning community as an organization that “must show strong evidence of providing members with learning experiences that are transformative, inclusive of life experiences, rewarding, and accommodating of

diverse learning styles” (p. 11). They further state that online learning communities have “processes that actively advocate learning and development” (p. 7) and “provide resources that are tied to the expressed needs and interests of the communities they serve” (p. 8). The primary goal of an online learning community is to foster “collective and participatory communication” and “individual empowerment”; only occasionally do online learning communities advocate concrete action to solve a problem (p. 9).

Lifelong Learning

Learning is currently viewed as a diverse, lifelong process that “begins in early childhood and continues into the senior years” and enables people to “participate and prosper in this ever-changing knowledge-based economy and society” (Alberta Learning, 2002, p. 4). Cao indicates that learning is “all about acquiring and applying knowledge and skills throughout life to help reach employment goals, enjoy a high quality of life, and be active and responsible citizens” (as cited in Alberta Learning, 2002, p. 1).

Self-determination and Personal Agency

In this thesis, *personal agency* is used as a synonym for *self-determination*. Wehmeyer, Agran, and Hughes define self-determination as a set of skills that include the following: self-awareness, choice-making, goal-setting, self-regulation, problem-solving, communication, goal attainment, independence, risk-taking, attention to safety, socializing, self-advocacy, leadership, teamwork, assertiveness, and self efficacy (as cited in The Link, 2004, p. 1). Bickley states that personal agency is gained when individuals receive set realistic goals, receive supports

towards independence, make decisions, and take risks. Self-determination cannot occur if people are taught “compliant behavior” (as cited in T/TAC, 2001, Self-determination Begins NOW section). Flanagan notes that self-determination improves when “choice-making opportunities [are not left] to chance” and people are asked to set “realistic but ambitious expectations” (as cited in T/TAC, 2001, Partners in Learning section).

Limitations

Although the subjects in the study were willing to share their experiences, some subjects were unable to articulate their thoughts, needs, wishes, and desires due to communication difficulties associated with their developmental disability. Medical issues occasionally affected subjects’ participation in training sessions as well.

Another limitation was the researcher’s lack of experience working with adults with developmental disabilities and lack of training in special education; however, the researcher had 10 years’ experience teaching in traditional and online classrooms where many learners (e.g., single parents with several children, aboriginals, and residents of sparsely populated areas in northern Alberta) were considered to be disadvantaged.

A final limitation involves the generalizability of the findings. This multiple-case study provides a rich and detailed description of the process and outcomes that occurred when a group of adults with developmental disabilities went online; however, the findings cannot be generalized to other settings or to all adults with developmental disabilities due to the limitations of the research design itself.

Delimitations

The study was confined to a group of subjects who received support services from an agency in a small town in Alberta. A limited number of clients from the agency were involved so that the researcher could meet with each subject once a week for 30 minutes. Data collection was limited to seven months.

This investigation used affordable and readily available technologies. The Read and Write screen reader was found to be useful in the NorthEast Community Online project, so it was also used for this study. The promotional material on both voice e-mail applications indicated that they met the main criteria considered important for the subjects in this study; both applications were audiographic in nature and reduced the need for reading, writing, and memorization.

Organization of Thesis

This chapter introduces the study. Chapter II summarizes current literature about adults with developmental disabilities—literacy levels, exclusion from online activities, the benefits and risks of going online, how assistive technology may facilitate online inclusion, and how e-learning may accommodate special learning needs. Chapter III describes the research setting and the research methodology; it also presents protocols for ICT training for adults with developmental disabilities. Chapter IV presents the findings and answers the research question. Chapter V reports what conclusions were drawn and makes recommendations for future projects and research. The thesis concludes with a reference list and an appendix containing the following documents: a letter of invitation to subjects (adults with developmental disabilities), detailed information about the study for other

participants (agency personnel, guardians and parents), two consent forms, subject interview questions, and a condensed version of the protocols developed in the study in a format designed to be a useful reference for computer coaches.

CHAPTER II

Review of Related Literature

Several areas of literature relate to this investigation: (a) literacy and adults with developmental disabilities; (b) statistics about who is online and what people do while online; (c) benefits to adults with developmental disabilities from going online; (d) current issues regarding e-mail and the Internet; (e) assistive technologies; (f) learners with developmental disabilities; and (g) access to learning. This body of literature was used as a foundation to ensure that the study built upon previous research.

Literacy and Persons with Developmental Disabilities

A review of the literature shows that there is much debate over what constitutes literacy. The debate is occurring because the concept of literacy is continually evolving and expanding in different directions. The seemingly singular term of literacy actually refers to a broad mixture and growing number of skills that must continually be updated (Langford, 1998; Leu, 2002; National Institute For Literacy [NIFL], n.d.; Swan, 1999; UNESCO, 2003c, Literacy as Freedom section). Literacy involves multiple areas. For example, current literacy literature classifies and measures literacy according to at least 33 different subcategories: academic literacy, basic literacy, new basic literacy, business literacy, computer literacy, critical literacy, cultural literacy, digital literacy, document literacy, e-literacies, electrographic literacy, ethical literacy, electronic literacy, environmental literacy,

functional literacy, gestural literacy, health literacy, information literacy, library literacy, media literacy, moral literacy, multicultural literacy, network literacy, personal literacy, political literacy, prose literacy, quantitative literacy, scholarly literacy, social literacy, technological literacy, textual literacy, traditional literacy, and visual literacy. These subcategories show that the concept of literacy has expanded well beyond the ability to sign one's name and know how to read and write.

Literacy experts agree that literacy is complex and involves more than the ability to read and write. It is essential for communication and enables an individual "to function in society, to achieve one's goals, and to develop one's knowledge and potential" (National Center for Education Statistics, n.d., Defining and Measuring Literacy section). Experts also agree that literacy is no longer a single skill acquired once and for all in a lifetime. Children develop many kinds of literacy-related skills in schools; as adults, they continue to develop literacy skills.

Alberta's Persons with Developmental Disability board notes that "illiteracy and other communication problems" are barriers to "sharing all kinds of information...both within the community of people with disabilities, and between disabled people and the rest of the community" (PDD, 2003, p. 2). Low literacy levels are partially caused by a deficiency of rich literacy experiences in the environment. Children with developmental disabilities often need intensive medical support, so the time and energy that could be spent promoting literacy skills is sacrificed in order to give attention to health and medical issues (Gurry & Larkin, 1999). Gurry and Larkin (1999) note that it is never too late to improve literacy skills. When literacy levels improve, adults with developmental disabilities have more tools

to “both challenge society and empower themselves” (Lakhani as cited in Lockert, 1999, p. 2-15).

A common theme throughout the literature is that literacy is inseparably intertwined with ICT. In the past, literacy tools were limited to parchment and inkwells. But in today’s world, literacy technologies include computer technologies. The National Council of Teachers of English and the International Reading Association state that “being literate in contemporary society...means being able to use an array of technologies to gather information and communicate with others” (as cited in Swan, 1999, ¶3). ICT and literacy are linked in other literature as well (e.g., Abbott, 1998, Canadian Commission for UNESCO, 2003; Gurry and Larkin, 1999; Klaus, 2001; Langford, 1998; Veerhof, Clermont & Sciadas, 2005). UNESCO (2003c) points out that “limited access to the Internet and to information technologies inevitably leads to lower computer literacy levels, which in turn results in restricted access to knowledge and means of communication” (n.p.). The connection between literacy and ICT is evident in literature on developmental disabilities as well. For example, Moisey (2003) points out that low literacy skills prevent adults with developmental disabilities from using computer technologies to seek information and to communicate with others.

Schools acknowledge and address the link between literacy and technology by developing literacy skills and ICT skills simultaneously. Web-based ICT is part of literacy training starting in elementary schools and is well underway by the time children are 10 years old. In the United States, Grade 4 students are expected to use the Internet to search for information, to judge the usefulness of the information

they find on the Internet, to bookmark websites, to use appropriate gaming systems, to enter into and participate in appropriate chat rooms or discussion forums, to correspond with e-mail pals or mentors, and to use ICT in socially responsible ways (Partnership for 21st Century Skills, 2004). In Alberta, students are encouraged to use the Internet as a resource by Grade 2 and to use e-mail for communication by Grade 4 (Alberta Learning, 2000) although logistics involved makes it more likely that ICT is cannot be used in these ways until Grade 5 (M. Osborne, personal communication, May 28, 2005). Many educators are in favor of using ICT and see e-mail, in particular, as a “powerful tool for learning to write” because beginning writers find e-mail enjoyable and “highly engaging” (Wollman-Bonilla, n.d., Overview section). The expanding use of online technologies throughout the curricula during primary, secondary, and post-secondary schooling shows that governments, educators, and parents all recognize the value of ICT skills.

Literacy literature, in many aspects, echoes the themes of voice and self-determination that are found in inclusion literature. Inclusion and literacy experts are concerned with improving communication, increasing access to information, and giving people a voice so they can speak out and advocate for themselves (Klaus, 2001; The National Center for Education Statistics, n.d.). Literacy skills empower individuals by allowing them to access information and resources so that they can “orient themselves in the world” and “express ideas and opinions with the confidence they will be heard and taken into account” (NIFL, n.d., Four Purposes for Learning section). Literacy allows people to be taken seriously and to have their ideas count whether at home, at work, or in the community.

Literacy and inclusion experts share the same goals of empowering people and enabling full participation. Their methods for achieving these goals often overlap. For example, literacy experts may provide ICT training so that people have tools to increase their literacy levels and improve their lives, while inclusion advocates may provide ICT training so that people have the skills needed to participate more fully within a technology-oriented society. Both advocate access to training and tools so that people can speak out for themselves and have more freedom and power over their lives.

The body of literature linking literacy, technology, and interaction and participation within a community highlights a discrepancy. Adults with developmental disabilities who cannot use (or are not allowed to use) web-based ICT are disadvantaged. They have less access to the literacy tools of today and, therefore, fewer opportunities to develop the competencies they need to interact and participate fully in modern life (Veenhof, et al., 2005).

The literature surveyed underscores why literacy is an important consideration when undertaking inclusion projects. Two points are particularly relevant to this study:

- Defining literacy as simply the ability to read and write is no longer adequate. Literacy is a complex and ever-growing number of skills that enable people to function and participate in society. Literacy training should occur throughout the life span as literacy itself and literacy tools are constantly evolving. Instruction should include the use of current and

emerging literacy-related technologies; computers and online technologies are current literacy technologies.

- The literacy levels of adults with developmental disabilities are low for various reasons, but it is not too late, nor impossible, for literacy levels to be improved. Basic training in the use of computers and online technologies can be classified as a form of literacy training; ICT skills can facilitate communication, self-determination, and inclusion.

Who is Online and What They Do

Statistics show that Canada, the United States, and Australia are the three most *wired* countries in the world. The number of new Internet users is growing steadily in these and many other countries after many years of huge increases (Fallows, 2004; Madden, 2003; Media Awareness Network, 2004). In 2003, approximately 63% of the U.S. population (Fallows, 2004; Madden, 2003) and approximately 64% of the Canadian population were online (Statistics Canada, July 8, 2004, ¶12). Madden (2003) notes that the Internet was an interesting and “dazzling” novelty in the past but now is a “normalized part of daily life” (p. 78). The Internet has affected “children, families, communities, the work place, schools, health care and civic/political life” (Fallows, 2004, viii). 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 (Fallows, 2004, p. iv, 4).

The increasing availability of broadband access is partially responsible for transforming the Internet from “an occasional reference and communication tool”

(Madden, 2003, p. 75) into what Horrigan and Rainie call an “always-on” information appliance (as cited in Madden, 2003, p. 75). Internet users report that the Internet has changed the way they live (Fallows, 2004, p. 21).

In a review of the research, Fallows (2004) identified more than 50 ways in which people use online technologies in everyday activities and categorized these activities as follows: information seeking, communications, transactions, and entertainment. Of these 50 different activities, the two most popular activities in both the United States and Canada were e-mailing others and searching for information. Madden (2004) points out that using e-mail is a “seamless part of everyday life,” and it is “hard to image life without it” (p. 8). Madden (2003) states 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). Other research (Madden, 2003) shows that people use e-mail and the Internet more seriously as they gain experience. Over time, they use e-mail and the Internet more often at work, expand the variety of online activities they perform, and conduct more online transactions.

While it is evident that electronic technologies are becoming more widely used and people are becoming dependent upon them, 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 as tool;

they are on the wrong side of the Digital Divide. 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 double 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). The research also shows non-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).

Democracies are concerned about bridging the Digital Divide by creating equitable access to ICT. Waddell (1999) describes online inclusion as a “civil right for people with disabilities” (IV section), and Abbott and Masterman (1997) report that the right to communicate via ICT is now “recognized as constituting a distinctive ‘third generation’ of human rights” (p. vii).

The interest of democratic countries in online inclusion is driven by an interplay between the principle of equity and the reality of economics. A fundamental democratic belief is that individuals, regardless of ability or disability, have the right to full membership within society and the right to live their life 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).

Some experts on disabilities find 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” (Kaye, 2000, 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 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.

Benefits of Going Online for Persons with Developmental Disabilities

Research on how people with developmental disabilities, in particular, 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 *connected*, their sense of well-being and quality of life improve in many ways. According to Kaye (2000), people with disabilities (developmental disabilities are not specifically mentioned) who have access to the Internet use it 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).

Although the studies exclusively reporting how persons with developmental disabilities benefit by going online are limited, several exist. 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 social networking and storytelling. 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). Moisey (2003) notes that the persons with developmental disabilities community supports the notion that participation in a virtual community can improve people’s quality of life (p. 5).

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).

Another study conducted at the University of Calgary (Triggs, 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 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, 1998, p. 1). Using standard software, Triggs helped the two subjects use the Internet to connect with others around the world, to advocate for themselves, to teach others, to 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, Triggs 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. *Think and Link* is a five-year project funded by the U.S. Department of Education with a goal of “universal access to electronic communication” (Think and Link, 2003, Think and Link section). Since

the initial study in 2000, it 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). Its website offers guidance, suggestions and encouragement on how to make the online world accessible.

A Think and Link project update in 2004 reported ongoing success, noting that subjects were satisfied with the training systems and were becoming independent in using Think and Link’s own e-mail system (<http://www.coglink.com>). Subjects experienced four major benefits from 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 emailing” (¶1). 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 (faster, less expensive), and it had therapeutic benefits because e-mail was “something to anticipate, stimulates your brain” (Think and Link, n.p., Pilot Study section).

Sohlberg, Ehlhardt, 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” (Sohlberg, et al., 2002, p. 6).

The Think and Link project has collected quantitative data on the “frequency, purpose, length and complexity of incoming and outgoing emails” as well as composition time, letter erase, word erase, and the average number of reads per message (Think and Link, 2003, What do the data say? section). The organization has found that volunteer e-mail buddies are needed, and that e-mail activity has value as both an independent activity and as a supervised, supported and “facilitated recreational activity” in long-term care facilities (Think and Link, n.d., Tips for Assisting People with Email section). Two other findings are relevant: (a) “All subjects were highly motivated to use email and the time spent emailing exceeding their documented attention abilities”; and (b) A “one-size-fits-all solution does not work for assistive interfaces as subject preferences for email interfaces widely varied” (Think and Link, n.d., Pilot Study section). The organization gives recommendations for making personal computers more accessible, advocates the use of graphics over text, and discusses the use of screen readers. Its website (www.think-and-link.org) gives many tips for helping people with memory problems use e-mail, provides protocols for sending e-mails to people with memory problems, and calls for additional research. While Think and Link’s project focuses on people with acquired cognitive impairments, its findings are relevant to this study because

the project shows how online technologies can be beneficial to a population with special needs.

The literature described above shows that many people with all sorts of 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-making 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.

Current Issues Regarding E-mail and the Internet

The literature on e-mail and Internet concerns is especially relevant to this study because users of online technologies assume numerous risks, and the research community and others perceive persons with developmental disabilities as a “vulnerable” population (Medical Research Council of Canada, Natural Sciences and Engineering Research Council of Canada, & Social Sciences and Humanities Research Council of Canada, 1998, p. 2-12).

The most serious risk is exploitation. Predators solicit their victims online, luring them with requests for personal information and photographs, offers of free gifts, or invitations to meet in person.

Many other Internet risks exist, ranging from minor annoyances to serious problems. For example, Internet users may experience the following: unsolicited e-mails, online bullying, identity theft, financial loss, damaging viruses or worms, poor online etiquette, copyright infringement, Internet addictions, or spyware troubles (Chezzi, 2004; Fallows, 2003). Some of the drawbacks Internet users experience occur because the Internet has unregulated content; they may encounter inaccurate information or objectionable material, such as pornographic and racist content. Still another concern is that the Internet causes isolation, depression, and social disengagement, but some research suggests that Internet users believe that the Internet increases communication and contact with others (Madden, 2003, Summary of Findings section). This finding is supported by Think and Link (2003) and Triggs (1998). Despite the many legitimate concerns currently surrounding e-mail and the Internet, research shows that e-mail is still the most popular Internet application, and its popularity is not diminishing (Fallows, 2004; Madden, 2003; Media Awareness Network, 2004; Statistics Canada, July 8, 2004; Veenhof, et al., 2005).

Another major issue affecting Internet users with disabilities is that website designs are often inaccessible even with assistive technology. For example, pop up windows are confusing, and screen readers cannot assist users in managing them. Web designers could make web pages more accessible to people with disabilities by providing alternative or more appropriate content. For example, designers could

provide notification when windows pop open; include text that describes images (alt tags); allow users to change colors; divide information into manageable amounts; provide captions, headers, titles, and summaries to facilitate navigation; and use plain language.

These concerns, issues, and risks are receiving attention. Appropriate legislation is being enacted, filter technologies are being developed, consumers are being educated, and websites are being made more accessible. But progress is slow. Structural changes to the Internet (in particular laws to regulate the Internet) and design changes are especially difficult to implement, so people who exercise their right to use the Internet must also assume the responsibility of taking actions to protect themselves and advocating for improvements. Bohman (2004) notes that the “problem with inaccessible web designs is unlikely to change overnight because the amount of research related to the accessibility of Web content is relatively scarce” (§1). Three major actions Internet users can take right now are (a) to learn how to “engage in safe online behavior;” (b) to use “protective software,” primarily anti-spam and antivirus software (Protect Yourself Online, 2004, p. 12); and (c) to advocate for web accessibility. In the meantime, projects that offer training in online technologies should use safe technologies, offer safety training, and involve accessible websites.

Assistive Technology

Assistive technologies are the “innovative hardware and software tools either equalizing, compensating for, or eliminating barriers, or enhancing the mental and physical activities that challenge a person with a disability” (Williams, 2003, §4). Approximately 60 companies manufactured assistive technology two decades ago;

this number had grown to about 1,000 companies worldwide by 2003 (Williams, 2003, Assistive Technology's Impact section). Kingma's research (as cited in T/TAC Bulletin, 2001) shows that alternative or augmentative communication systems can help people with "communication disabilities acquire the dignity of self-determination and self-advocacy" so that they can "defend their interests, promote skills/strengths/talents, be active participants, have positive relationships, and interact in a manner that promotes inclusion in the community" (T/TAC Bulletin, 2001, Communication Considerations section).

Lack of access to or use of assistive technology is a concern. Research shows that "assistive technology products have enriched the lives of people using them", but only a fraction of the 54 million people with disabilities in the United States use assistive technology products (Williams, 2003, What Needs Improvement section). Assistive technology experts advocate the continued development and dissemination of the "tools which enhance the independence and abilities of people with disabilities, not only because it is right, but because it benefits the country" (Williams, 2003, What Needs Improvement section). These findings on all forms of assistive technology are relevant to the study as they suggest that assistive technology is beneficial, yet limited and underused.

Learners with Developmental Disabilities

Adult learning is frequently described as a *lifelong learning journey*. Adults need to learn throughout their lifetimes in order to adapt to a rapidly changing world, but adults also are driven to learn. The "need to learn is a powerful force...so basic to human nature that many would consider the pursuit and application of knowledge

as the very essence of life itself” (Jeffreys & Gall, 1996, p. 83). Learning is viewed today as “a joy, a tool, a right, and a shared responsibility” (UNESCO, 2003b, ¶2) throughout the lifespan, not for an isolated stage of life alone, and not only for those who have access to learning activities or are able to learn readily.

Knowles (1975) viewed adult learning as a self-directed process. His research showed that adults want to take the initiative to diagnose their learning needs; set their learning goals; identify resources for learning; choose and implement appropriate learning strategies; and evaluate the outcomes (pp. 85-88). He also believed that adults want to connect new learning with previous life experiences (1980, p. 99). Other research on adult learning has built upon Knowles’ work and emphasized the social and political aspects of learning. Self-directed or autonomous learning is now also viewed within a “social context” (Tennant & Pogson, 1995, p. 147).

As learning is considered a lifetime project, instruction can no longer be “contained exclusively within the four walls of educational institutions” (Jeffreys & Gall, 1996, p. 83). Adult learners today are consumers demanding many choices and many sources (Russell & Ginsburg, 1999). Many forms of formal and informal training and education, including Internet-based learning or e-learning, are available from a wide variety of sources including colleges, universities, individual tutors, private instructors, religious institutions, employers, charitable organizations, governmental agencies, quasi-governmental agencies, advocacy groups, labor organizations, hospitals, public health clinics, and professional associations.

The belief that lifelong learning is a joyous, self-directed journey with many routes is also applicable to adults with developmental disabilities. Adults with developmental disabilities also want to learn, know what they want to learn, and find pleasure in the learning process. For example, the Alberta Provincial Board for Persons with Developmental Disabilities reports that some adults with developmental disabilities are explicitly asking for help in gaining ICT skills so that they can use a computer, the Internet, and website forums to “influence and shape service directions and decisions that affect them” (PDD, 2003, p. 14).

Research shows that adults with developmental disabilities are capable of lifelong learning, but not enough is currently known their learning potential (Jeffreys & Gall, 1996, p. 78). Adults with developmental disabilities are specifically “encouraged to join the movement for adult learning throughout life” because adult learning can “shape individuals’ identity and give meaning to their lives, as well as ensure active citizenship and full participation in society” (UNESCO, 2003b, ¶2). Jeffreys and Gall (1996) assert that “it is never too late in life for any individual, as an adult, to benefit from a continuation of their education in settings designed for all other adults” (p. 84).

Research shows, however, that adults with developmental disabilities have reduced participation in formal learning. Edgar’s research noted that “only 50% of the disabled receive some form of post-secondary training” (as cited in Jeffreys & Gall, 1996). Learning opportunities are sometimes denied to people with disabilities “in the name of protecting them” from making mistakes (Jeffreys & Gall, 1996, p. 79). Jeffreys and Gall (1996) caution against “shielding people from learning

opportunities,” because over-protectiveness “increases the negative effect of their initial learning weakness and reinforces the perception of the degree of disability” (p. 79). In some situations, they conclude, the only thing learned is helplessness.

Jeffreys and Gall (1996) identify various reasons why adults with developmental disabilities have less participation in adult educational settings. Their research reveals that learners with developmental disabilities possess general characteristics or traits different from the dominant society that can adversely affect learning. For example, these learners tend to have

- restricted learning and memory capabilities,
- restricted metacognitive skills,
- restricted ability to apply and generalize old learning to new experiences,
- reduced speed of acquiring new learning,
- impaired focus which allows irrelevant learning materials to interfere,
- inefficient rehearsal strategies that interfere with memory, and
- generally, a poor ability to acquire information from casual or incidental learning opportunities (Jeffreys & Gall, 1996, p. 59).

These characteristics may trigger preconceived notions about what individuals with developmental disabilities are capable of achieving educationally. Both teachers and parents may have “limiting attitudes”; consequently, students with special needs will learn “as little, or as much, as their teachers expect,” and most students “rarely surpass” the low expectations some educators set for them (Jeffreys & Gall, 1996, p. 64). Brophy and Good’s research also shows that students with developmental disabilities receive “less direct instruction, have fewer opportunities to

learn new material, and are asked to do less work” in the classroom (as cited in Jeffreys & Gall, 1996, p. 64). Other relatively recent literature shows that both teachers and parents rarely consider “post-secondary educational opportunities as part of the natural range of options that can follow school graduation” (Jeffreys & Gall, 1996, p. 83). When people have “watered down expectations” and “attitudinal prejudices,” people with developmental disabilities do not believe they are capable of doing what other people do (McCall, 2004, p. 10). Bickel and Bickel note that “differential treatment” may prevent people with developmental disabilities from achieving their potential and from fulfilling their roles as citizens and members of the community and society (as cited in Jeffreys & Gall, 1996, p. 44).

Although people with developmental disabilities may possess characteristics that hinder learning; nonetheless, learning can be facilitated in many ways, and learning successes could effect changes in attitudes. When learners do not have existing skills to strengthen through continuing education, they can be helped to develop basic skills first (Jeffreys & Gall, 1996, p. 87). If learners have past negative learning experiences, a pessimistic outlook on learning may be overcome through remediation and interpersonal support (Jeffreys & Gall, 1996, p. 84). Learned helplessness may be overcome with de-conditioning. When learners set their own relevant and personally meaningful goals, they have more motivation to learn. When students are not effective learners, direct instruction is needed; learners make progress when they experience “active learning of systematically, sequentially-organized stages, with the purpose and the result of each step made explicit” (Jeffreys & Gall, 1996, p. 65). Individualized instruction, appropriate learning

materials, clear goals and expectations, and appropriate pacing also help learners with developmental disabilities achieve success. Jeffrey and Gall (1996) note that computers are especially important learning tools for learners with developmental disabilities because computers can be

equipped with adaptive peripheral devices and appropriate software [that] can provide for the repetition of curriculum units and the generation of motivational supports. A variety of teaching presentation styles can be engineered into the software to create more individualized learning programs for challenged learners. (p. 94)

Although Jeffrey and Gall (1996) provide many suggestions for teaching learners with developmental disabilities, they call for additional research into how to minimize the genetic and environmental factors that affect learning and how to accommodate special learning needs. Weber reports that that the result of carefully planned learning experiences is success, and success inspires people with developmental disabilities to believe learning is possible and worthwhile and that they can make unique contributions to the world as well as any other people (as cited in Jeffrey & Gall, 1996).

Access to Learning

Adults with various kinds of disabilities are beginning “to gain access to educational resources that were previously unavailable to them or not relevant to their former limited lifestyles” (Jeffrey & Gall, 1996, p. 83). Many colleges and universities are enacting policies and providing services that give learners with physical disabilities (such as blindness, hearing impairments, and mobility

restrictions) access to traditional learning opportunities. In distance education and training, few online courses have been “designed to allow people with disabilities to participate” (Waddell, 1999, Long Distance Learning section); however, the “optionalizing” and “disenfranchising” of people with disabilities from learning opportunities that occur in electronic environments is beginning to be corrected (McCall, 2004, p. 10). Adults with disabilities need access to Internet-based learning in order to access opportunities for continuing growth, personal development and life-long learning (Miller, 1987; Newell & Walker, 1991; Sutcliffe, 1995; Vincent, Edwards, Child, & Firminger, 1988).

Traditional, face-to-face instruction does not meet the needs of all learners, especially rural dwellers, because learners are often required to adhere to rigid schedules and attend urban centers for instruction. E-learning is an increasingly popular way to learn because it often allows learning to take place anywhere, anytime, and at any pace. E-learning is rapidly expanding because it meets people’s ongoing and varied needs; it is flexible, convenient, efficient, and effective; however, it is only available to those who have ICT skills.

The literature on how adults with developmental disabilities participate in distance learning is limited; however, two relevant studies were found. Sutcliffe (1995) reported a case study of a 15-year-old learner in Australia whose special needs were met through blended delivery. The learner received face-to-face instruction at a learning centre from onsite instructors, while the distance educator produced the learning materials, monitored progress from a distance, and functioned as a coordinator for the other members of the team. Miller (1987) reported on the

technology-based initiatives in adult special education that were delivered via open learning in British Columbia, but also noted that learners with special needs were forced to fit into existing, rigid education systems and called for more research into adult special education delivered via open learning. In that same year, Vincent (1987) indicated that multimedia techniques were creating new opportunities for disabled people (as cited in Miller, 1987, p. 96), but cautioned that longer training or learning periods were necessary (p. 35).

This body of literature on access to learning shows that people with disabilities face inequities and challenges as lifelong learners. However, attitudes are changing and investigations are revealing how to help learners with developmental disabilities achieve educational success. Both traditional and distance educational systems are becoming more responsive and welcoming to learners with special needs.

Summary of the Literature

The literature review shows that literacy, ICT, and inclusion are interrelated. Literacy now involves the ability to use modern-day ICT tools. Literacy and ICT skills facilitate inclusion in community activities as web-based technologies are beneficial, much-used, much-desired, and highly motivating tools for everyday living, working, playing, and learning. Increasing numbers of people of all ages are using ICT to find information and to connect with others, and all users require safety training and secure e-mail systems. 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).

The literature also shows that it is never too late to become a lifelong learner. Learners with developmental disabilities, like any learner, should be able to participate in all forms of lifelong learning, both offline and online. 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. Assistive technologies, such as screen readers and voice e-mail, may compensate for low literacy levels and help to overcome other challenges people with developmental disabilities encounter when they go online.

How this Study Builds on Previous Research

The literature review revealed gaps in the research about the online activities of adults with developmental disabilities. Therefore, this study used previous research findings in the areas of literacy, the Internet, disabilities, assistive technology, learners with developmental disabilities, and e-learning in order to approach the problem of online exclusion for persons with developmental disabilities. The study followed up on two of Moisey's (2003) research recommendations: facilitate online participation by providing users with basic computer training and assistive technology.

This study adds to the body of literature by providing a multiple-case study that describes the activities and outcomes when 11 adults with developmental disabilities went online. It shows how assistive technologies were used to work around literacy deficits and build upon subjects' strengths, as Hearne and Stone recommend, rather than focusing on fixing deficits and weaknesses (as cited in Jeffreys & Gall, 1996, p. 46).

The study contributes to the literature by providing protocols for enabling adults with developmental disabilities to gain ICT skills and by reporting the outcomes when they go online.

CHAPTER III

Methodology

Research Paradigm

This investigation used a mixed approach, collecting both qualitative and quantitative data. A multiple-case research design was used. Fieldwork consisted of observing behaviors, examining e-mail documents, and conducting interviews. Field notes were taken during data collection and analyzed at the end of the study.

A qualitative approach was taken initially as the review of the literature revealed that little was known about adults with developmental disabilities' use of online technologies. A qualitative approach is appropriate when variables are unknown and the theory base is "inadequate, incomplete, or simply missing" due to a lack of previous research (Creswell, 1994, p. 10). During qualitative research, scientific data is obtained through experiences. The researcher interacts with participants and records "what is heard, seen, read, felt or otherwise noticed respecting the topic or situation under scrutiny" and tries to "gain knowledge (data) from the subject's frame of reference" (Mauch & Birch, 1998, p. 17). Typical qualitative studies, including this one, investigate what people think, how they feel about certain things, how they behave within society, and how they go about the business of living (Mauch & Birch, 1998, p. 17). In qualitative studies, procedures tend to be open and flexible, rather than closed and rigid, in order to cope with the uncertainty that arises since the "boundary between a phenomenon and its context

is not always clear” (Yin, 1999, n.p.). Qualitative data are often collected in the form of words, a form that does not easily allow “quantification, specification, objectification or classification” (Mauch & Birch, 1998, p. 17). The final product in a qualitative study is often a narrative that includes quotes from the informants. Similarly, this study generated a narrative about the activities and outcomes of several adults with developmental disabilities who went online.

A quantitative approach was not initially taken in this study as the problem did not have readily identifiable variables that could be objectively controlled and measured in surveys or experiments (Yin, 1999). The researcher also wished to become actively involved with the participants rather than take a passive approach and remain detached to avoid influencing the investigation (Creswell, 1994, p. 145). The researcher wish to consider the context rather than delete context or “tightly control it [and] minimize the influence of affective nuances” (Mauch & Birch, 1998, p. 19). However, as the study unfolded, the “exploratory” operational mode was used in conjunction with a “logic model” framework, which is not unusual in case studies according to Yin (1999, n.p.). As this study unfolded, the researcher hypothesized that certain training methods and certain technologies would facilitate the subjects’ online activities and explored these methods in order to create training protocols. Also, as the study unfolded, the quantitative data that became readily available were collected and analyzed. The numerical data were used to add richness to the narrative and support the conclusions that were drawn.

The study’s generation of qualitative and quantitative data is not unusual; most case studies will reply on multiple types of data collection” (Yin, 1999, n.p.).

A multiple-case study design was used. A single case study focuses intensely on a “single phenomenon within its real-life context” that contains “innumerable variables” (Yin, 1999, n.p.); a multiple-case study was conducted as it is more useful than a single case study in a situation where the researcher is interested in understanding the “same issue” or a “particular situation from different perspectives” (Jacelon & O’Dell, 2005, p. 49). Multiple data sources maximize “the range of data that might contribute to the researcher’s understanding of the case” (Jacelon & O’Dell, 2005, p. 51). In other words, studying 11 subjects was expected to be more useful and informative than studying one subject alone.

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” (Yin, 1999). In this study, each subject is the 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 when several adults with developmental disabilities went online. The final product is a realistic, but unique, “matter-of-fact portrait” that closes a gap in the literature (Creswell, 1994, p. 159).

Phases of the Study

The study involved three distinct phases:

- *Phase 1: Setting Up Training.* This phase was designed to answer the study’s first subquestion about what factors to consider prior to training.

Seven factors were identified and are discussed below in a section titled, “Phase 1 Methodology: Set Up Training.” More than 30 hours of set-up time was needed prior to the first meeting with subjects and an additional five hours of preparation time was needed during the study to prepare for subjects’ participation in the study.

- *Phase 2: Training.* This phase was designed to answer the study’s second subquestion about how to conduct effective computer operations, web search, and e-mail training. First, the ICT skills needed to go online were identified. Then approximately 62 hours of training were provided, in total, to the 11 subjects involved in the study. Throughout Phase 2, nine protocols relating to training were developed through a trial-and-error process. As new subjects entered the study, the improved protocols were used. During the latter part of Phase 2, four key informants were offered extended training so that the training protocols could be further refined. Information about the training conducted in Phase 2 and the nine training protocols that were developed appear below in a section titled “Phase 2 Methodology: Implement Training and Create Training Protocols.”
- *Phase 3: Outcomes.* This phase was designed to answer the study’s third subquestion about the outcomes of ICT training. Five hours of interviews were conducted with subjects and other participants (parents, guardian, and support workers) in order to identify and evaluate the outcomes. Interviews were used to ensure that the conclusions accurately reflected participants’ experiences. After interviews were completed, new data were

analyzed, previously collected data were reviewed, protocols were re-examined, and a narrative was written. Additional information about Phase 3 and the outcomes appear below in a section titled “Phase 3 Methodology: Determine Outcomes.”

Phase 1 Methodology: Set Up Training

Set-up involved seven factors: (1) arranging the location; (2) selecting the technology; (3) deciding on the length and frequency of training sessions; (4) selecting the subjects and other participants; (5) reviewing ethical issues; (6) addressing ethical concerns; and (7) obtaining informed consent and assessing subjects’ learning needs. A set of protocols was iteratively developed for obtaining informed consent and assessing subjects’ learning needs as subjects entered the study at their convenience over a period of two months. Protocols were refined as subjects entered the study.

The Location

The study took place in a host agency situated in the northeast region of Alberta, a large but sparsely populated area covering one quarter of Alberta’s territory.

The host agency was situated in a rural area and provided various services to approximately 225 adults with developmental disabilities. Services included individual service planning, independent living supports, community living supports, employment supports, community inclusion supports, child support services, and healthy living instruction. The host agency was contacted in June 2003; the study began in September 2003 and concluded in April 2004.

The Technology

The host agency's computer was secure and conveniently located for the subjects who were accustomed to making trips to the agency. For the first six months of the study, a Pentium II computer with Windows 98, speakers, a stem microphone, and high-speed Internet connectivity was used. As the computer did not have assistive technology software to facilitate online activities, Voyager Suite, Read & Write, and ICan Email were installed. The hard drive had sufficient RAM and ROM to run and store the assistive programs.

A staff member at the agency who was knowledgeable about computers set up and maintained the clients' computers; all users were asked to use the default settings. The default for screen display was enlarged text and icons to accommodate people with vision difficulties; however, doing so created the need for frequent scrolling from top to bottom and from left to right on all web pages. Due to the host agency's policy and time constraints, default settings were not changed prior to each training session to accommodate each subject, even though none of them had vision difficulties.

The researcher requested and obtained a default setting of a slow double-clicking speed and the use of ToggleKeys. The researcher could have asked for permission to alter settings at the beginning of each session and return to the defaults at the end of the session, but doing so would have reduced training time. The researchers used all other default settings, which at times were annoying but did not prevent online activity. (For further discussion, see Chapter IV Results and Conclusions, the section titled "Answer to Subquestion 1.")

For the last month of the study, a new computer was used. The agency purchased a HP Pavilion 6630 (500 Hz Intel Celeron processor), a large flat panel monitor, a wireless mouse, and a wireless keyboard. Read & Write and ICanEmail were reloaded and set-up. Favorite websites were located and bookmarked again. The new computer performed commands quicker and froze less often when running several programs at once. Defaults were again set to display larger fonts and icons to accommodate people with vision problems, so subjects in the study continued to have to scroll left and right as well as top to bottom during all web activities.

The NorthEast Community Online website was selected as the e-mail agent as it contained an intranet e-mail function. This was an easy-to-use intranet e-mail system based on SquirrelMail.

The Length and Frequency of Training Sessions

A training schedule was set up so that each subject would have a 30-minute training session once a week. As the agency's computer was well used throughout the day, training started after 3:00 p.m. and finished at the 5:00 p.m. closing time.

Subjects and Other Participants

The subjects and other participants were selected purposefully (Creswell, 1994, p. 148).

Subjects. Subjects were selected from a group of adults with developmental disabilities receiving services from the hosting agency. The subjects met eligibility requirements for funding from the Northeast Alberta Community Board for Persons with Developmental Disabilities (PDD) to provide services and supports.

The community inclusion program coordinator at the agency referred 13 of the program's participants to the researcher. Individuals were not required to have computer skills, only an interest in computers, e-mail, and Internet training. Twelve people voluntarily entered the study between September 2003 and November 2003, whenever it became convenient for them to do so. However, one individual moved away after a few sessions and, therefore, was dropped from the study.

The 11 subjects officially enrolled in the study included four men and seven women, all between 25 and 45 years of age. They had varying degrees of computer experience. Three subjects regularly used computers for educational games (stored on the hard drive, not accessed online). Of these three, two had basic e-mail and Internet skills.

Other Participants. Other participants included agency personnel, parents, guardians, and the researcher who functioned as the computer coach. Their selection was based on their involvement in the study's activities and their willingness to provide feedback.

Ethics Review

The subjects were classified as a vulnerable research population (Medical Research Council of Canada, et al., 1998, p. 2-12), an important factor in the study as online activity has some known risks. Therefore, informed consent involved many steps and many parties. Initially, project information was sent to the Northeast PDD, to the NorthEast Community Online project director, to Athabasca University's Research Ethics Board, to the host agency, and to the program coordinator. After these parties gave their support to the study, the subjects, their support workers,

and/or their guardians/parents were provided with written information and asked to participate voluntarily in the study.

A vulnerable population's participation in research is not unusual. The general consensus within the community of people most affected by this study was that adults with developmental disabilities are experts on what it is like to have a developmental disability; therefore, they should be directly involved in research that affects them. In fact, PDD provides research funds so that adults with developmental disabilities can be included in applicable research (PDD, 2003). This study was pertinent—adults with developmental disabilities and their families/guardians had specifically requested access to ICT in the belief that it would enable them to "meet and maintain contact with others, express their views, share their experiences, and provide input into policy-making" (Moisey, 2003, p. 3).

Addressing Ethical Issues

The following efforts were taken to minimize the risks associated with being a research subject and with using online technologies:

- Experts in the field of developmental disabilities were asked to provide input to and approve the study and refer the subjects.
- Informed consent was obtained. Subjects received general information about the study written in plain language, whereas all other participants received detailed information. Subjects who acted as their own guardians signed their own consent forms, and their support workers witnessed their signatures. Subjects with guardians signed their own consent forms, as

did their guardians. The other participants also signed consent forms.

(See Appendices A, B, and C for letters of invitation to participate in the study, detailed information about the study, and consent forms.)

- Subjects were reminded that their involvement in the study was voluntary, that they had the right to withdraw at any time during the period in which data was collected without prejudice, and that they also had the right to refuse to answer any questions posed to them. Periodic reminders about voluntary participation and repeatedly seeking informed consent adhere to Young's (1999) recommendation that people with developmental disabilities be given regular opportunities throughout a study to verify an ongoing willingness to participate (p. 2).
- Appropriate technologies were used to reduce risks. A secure computer at the support agency was used instead of a publicly-accessible computer. The three e-mail systems selected—the NorthEast Community Online's e-mail system SquirrelMail (which uses a Spam Assess filter), Voyager Suite, and ICanEmail—were all designed for the target population.
- Internet safety training was provided. The NorthEast Community Online website was used because the information was written in plain language.
- Training was conducted in an open area where the host agency's staff could observe the sessions. Support workers were also invited to give feedback on activities throughout the study.
- Field notes were shredded when they were no longer needed.

Protocols for Obtaining Consent and Assessing Goals

Protocols were developed for two set-up factors: obtaining informed consent from the potential subjects and for assessing learning goals of the individuals who wished to participate in the study. These protocols appear below.

1. *Introduce potential subjects to the coach.* During the first meeting, a friendly discussion occurred so that the computer coach (the researcher) could make a personal connection with each potential subject and demonstrate what a computer coach does.
2. *Introduce potential subjects to a simple computer activity if appropriate.* Two potential subjects had Internet experience and did not need an introductory computer activity and proceeded immediately to Step 3 below. All other potential subjects sat directly behind the computer and used Voyager Suite's Mouse Trainer to complete a simple puzzle and reveal a picture. This activity assessed the user's ability to use a mouse and interest in operating a computer. All potential subjects successfully completed simple puzzles in less than a minute while the program offered verbal encouragement and prompts such as "Nice work" and "Keep going."
3. *Obtain informed consent.* After Steps 1 and 2 (conversing with the coach and/or completing a puzzle), potential subjects were asked if they would like to continue the session and do a second computer activity using the Internet. If they agreed, they were considered official subjects. Two potential subjects elected to quit after the first activity, after approximately

five minutes. One did not become an official subject as he decided not to participate in the study. The other officially became a subject when he attended another training session the following week.

4. *Introduce subjects to an appropriate online activity.* Subjects entered the NorthEast Community Online website at www.ne-community.com (Figure 1), a virtual community designed for people with developmental disabilities. After the first few subjects had difficulty typing the address, the website was added to the Favorites menu for easy access.

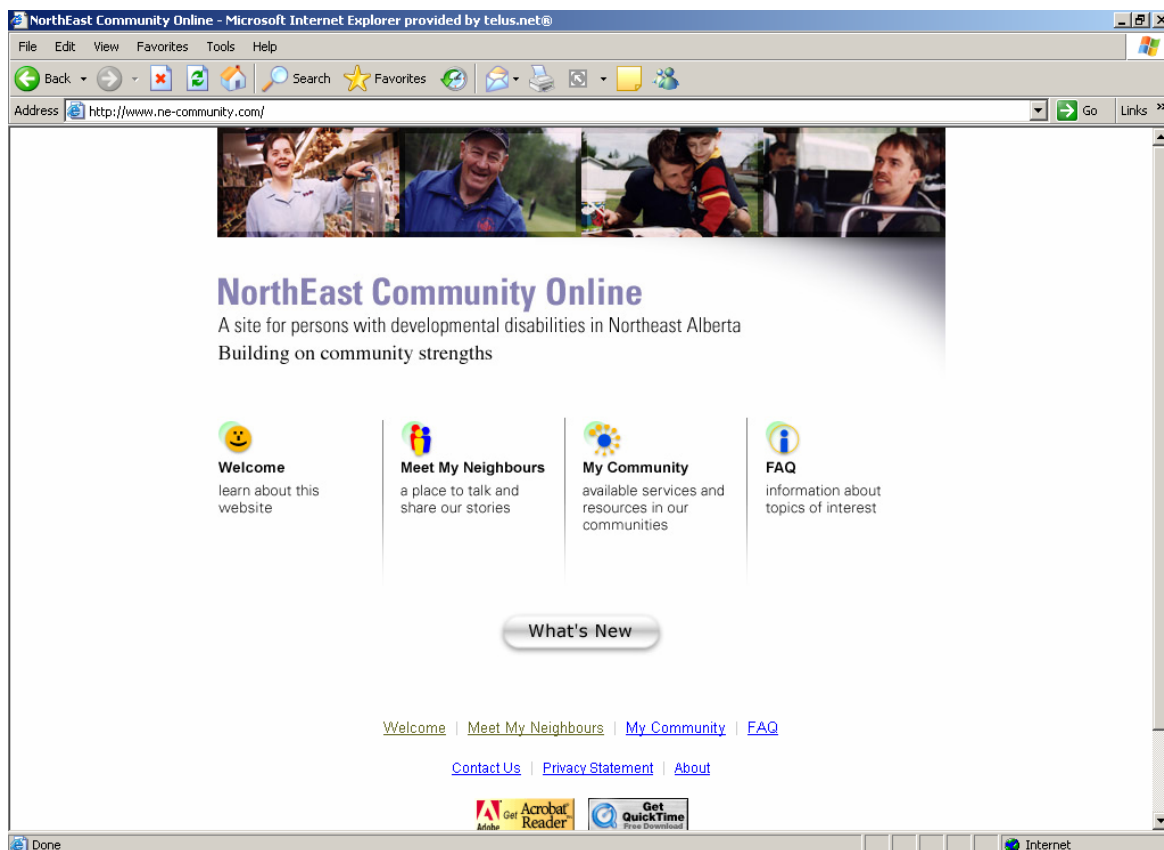


Figure 1. NorthEast Community Online home page.

- If subjects were unfamiliar with basic computer operations or if time was short, subjects were asked to select a personal story about one of the members of the online community and read it aloud. If reading aloud was difficult, subjects selected a story in audio format and listened to the story. (See Figure 2 for the page listing stories. The speaker icon denotes that an audio version of a story was available.)

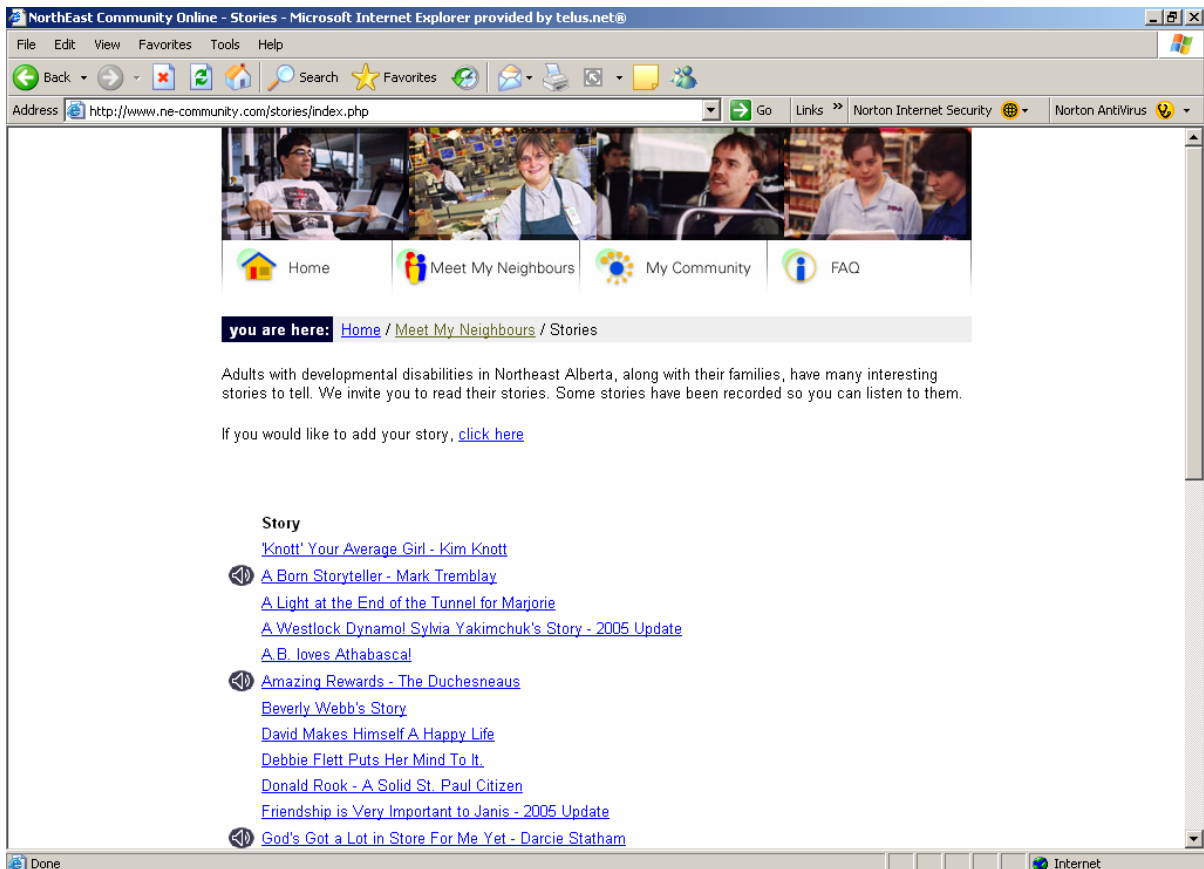


Figure 2. Members' stories posted in NorthEast Community Online.

- If subjects were primarily interested in e-mail activities and time permitted, they used NorthEast Community Online e-mail. Two subjects had e-mail accounts; other subjects registered for an account

as the voice e-mail programs used in this study worked in conjunction with text-based e-mail accounts. To register, subjects read or were read the registration questions, and then typed their answers (Figure 3). The subject and computer coach selected an easy-to-remember and easy-to-spell password.

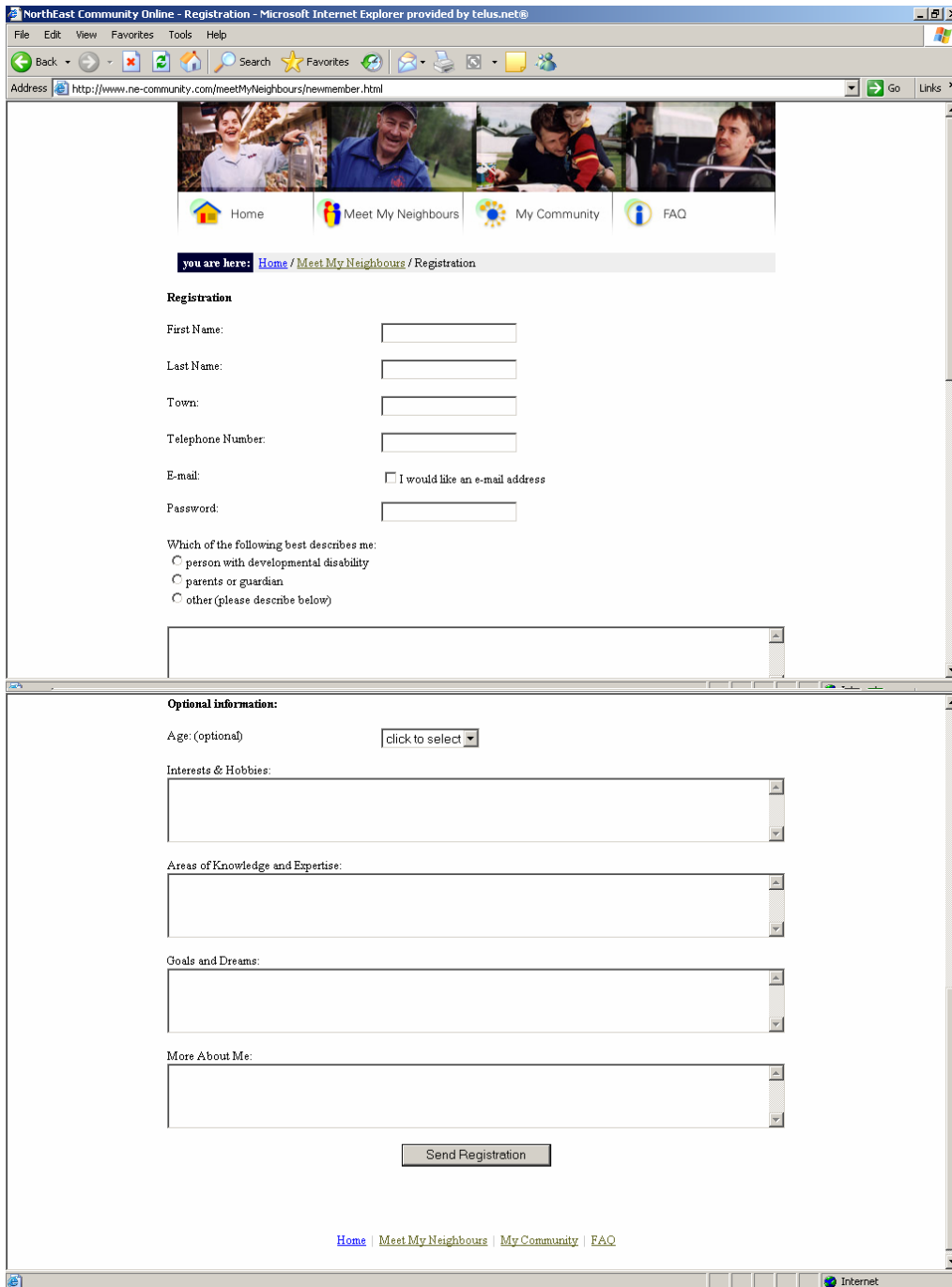


Figure 3. Online e-mail registration form.

- Subjects who had e-mail accounts either demonstrated their e-mail skills or described what they wanted to learn about e-mail.

5. *Assess learning needs.* The process of assessing literacy skills, interests, ICT skills, and assistive technology began in Phase 1 of the study while subjects used the NorthEast Community Online site so that individualized computer, e-mail, and Internet training programs could be established.

(Note: Assessment of learning needs also continued throughout Phase 2.)

- Literacy skills were evaluated as subjects read aloud (e.g., website information, the e-mail registration questions, screen prompts). Reading difficulties indicated a need for assistive technologies for Phase 2 of the study (the actual training sessions).
- Subjects' reaction to the NorthEast Community Online website determined whether or not the next training session would include further exploration of the website, participation in the online community, and/or further e-mail instruction.
- An interest in exploring other websites was assessed by asking subjects about their hobbies and interests.
- ICT skills were assessed by noting how many verbal prompts and how much physical assistance subjects required to successfully access and navigate within the website (e.g., how to double click, how type the address, how to click on links, what to type, and how to exit). Verbal instructions were first provided in plain language and using simple analogies. For example, a scroll box was called "an elevator"; subjects were asked to "use the elevator to take us to the top" instead asked to "scroll." Double clicking was demonstrated by the coaching resting a

hand on the desk and tapping on the desk with the right index finger and saying “1, 2” at the appropriate double-clicking speed. If additional help was needed, the coach gave verbal instructions in plain language, used simple analogies, and used a pen to point out relevant screen icons and keyboard keys (e.g., “This picture here of the hourglass or timer means we have to wait.” “Here is the hyphen. It’s a little line.”). If additional help was still required, minimal physical assistance was provided, such as preventing the mouse from moving while subjects clicked or double clicked. (Note: the reduced double-clicking speed was only partially helpful.) Assistance was given by the coach pressing the mouse cord, right where it attached to the mouse, down onto the desk so that the mouse stayed in place while the subject pressed the button once or twice. If subjects required more physical assistance with double clicking, the coach placed a hand over each subject’s hand so that the double click was done together. The coach did not touch the mouse or keyboard unless help was needed or if the coach needed to use the mouse or keyboard to demonstrate a task. Prior to demonstration, the coach asked for the subject’s permission to use the input devices (e.g., “May I show you what to do?” “Now try that on your own.”).

6. *Facilitate fun and success.* All subjects successfully operated the computer with various amounts of verbal and physical assistance. Typical operations included opening programs, selecting commands from menus,

spotting links, using the mouse, scrolling, navigating forward and backward in a website, adjusting the speaker volume, typing, and exiting programs. During the Phase 1 activities, the coach offered encouragement and worked at each subject's preferred pace.

7. *Close the session and confirm consent.* At the end of the session, the coach confirmed that subjects wished to officially move on to Phase 2 of the study (regular training sessions). The training times and dates scheduled on a nearby calendar were verified.
8. *Record data.* Data were recorded during the Phase 1 in a typical qualitative fashion. Less than one-half page of handwritten and factual, descriptive notes and "demographic information" (Creswell, 1994, p. 152) was taken during observations, such as day and time of the observation, the length of the observation, the subjects' choice of activities, web pages or e-mail documents observed, subjects' reactions to activities, technology issues, and the environment. Dialogue was occasionally recorded; however, no protocol or form was used.
9. *Analyze data.* Data regarding literacy skills, interests, ICT skills, and assistive technology needs were analyzed in order to plan for the individualized training activities for Phase 2. Reflective notes were created when the descriptive notes were entered into a word processing file, and contained typical qualitative data such as "speculation, feelings, problems, ideas, hunches, impressions, and prejudices" (Creswell, 1994, p. 152) about the sessions, interactions, training methods, outcomes, setting, or

technology. They also included comments about the barriers to building basic computer skills, barriers to participation in online activities, and literature topics to review. The data were also analyzed in order to refine protocols.

Phase 2 Methodology: Implement Training and Create Training Protocols

During training, subjects received instruction in how to connect with other people through e-mail and how to find information on the Internet. Table 1 lists the basic skills needed to engage in these online activities and indicates that the skills are often developed in elementary schools.

Table 1

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

Web-based ICT Skills Developed in Grades 1-6
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
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

(table continues)

Table 1 (continued)

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
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

Note. 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). The basic computer operations skills listed in Table 1 were not taught separately during this study; these skills were developed at the same time as web browsing and e-mail skills.

The skills were taught using the instructional methods described below.

- ask the learner to select online activities so that the training session would be fun, interesting and motivating;
- give directions, explanations, encouragement, and praise during hands-on activities;
- give subjects the opportunity to repeat activities in order to build skills yet give them some variety within these activities;
- offer opportunities to experience new tasks and gain new skills;
- provide appropriate and declining levels of support; and
- provide safety training.

While ICT training was taking place, nine protocols were developed and refined on a trial-and-error basis. In order to develop these protocols in a reasonable amount of time, the researcher identified subjects most likely to provide useful data. Four months into training, eight of the 11 subjects were invited to continue with the study, and all accepted the invitation. After another two months, four subjects were invited to continue with the study, and all four accepted the offer to participate in more training. These final four subjects were considered to be key informants. They were committed to the study and to their own learning, evidenced by their regular attendance at sessions and enthusiasm during the activities. They arrived with specific lists of what they wanted to do with their time during each training session and made decisions throughout the activities.

Below is a discussion of nine training protocols. These instructional processes effectively enable adults with developmental disabilities to gain the skills needed to find information on the Internet and to connect with others via e-mail.

Protocols for Determining Undefined and Specific Recreational Goals

During Phase 1, as learning objectives were assessed, it became evident that all subjects were primarily interested in learning how to use the Internet for recreational rather than serious purposes. During Phase 2, as learning objectives continued to be assessed, observation of subjects' behaviors lead to the conclusion that subjects held one of two kinds of recreational goals: (a) undefined recreation, where the subject wanted the coach to guide the recreational activities; or (b) specific recreation, where the subjects wanted to guide their own recreational activities.

Identifying the recreational goal was necessary so that training methods could be adjusted to suit each subject's preference. Below are the guidelines that were developed to assess the recreational goal.

Undefined recreational goals. Subjects with undefined recreational goals tended to display three characteristics:

- *They limited the training time.* For example, one subject attended every session and continually expressed a desire for ongoing training, but always elected to end sessions at the earliest possible opportunity. He participated in the study for 2.5 months, but eight sessions resulted in only 1.75 hours of training. Four other subjects smiled and laughed during training activities. They always indicated their desire to attend future

sessions, but they were also likely to cancel sessions for reasons unrelated to health or transportation issues. These subjects did not express disappointment when the researcher ended their participation and extended training to only the key informants.

- *They were content to let the computer coach direct the activities.* Subjects with undefined recreational goals did not give suggestions for activities (e.g., suggest topics to research on the Internet) and did not want to make a choice when given two options. These subjects wanted the computer coach to make suggestions for online activities that focused on the fun aspects of using the Internet (e.g., visit websites with multimedia and access interactive e-cards). They were seeking an introduction to online recreation and wanted to know what was possible without focusing on any one particular form of recreation.
- *They performed basic computer operations in noticeably different ways.* For example, one subject performed computer commands as rapidly as possible and moved through as many web pages as possible, surfing the Internet by clicking, double clicking, scrolling, using links, and navigating forward and backward. Observing his online behaviors was similar to watching someone play a video or computer game as he made many rapid, fine motor movements with the input devices, and the screen display constantly changed. Using the computer in this way entertained him. He observed some information and saw some pictures as he surfed through a variety of coach-led activities.

Another subject with undefined recreational goals operated the computer in an opposite way to a *gaming* approach. This subject used the mouse tentatively, often with only one finger and without resting his hand over the mouse. He also rarely spoke during sessions and did not make a selection when given two choices during training. The interview with his support worker revealed that he elected to receive reading and writing instruction in a traditional way and did not want to use computer technologies. This subject's desire to use a computer for some activities and not for others could be explained by examining his goals. He did not want to use a computer for reading and writing instruction, which had a serious and educational purpose. Rather, he may have wanted to fill some leisure time in a spontaneous way. Using the computer in this way entertained him. He, too, experienced a variety of online recreational activities selected by the computer coach.

Specific recreational goals. Subjects with specific recreational goals were entertained by achieving specific, self-selected tasks, such as contacting out-of-town relatives and finding information to satisfy their personal curiosities. Subjects who had specific recreational goals tended to display three characteristics.

- *They liked long training sessions.* Subjects with specific recreational goals became immersed in online activities for 30 minutes and longer. They used extra time whenever it became available (e.g., when other subjects were absent, the office stayed open late, or they decided to observe other subjects' sessions).

- *They controlled the training activities and had preferences about the duration of training.* For example, one subject selected personally meaningful topics to explore outside of training sessions and wrote her preferred web search topics on her hand so that she would not forget. Another subject developed the habit of sitting down in his chair and immediately listing off what he wanted to do and in what order. He clearly showed that he had recreational preferences and wanted to give input into his training plan. A third subject indicated that she wanted to continue performing variety of e-mail activities, but did not want to engage in web searches. A fourth subject limited her online activities to connecting with others via e-mail and staying up-to-date on soap opera events when her job prevented her from watching the show. A fifth subject controlled both the training activities and the number of training sessions. She specifically asked for help accessing her e-mail. Once she achieved her practical and purposeful learning goal (i.e., fix a password problem and learn one or two new things about e-mail), she no longer needed the computer coach as a resource and ended her training. Unlike subjects with an undefined recreational goal, these subjects with specific recreational goals did not want their online activities to end.
- *They connected with the textual, visual, and auditory information within e-mail messages and websites.* Subjects who gave input about what to see and what to do spent more time reading the online information and talking about the information with the coach.

The coach did more preparation work *before* the training sessions involving subjects with undefined recreational goals, and their training was short term. The coach spent more time during the training sessions involving subjects with specific recreational goals, and their training was long term.

Protocols for Computer Operations, Web Searches, and E-mail Training

1. *Select technology carefully and stay up-to-date.* Adults with developmental disabilities need a computer capable of processing multimedia because text information is less accessible than audio and graphic information. Some individuals also require assistive technology, which commonly requires significant computer memory and processing capability. Emerging assistive technologies may not work perfectly and new developments should be monitored.
2. *Encourage decision-making and goal setting.* These are basic tenants of adult education. First, both strategies facilitate individualized instruction. Individualized instruction is necessary as adults' interests, abilities, and previous learning experiences are not identical and cannot be served with the same instructional strategy. Asking adult learners to make decisions and set goals increases the relevance of training activities and enhances motivation. Second, both strategies promote self-determination. As Kingma notes, self-determination is an essential skill that allows people to "defend their interests, promote [their] skills/strengths/talents, be active participants, have positive relationships, and interact in a manner that

promotes inclusion in the community” (T/TAC Bulletin, 2001, Communication Considerations section).

- Sessions began by having a friendly conversation and asking subjects if they had any activities they would like to do. If they did not, they were asked to make a choice between two activities, typically either e-mail or web browsing, and then to make more choices within each activity. Two options were offered for decision-making. For example, subjects were asked, “What do you want to do first, open that e-mail from me or send someone an e-mail?” or “Do you want to keep that e-mail message from your mom or throw it away?” If subjects did not know what to investigate during web browsing, they were asked what kind of information they would seek in a library. Other prompts were provided if necessary, such as “What’s your favorite sport?” and “What hockey team do you like?”

3. *Make the online experience authentic by honoring choices and decisions.*

- Flanagan’s discussion of self-determination notes that people with disabilities need to explore the world; people who support them must “let go” while walking a “tightrope between protection and independence” (as cited in T/TAC, 2001, Partners in Learning section). This recommendation is supported by Jeffrey and Gall (1996). Protecting adults with developmental disabilities from the risks of using web-based ICT by denying access to online technologies also denies them the benefits of this technology. Certainly the risks are real, but

they can be effectively managed with measures such as a secure e-mail system, Internet filtering software, safety training, and appropriate supports.

- The subjects in this study experienced some of the typical annoyances that happen to all Internet users at some time or another. For example, they had to reboot the computer after it froze during an operation, experienced hardware and software that did not always work or had shortcomings, and were frustrated by slow response times and wanted to the computer to work faster. Subjects did not have individualized computer settings and had to deal with pop-up windows among other annoyances. One subject found inaccurate information on the Internet, and another experienced Internet commercialism and encountered aggressive marketers. Had the study lasted longer, they might have experienced other annoyances (e.g., spam) or dangers (e.g., viruses, pornography). Subjects in this study had realistic online experiences; they were guided, but not overly protected. At times, their choices led them in directions they did not want to go, they experienced some disappointments, and they had to manage problems; but all these opportunities enhanced learning and promoted self-determination.

4. *Promote success during enjoyable training activities.*

- Give practice in previously taught tasks.

- Introduce new tasks when appropriate. Offer variety in training activities to maintain motivation and participation. ICT can offer great diversity in tasks and richness in learning experiences.
- Provide assistive technology when necessary.
- As learners perform tasks, give encouragement and praise.
- Provide appropriate verbal and physical assistance. Enjoyment, learning, and personal agency are gained by doing, not watching. Learners should sit directly behind the computer and be asked and allowed to perform all computer operations (e.g., the coach should not touch the mouse, keyboard, or speaker volume button). This instructional approach supports Triggs' (1998) recommendation for trainers to remove their hands from the mouse and the keyboard so that their personal interests and needs are not imposed on the "work of the project" (p. 6). Learners need an appropriate level of assistance, not too much and not too little. Trainers should provide support "without taking over" (Triggs, 1998, p. 7).

In this study, subjects were initially given verbal prompts and offered physical assistance only when necessary so they could successfully perform the desired activities. As subjects gained more experience and skills, verbal cues were reduced. For example, when trying to access e-mail, subjects were invited to "just try something" to see if they ended up where they wanted to be. Over time, instructions were given in both plain language and in computer terminology, using

terms such as “scroll,” “exit,” and “shut-down.” Two typical prompts were the following: (1) “See this X up in the corner? Click on it to put everything away and leave the computer ready for the next person. Good. We’re back to where we first started”; and (2) “The computer isn’t working. We have to turn it off in a special and safe way. Hold down this Ctrl key and this Alt key. Good. Now push this Delete key once. Good. We’ll just wait until the computer gets itself going again.”

5. *Use plain language and simple analogies.* For example, recording a voice e-mail message can be compared to leaving a message on an answering machine. Subjects who were having difficulty composing a message were asked, “What would you say if you telephoned this person right now?” When using the screen reader, learners were shown that the icons for operating the software looked like VCR or CD player buttons. The animated Internet Explorer icon in the upper right corner of the window that shows that a page is loading was pointed out as an important cue (e.g., “See it moving? That means the computer is trying to do that job for you, so we have to wait.”). Plain language can gradually be replaced with official terminology for some individuals (e.g., all long-term subjects understood the terminology of “scroll”, “shut-down”, and “inbox”).
6. *Gradually reduce assistance and do not expect that all users will become fully independent.* An initial expectation in the study was that subjects would become independent after several months of training, but this was not the case. However, even if people cannot access the Internet

independently, going online still has value as a supervised and supported recreational activity (Think and Link, 2003).

7. *Commit an appropriate amount of time to training.* For learners with undefined recreational goals, weekly 45-minute training sessions over a two-month period was appropriate for providing an introduction to online recreation. For learners with specific recreational goals, at least six months of training is required. Also consider having longer sessions or meeting twice a week.
8. *Plan for future training and close the session.* Skills and interests were continually assessed, and subjects were asked for suggestions for their next training session. Subjects were thanked for attending the session.
9. *Record and analyze data in order to refine protocols.* Training events were observed and recorded in order to create and refine training protocols. E-mail documents were observed, examined, and analyzed while subjects processed incoming and out-going e-mail. No standardized procedure was used when examining e-mails from subjects and their correspondents, but descriptive and reflective notes were made about this source of data.
10. *Obtain ongoing consent.* Each subject's desire to continue to participate in the study was confirmed by asking subjects whether they would like to discontinue training or meet again the following week.

Protocols Specifically for Web Search Training

1. *Plan a lesson that offers access appropriate websites.* During web searches, subjects were asked to select the research topic. If they did not

have one, the coach suggested a topic. Google searches were performed to find the information selected by the subject or the coach. Subjects were asked which websites they wanted to bookmark for easy access in the future. Even though subjects were asked to select the web search topics, the coach also researched each subject's interests prior to each session to locate appropriate websites, particularly those with multimedia (e.g., music, interactive games). Subjects with undefined recreational goals went directly to these sites. Subjects with specific recreational goals were offered the option to explore these coach-selected sites if time remained after performing their self-selected recreational activities.

2. *Use assistive technology only when necessary.* As web pages were displayed, the coach noted whether or not the subject could read the information. If subjects were quite capable of reading the information displayed on the screen, no screen reader was used. If subjects had difficulty reading, did not want to read the information, or asked the coach to read the information, the screen reader Read & Write was used.
3. *Identify and use appropriate assistive technologies.* Voyager Suite's web search application was used early in the study, but did not prove to be a useful assistive technology. When using this application software, subjects clicked on a picture of a general search topics (e.g., sports), then on a picture of a more specific topic (e.g., baseball), but the assistance ended there. The typical Google's list of results appeared, and subjects selected and entered websites with no further pictures or audio help. If help was

needed with reading, a second assistive technology, Read & Write, was opened and used. After two short trial runs, Web Trek was no longer used for web searches because it did not provide sufficient or appropriate help. Moreover, running two assistive technologies added complexity to web searches. For the remainder of the study, subjects directly typed keywords into the Google search engine (the coach helped with spelling) and accessed links from the results list. The screen reader was used for further assistance with reading and writing.

4. *Develop assistive technology skills using the same methods as developing other ICT skills.* Subjects who used the screen reader were prompted through several steps while instructions were given in plain language and analogies were provided.
 - Subjects opened the program by first minimizing the website window and double clicking on the screen reader icon on the desktop. Subjects then maximized the website's window, and the Read & Write tool bar automatically appeared on top of whatever web page was open.
 - If Read & Write was being used for the first time, subjects selected the type of voice they wished to hear (male, female, English accent, electronic, etc.), the pitch, and the reading speed.
 - Once into the program, users selected the text that they wanted to hear, and a separate window opened where the selected text was displayed.

- The text-to-speech program highlighted individual words on the window as they were spoken. In this way, users were able to follow along with the text while it was being read. Users could stop the reading with another button on the toolbar, a square button similar in appearance to the stop button on a CD player.
- As soon as all selected text had been read aloud, the Read & Write text window closed, and the subjects were returned to the web page where the Read & Write toolbar remained. Subjects sometimes read the same text again, but usually selected new text to be read.

Protocols for Determining Readiness for E-mail Training

Protocols were developed to determine subjects' readiness for e-mail training. Subjects received e-mail instruction if all of the following conditions were met:

- subjects provided at least one e-mail correspondent's address;
- subjects expressed an interest in e-mail or selected e-mail when presented with the option of either surfing the Internet or using e-mail; and
- subjects were interested in participating a training activity lasting at least 20 minutes.

Protocols for Selecting an E-mail Address and Agent (Voice and Text)

The NorthEast Community Online's website provided default e-mail addresses of firstname.lastname@ne-community.com, an advantageous format that allowed the virtual community members to easily identify each other while interacting online and facilitated technical support to users who forgot their usernames and passwords. However, this default address created minor difficulties for nine out of 11

subjects (82%) and a safety concern for one guardian. Below is a list of protocols that were developed for selecting suitable text and voice e-mail addresses and a rationale for each guideline.

- *Use short and simple e-mail addresses.* Short and simple addresses are essential for time-efficiency reasons. As they logged onto text-based e-mail, most subjects searched all over the keyboard to find the letters. Longer addresses take longer to type, a factor if training sessions are short. Another reason why short and simple e-mail addresses are needed is to facilitate memorization. One of the original goals of the study was to eliminate the need for memorizing e-mail addresses, so no efforts were made to help subjects memorize their e-mail addresses. During the interviews at the end of the study when outcomes were being assessed, the four long-term subjects were asked to write their e-mail addresses on a piece of paper. Although they had been involved in the study for six months or more, they could not do so. Address length and complexity may have been a factor, but subjects also had not specifically worked on memorizing their addresses. An improved protocol would be to encourage memorization of simple and short e-mail addresses. This strategy would facilitate the exchange e-mail addresses with potential correspondents, as well as make it easier to send e-cards to others, and access e-mail on other computers.
- *If feasible, use a Mail User Agent (MUA) with a short domain name and simple log in procedures.* The NorthEast Community Online's e-mail login

box appeared in two different formats. One login box already had the axon sign (@) and domain name (ne-community.com) filled in for users. This login box was easy for subjects to use. However, while the study was running, a more difficult login box on occasion and users were required to type their complete addresses in the format of [firstname.lastname@ne-community.com](#). The axon sign is a requirement in an address, yet it is difficult to remember because it is an unusual character unlikely to be encountered in literacy training. It was difficult to find on the keyboard and time-consuming to type because it requires the shift key. Using the shift key is more difficult for individuals who type with one hand; therefore, StickyKeys are useful. (StickyKeys is a Windows Accessibility Option which allow users to lock the Shift, Ctrl, Alt, Option, and Command keys so that they do not have to press two keys simultaneously.) Figure 4 shows the more difficult login screen.

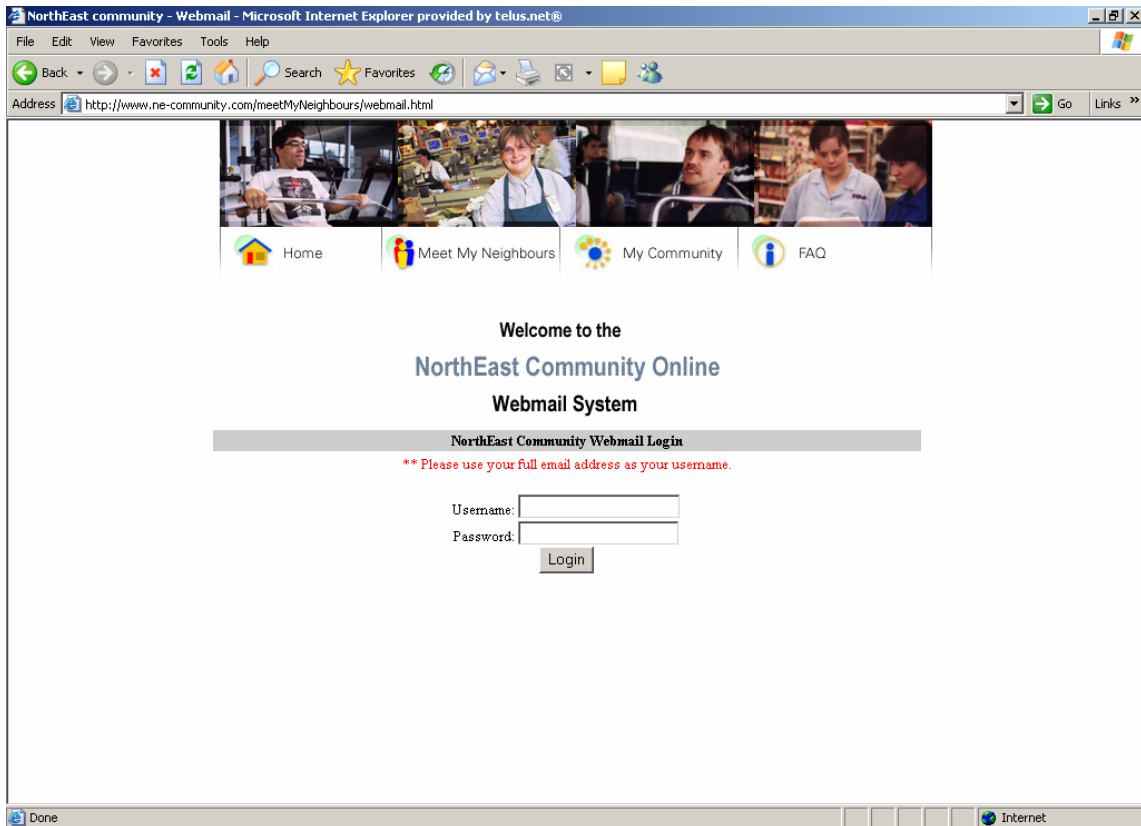


Figure 4. Login screen for NorthEast Community Online e-mail where users typed full addresses.

- *Select addresses with easy-to-spell words.* The domain name is part of an e-mail address. Subjects in the study had difficulty spelling *community* accurately. One subject also had difficulty spelling his last name which made the default e-mail address unsuitable.
- *Avoid addresses that have periods.* A default address with period between the user's first and last name was challenging to remember because subjects were taught in literacy classes to put a space between words and their first and last names. No punctuation or

character between the first and last name might have been easier than a period.

- *Avoid abbreviations and use addresses that make sense when screen readers read them.* Many subjects and e-mail correspondents did not know that *ne* in the domain address meant *northeast*. The screen reader read *ne* in the domain address as *knee*.
- *Avoid hyphens and underscores.* Both are common in website and e-mail addresses, but they are lesser-used punctuation and are less likely to be discussed in basic literacy training. Hyphens and underscores are time-consuming to type and easy to mistype; many people confuse the hyphen and underscore because they are similar in appearance and are typed with the same key on the keyboard.
- *E-mail addresses may need to protect the identify of the user.* One subject's parent had been taught to conceal name or gender in e-mail addresses and was concerned with protecting her daughter's identity. A pseudonym was used in this situation.

Protocols for Selecting the Form of E-mail Training (Voice or Text)

Protocols were also developed to determine whether to offer subjects instruction in voice-based or text-based e-mail. Subjects were automatically started with text e-mail and were shifted to voice e-mail if necessary. Voice e-mail is easier to use than text e-mail; however, it should not be used unless the following conditions exist:

1. Individuals are unable to read aloud a simple e-mail message (two short sentences).
2. Individuals need help composing a sentence of three to five words.
3. Individuals have ongoing difficulties remembering procedures or knowing which buttons to use.
4. Individuals are unlikely to want to send and receive e-cards.
5. Individuals have ongoing access for six or more months to a secure computer equipped with a voice e-mail program.
6. The use of voice e-mail will not adversely affect the subjects' literacy development activities.

This topic about selecting the form of e-mail training, voice or text, will be discussed further in Chapter IV in the Results section titled "Answer to Subquestion 1" and in Table 2.

Protocols for E-mail Training (Voice and Text)

Other general protocols were developed to guide instruction for either text or voice e-mail. Those guidelines are described below.

1. *Expose subjects to a variety of e-mail.* Once subjects started using either text or voice e-mail, the coach regularly sent subjects e-mail message so that they could practice sending, opening, closing, and replying to e-mail. In this study, subjects using voice and text e-mail found pictures to be an appealing and effective form of communication. Interactive e-cards were also useful, such as those at www.hallmark.com, as mini educational, multimedia games. Some subjects *played* the interactive e-cards several

times. Interactive e-cards also allowed recipients to practice mouse control by requiring them to accurately, and often quickly, move the mouse pointer to click on moving targets such as flying ghosts on Halloween cards, to connect dots to create a turkey on a Thanksgiving card, or to squish bubbles into colored happy faces. E-cards were particularly useful for subjects with undefined recreational goals.

2. *Accommodate lower-level reading skills.* In this study, many subjects needed text messages with short sentences and no contractions.
3. *Send e-mail messages with links to interactive and multimedia websites.* Text e-mail users clicked on the hyperlinks and entered the sites. Voice e-mail users, however, went through a longer and more complicated process of accessing the website outside of voice e-mail (they typed the address into the browser). Interactive websites were good for experiential learning and helped subjects develop an intuitive sense of how to work in an online environment. (For an example of an appropriate interactive website, see Maukie2 (<http://www.broenink-art.nl/maukie2.swf>). Users learn to manipulate a mouse using the activities from this website, by randomly moving the mouse pointer that a cartoon cat's head follows. If the pointer is directly positioned on the cat's forehead and not moved, the cat meows. When the pointer stops directly on the cat's chest, the cat purrs.)
4. *Selectively forward e-mail jokes and inspirational writings.* Appropriate messages should be edited for length and content prior to forwarding.

Correspondents must delete unimportant text headers that contain information about previous senders and recipients, and add a personalized message at the beginning of the forwarded text.

Correspondents need to delete hard-to-understand items in lists and pare down the volume of text to a manageable amount, generally no more than two or three screens of scrolling.

5. *Do not forward chain letter e-mails where recipients are pressured to forward the content to others.* In this study, subjects did not understand that forwarding was optional; they worried about not performing the forwarding request. Chain letters also highlighted a potentially upsetting reality—most subjects had limited correspondents and therefore could not comply with a request such as, “Forward this e-mail to five people you care about within the next 24 hours, and you will receive a blessing and good luck.”
6. *Messages with words in all capitals may be inappropriate.* Screen readers say each letter aloud instead of speaking the capitalized word. Acronyms should be spelled out or words emphasized in other ways (e.g., italics, quotation marks).
7. *Continually seek additional e-mail correspondents.* Subjects were encouraged to obtain e-mail addresses of correspondents other than the coach. Most subjects provided at least one support worker’s e-mail address (someone who lived in town and someone the subject frequently saw in person). A few subjects provided e-mail addresses for friends and

family members. Having at least some out-of-town correspondents is helpful as it shows the usefulness of e-mail. If out-of-town relatives and friends are unavailable as correspondents, however, e-mail buddies may be helpful (www.ebuddies.org).

8. *Gradually increase e-mail privacy.* As subjects began to compose messages independently, the coach made notes, looked away, or did something to appear busy and avoid reading the private message unless the subject specifically asked for assistance (e.g., spelling or a procedure), so e-mail documents gradually decreased as a source of data.

Protocols Specifically for Voice E-mail Training

1. *Seek appropriate and reliable voice e-mail application software from a company that offers technical support.* Early in the study, Voyager Suite's voice e-mail was purchased for \$650, but it was unsuitable for several reasons.
 - *Set up was time consuming.* A link had to be established from the free e-mail account, through certain versions of Outlook Express, and into Voyager Suite. The replacement program, ICanEmail, had direct access to free e-mail accounts.
 - *The assistive software had a design error.* When Voyager Suite worked correctly, subjects easily accessed their e-mail accounts by simply clicking on their own picture and/or name. To open mail in the Voyager Inbox, subjects clicked on the message. The text messages were automatically converted to audio and read aloud by a text-to-

speech reader; voice e-mail messages automatically played when opened and the sender's actual voice was heard. When subjects wanted to send e-mail, they clicked on the recipients' name and/or picture, clicked on a record button, talked into a microphone, and sent the e-mail which arrived in a text e-mail account as a blank text message with an audio file attachment. However, due to a design error, Voyager Suite's voice e-mail was not operational. The computer froze if there was a high volume of e-mail moving from the NorthEast Community Online Inbox through Outlook Express and into the Voyager Suite Inbox. Sometimes incoming and outgoing e-mail was lost during the sending or opening process.

- *Lack of technical support.* Two months passed before the company confirmed there were programming errors. The company promised to send replacement software within a couple of weeks; however, months went by and the software was never sent. Telephone messages and e-mail inquiries about the software continued to go unanswered, so ICanEmail was purchased for \$150. (<http://www.rjcooper.com/icanemail/index.html>). ICanEmail also had an audio and graphic interface and was designed for persons with special needs. With this voice e-mail product, subjects continued to access their already-established NorthEast Community accounts, much like Voyager Suite's procedures, but ICanEmail worked reliably and technical support was available for the few questions that arose.

2. *Develop assistive technology skills using the same methods for developing other ICT skills.* Instruction included plain language and analogies. For example, some subjects were hesitant about recording their voices for the first time in voice e-mail. Their comfort levels rose by using the analogy that recording a voice e-mail was like leaving a message on a telephone answering machine. Subjects were also asked to direct their learning activities. For example, subjects re-played and decided to send their message or re-recorded it. Subjects were also given practice on previous tasks and presented with new tasks. They were given only as much verbal or physical assistance as was necessary to ensure success, received praise for desirable learning attitudes, and were congratulated on accomplishments.

Protocols Regarding E-mail Correspondents

E-mail training is more likely to result in successful outcomes when suitable correspondents are selected, and they send appropriate e-mail (see Chapter IV “Protocols for Both Voice and Text E-mail Training”). The guidelines for e-mail correspondents listed below support and expand upon the recommendations made in the Think and Link’s project previously described in Chapter II (Think and Link, n.d., Survivors Email Tips section).

1. *The computer coach must have advanced ICT skills and make a significant time commitment.* A computer coach is needed to e-mail a variety of appropriate and increasing complex e-mails to learners that relate to their individual needs and interests. The coach must be prepared

to provide support for several months and do preparatory work before sessions so that the learner always is guaranteed of having e-mail to process. In this study, some of the coach's e-mails suggested relevant websites that subjects could visit.

2. *Additional correspondents with time and skills are needed.* Someone who resides in the same town is acceptable, but an out-of-town correspondent is preferable. Contacts at a distance best illustrate real world applications of e-mail and its value as a communication tool. If a contact resides in town, ideally the learner should not see this person daily or be present while the learner is accessing e-mail. Correspondents need to be able to open attachments (voice), create attachments (pictures), and have other basic ICT skills.
3. *Agreeing to be a correspondent implies a willingness to reply promptly to text or voice e-mails and/or to send at least one e-mail message per week on a regular basis for several months.* In this study, one subject obtained the e-mail addresses of several in-town and out-of-town family members and sent them e-mail, but received no replies; his e-mails were not returned. Presumably, the family members who had given the addresses to the subject knew they would be e-mailed and were willing to connect via e-mail. Unfortunately, such was not the case.

Phase 3 Methodology: Determine Outcomes

When the training phase of the study ended, subjects were thanked for their participation. E-mail users were invited to continue e-mailing the researcher. The

final four subjects were encouraged to make their own arrangements as they all wished to continue their online activities. Finally, interviews were conducted with the four subjects, as well as with four support workers, the program coordinator, one guardian, and two parents in order to do the following:

- to verify the conclusions that were being drawn from the data collected during Phases 1 and 2 of the study;
- to answer the third research question about the immediate and possible future outcomes when adults with developmental disabilities have access to online technologies and develop ICT skills;
- to look for discrepancies among subjects' and participants' perceptions about online activity;
- to determine if the assumption that online activities would continue independently or with the help of the agency's personnel was accurate;
- to gather suggestions for future projects; and
- to bring closure to the study.

Interviews lasted from two to 30 minutes. The informal, semi-structured interviews were conducted face-to-face or over the telephone using open-ended questions about various aspects of the study. Subjects were asked questions such as the following:

- "What did we do that you liked?"
- "Will you sign up for more training if we can find another computer coach?"

Guardians, parents, and agency personnel were asked questions such as

- “From your point of view, how beneficial is it for [subject’s name] to be able to go online?”
- “Would you like to see more Internet training offered?”
- “Do you have any recommendations for how to improve future projects?”

During the interview with the program coordinator, detailed information was provided about each subject’s activities and ICT skills in order to assist with future individual program planning sessions. Handwritten description notes were taken during the interviews, and reflective notes were made after the interviews.

Data Analysis

Three forms of data analysis were conducted to answer the research questions: ongoing data analysis throughout Phases 1 and 2; quantitative data analysis during Phase 3; and qualitative data analysis during Phase 3.

Ongoing Data Analysis

Ongoing data analysis occurred throughout Phases 1 and 2, beginning with setting up the study itself, throughout the first session to arrange each subject’s participation in the study, and continuing for seven months with a total of 123 training sessions for 11 different subjects. The descriptive and reflective notes made during the set-up and training phases were analyzed on a regular basis in order to refine emerging protocols and plan for subsequent sessions so participation in the study would be a successful and enjoyable learning experience. Ongoing data analysis resulted in the development of the working guidelines described throughout this chapter, namely:

- obtaining informed consent;

- assessing learner needs;
- selecting an appropriate location, appropriate technologies, and appropriate training periods;
- providing appropriate instruction to develop ICT skills relating to basic computer operations, web searches, e-mail, and assistive technologies.

Quantitative Data Analysis

At the end of the study, quantitative data were gleaned from the field notes, partially in response to the host agency's request for this information. Data were tabulated to determine the number of training sessions allotted to each subject, the subjects' percentage of attendance, the proportion of time spent on various training activities, and the percentage of subjects needing assistive technologies.

Qualitative Data Analysis

Observation and interview data were compared and contrasted using manual coding and cross-coding techniques with a special emphasis on identifying conflicting information, as well as identifying, understanding, and interpreting patterns and themes. Comparing emerging patterns with the patterns predicted from theory or literature was conducted in order to find "contrary or alternative explanations for the findings" (Creswell, 1994, pp. 153, 156-157).

Qualitative data analyses of subject observations generated lists of web search topics, ICT skills gained, and potential future online activities for each individual. The fine-tuning of protocols was completed, subjects were reflected upon as possible distance learners, and avenues for further research were identified. Interview data were examined and perceptions of participants were compared.

The final step in the data analysis was to take all the dissected parts—what Tesch calls the “bits and pieces” and details of what happened and what was learned—in order to create a “larger, consolidated picture” (as cited in Creswell, 1994, p. 154). The result is this thesis—a story of the processes and outcomes when adults with developmental disabilities go online.

CHAPTER IV

Results and Discussion

Introduction

The purpose of this study was to provide training and appropriate technology to a group of adults with developmental disabilities so they could engage in two of the most popular online activities identified in previous research: (a) using e-mail to create a broader social network; and (b) accessing information and other resources on the Internet. Throughout this chapter, data are presented to show the progress made towards these two goals and the outcomes that resulted.

This chapter begins by describing the subjects. It then reviews the main research question and reports the results for each of the three subquestions.

Description of Subjects

Eleven subjects were involved in the study. Below is a brief description of each subject. All names are pseudonyms.

Bob. This long-term subject was identified as a key informant. He was the first subject to enter the study, and he participated for all seven months. He attended whenever he could, attending 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 so that it could be posted with

the other members' stories. He performed some e-mail activities, but was unable to obtain committed e-mail correspondents during the study.

Stacy. This long-term subject was identified as a key informant. She joined the study two weeks after it started and participated for 6.5 months. She was a motivated learner, but often became upset with herself when 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 long-term subject was identified as a key informant. She 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 long-term subject was identified as a key informant. She 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 position herself in her chair. She was the only subject needing a left-handed mouse and StickyKeys as she performed computer operations with her left hand only. At the end of the session, she had to use the last few minutes 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 e-mail messages and e-cards to the researcher long after the study ended.

Carla. This short-term subject entered the study with 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 out-of-town correspondents or specific purposes for communicating via e-mail. She could also independently perform searches using www.google.ca. 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 websites, often information on a favorite movie star, more accessible and therefore more enjoyable.

Wade. This short-term 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 two options. 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 short-term 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 www.google.ca. At the end

of each session, he continually expressed a desire to continue in the study, and he did return each week for additional training.

Louise. This short-term subject quickly caught onto 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 short-time 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. Little data were gathered about her independent e-mail activities (e.g., who she e-mailed and if e-mail activity related to her involvement in a self-advocacy network) as Barb took a business-like approach to her sessions. She did not want to open or send private messages during sessions nor 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 short-term 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.

Review of the Research Question

The general research question was, “What are the outcomes when adults with developmental disabilities are given access to training and appropriate online technologies in order to build the basic computer, e-mail, and Internet skills needed for e-learning?” This question was divided into three subquestions.

- “What factors should be considered prior to training?”
- “What processes and protocols are most effective for training users to use e-mail and to access information on the Internet?”
- “What are the immediate outcomes and possible future outcomes when adults with developmental disabilities have access to online technologies?”

The answer to this main question will be provided by reporting the answers to each subquestion.

Answer to Subquestion 1 (Phase 1: Set Up Training)

The first subquestion was, “What factors should be considered prior to training?” This study revealed that seven factors should be considered prior to training:

1. the location;
2. the technology;
3. the length and frequency of training sessions;

4. selecting subjects and other participants;
5. reviewing potential ethical issues
6. addressing ethical concerns
7. obtaining informed consent and assessing learning goals (protocols appeared in Chapter III);

Below is a discussion of the results relating to the first three factors arranged during set-up: the location, the technology, and the length and frequency of training sessions.

The Location

The setting selected may affect training, so it should be considered prior to training. In this study, the location was suitable for the following reasons:

1. The location was conveniently located and familiar to the subjects.
2. Various personnel provided valuable help with the project. For example, the program coordinator helped with scheduling, while other staff provided important feedback about subjects and the study. Other workers helped by being e-mail correspondents for subjects.
3. Privacy was not possible, but this was not a concern as the environment was set up to provide support to adults with developmental disabilities. Subjects did not appear uncomfortable when voice e-mail messages or website information were read aloud with bystanders present.
4. The foot traffic through the work area and in and out of a nearby exterior door was not overly distracting.

5. The usefulness of e-mail was more difficult to teach if support workers walked by when the subjects were composing a message to them. While this drawback relates somewhat to the setting, it more clearly illustrates that subjects had limited social contacts outside their community.

The setting selected for this study was the best, single location available at the time. The only other setting choices within the community were the public library and an educational facility's computer lab. Both would have been appropriate locations for some, but not all, subjects. Voice e-mail would not have been secure on these computers, headphones would have been needed, and instruction would have had to occur in whispers in order not to disturb other library patrons or learners.

Alternate training locations would have been preferable for subjects who did not need assistive technologies. Having multiple locations would have illustrated that Internet users are not tied to one computer to access e-mail or surf the Net, a misconception that occurred in both Triggs' (1998) study and in this study.

The Technology

The technology selected during set-up influences training. In this study, the technology selections were appropriate overall, although some aspects could have been improved.

1. High speed Internet was provided. Quick and reliable access to websites with little wait time increased the enjoyment of online activities.
2. The agency's older computer was adequate even though it was slow, frozen occasionally, and could not play all media. Six months into the study, it was replaced with a new computer capable of performing all tasks

more quickly and more reliably—a noticeable improvement. The wireless keyboard and mouse were useful as they allowed users to move these devices into convenient positions anywhere on the desk.

3. The computer was secure enough to load a voice e-mail program which provided instant access to e-mail accounts (i.e., no usernames and passwords were required). No problems occurred with individuals accessing other people's e-mail accounts.
4. The inability to individualize the settings on the computer negatively affected the outcomes. Time available for training was restricted to 30 minutes, so little time was available to change the default settings (e.g., set up the mouse for the left-handed subject and change screen display to normal sized fonts and icons). (The agency policy was to request all users maintain the pre-determined settings.) However, the coach introduced a Windows Accessibility Option, ToggleKeys, and reduced the double-clicking speed on the mouse, and both settings were implemented as default settings for all users. The settings could have been changed by the computer coach at the beginning of each training session; however, the coach would have to remember to reset the defaults at the end of each training session, and the time adjusting the settings would have reduced the training time, which was too short for many users. This study showed that individualizing technology settings for individuals is essential whenever ongoing training is going to be offered; longer training sessions

will allow for customizing the settings and then reverting them back to standard defaults if necessary.

5. An alphabetical keyboard, rather than a QWERTY keyboard, was not available. It might have speeded up the typing of e-mail addresses, web addresses, key words in searches, and e-mail messages. Subjects in this study tended to type with one or two fingers and frequent errors were made. A fairly common practice occurred during error correction. Subjects usually deleted all characters and started over, retyping everything, rather than editing the incorrect letters or inserting the missing characters.
6. Application software was not fully tested for reliability and usefulness prior to implementation of training. As a result, some training time was lost.

The Length and Frequency of Training Sessions

In this study, the length of sessions and the number of sessions per week were set up in advance of training. Both influenced training and the outcomes in a less than optimal way.

Length of sessions. Subjects had 30-minute training sessions once a week, with two or three subjects having appointments back-to-back. A large number of short appointments, rather than a small number of long appointments, accommodated (1) the researcher's schedule for traveling to the training site and for conducting training sessions, (2) the number of people who wanted training, and (3) the agency's need to use the computer for other ongoing projects.

However, setting up 30-minute sessions with no changeover time scheduled between them was a weakness in the study's design. Ideally, session length should

have been matched to subjects' needs and interests, but it was not possible to know how much time to give each subject when initially planning the study. Subjects entered the study on an ongoing basis for the first few months. An hour long session would have been too long for some subjects, but a 45-minute session with 30 minutes designated for interaction and 15 minutes designated as float time would have been optimal for meeting the needs of the researcher, subjects, and the host agency. Setting up some float time would have aided training in these ways and for these reasons:

1. *To individualize computer settings.* Changing the computer settings for each subject was not feasible for the reasons mentioned earlier—a policy to maintain default settings and the study's time constraints. The default setting for an enlarged display increased the difficulty of navigation and decreased subjects' ability to grasp in a glance what was present in the website or window and what commands or links were available. Most subjects had good vision, so the offside-to-side scrolling was unnecessary (and annoying). The default setting also did not accommodate the left-handed subject's needs. The mouse was moved to the left side of the computer and operated with that hand as her right hand and arm were not able to perform fine and gross motor movements. The wrong mouse button was often clicked, so a menu popped up. Individualizing the computer settings before each training session would have been time well-spent.

2. *To provide a transition period.* Two subjects with mobility issues needed extra time to get in and out of winter coats, boots, and the computer chair. They needed more time to gather up belongings at the end of the session, call taxicabs, and exit the office before it closed. With a 45-minute session, these subjects would have had a full 30 minutes for computer activities.
3. *To compensate for time lost when technology malfunctions occur.* Subjects did not like having to reboot the computer because they had to sit and wait; it took a while to return to the task they were working on, and sometimes quitting time would arrive with the subjects feeling like not much had been accomplished.
4. *To increase training time.* Online activities take longer when people need step-by-step instructions. Some subjects, such as all the long-term subjects, would have happily spent an additional 15 minutes on the computer. In fact, Kendra and Bob occasionally had 60- to 90-minute sessions. There was never an opportunity to determine how long the long-term subjects would have kept going until they asked to quit, but whenever a subject left early or did not show up, other subjects were pleased to start early or work late and have more time on the computer. This finding is similar to that of the Think and Link Project whose subjects were “highly motivated to use email and the time spent emailing exceeding their documented attention abilities” (n.d., Pilot Study section).

Frequency of training sessions. Sessions were scheduled for once a week.

This resulted in some beneficial outcomes, although some subjects would have

benefited more from having two sessions per week if a computer and a computer coach would have been available, as more practice facilitates retention of learning. Training twice a week would have been appropriate only for the subjects with specific recreational objectives. Subjects performing e-mail activities would also have needed more out-of-town e-mail correspondents so that they would always have e-mail to process, so their correspondents would not be overworked, and so that communication would be natural rather than forced. Authentic and meaningful purposes for doing e-mail would have to be implemented so that motivation would remain high (i.e., using e-mail to become acquainted with a newly acquired e-mail pen pal or participate in a self-advocacy network). Setting up twice a week sessions would require more preparation time for the computer coach who continually needed to introduce variety into web search activities and constantly send e-mail to subjects.

Answer to Subquestion 2 (Phase 2: Implement Training)

The second subquestion was, “What processes and protocols are most effective for training users to use e-mail and to access information on the Internet?” The answer to this question is that many factors need to be considered during training. The training protocols that were developed during the training phase of the study and the criteria for key informants were both discussed in Chapter III. To review, protocols were developed for the following:

- determining if subjects’ recreational goals were undefined or specific;
- basic computer operations, web search, and e-mail training;
- web search training;
- determining readiness for e-mail training;

- selecting an e-mail address and agent (voice and text);
- selecting the form of e-mail training (voice or text);
- e-mail training (voice and text);
- voice e-mail training; and
- e-mail correspondents.

Below is additional information about training, namely:

- the results of identifying subjects' recreational goals;
- a summary of training time and activities;
- a list of the Internet resources accessed;
- the results of using the NorthEast Community Online intranet e-mail system;
- a description of subjects' e-mail networks;
- examples of subjects' e-mail messages; and
- the results of using assistive technologies.

Results of Identifying the Recreational Goal

Protocols were developed for identifying subjects' recreational goals as either undefined or specific. Determining subjects' recreational interests resulted in beneficial outcomes because training matched their preferences. Figure 5 shows that six subjects (55%) wanted to go online for recreation, but did not wish to control the activities. They wanted the coach to introduce a variety of recreational activities. The five remaining subjects (45%) also wanted to go online to pass the time recreationally, but wanted to accomplish specific, self-selected, and practical goals, such as contact out-of-town relatives and/or follow up on personal interests.

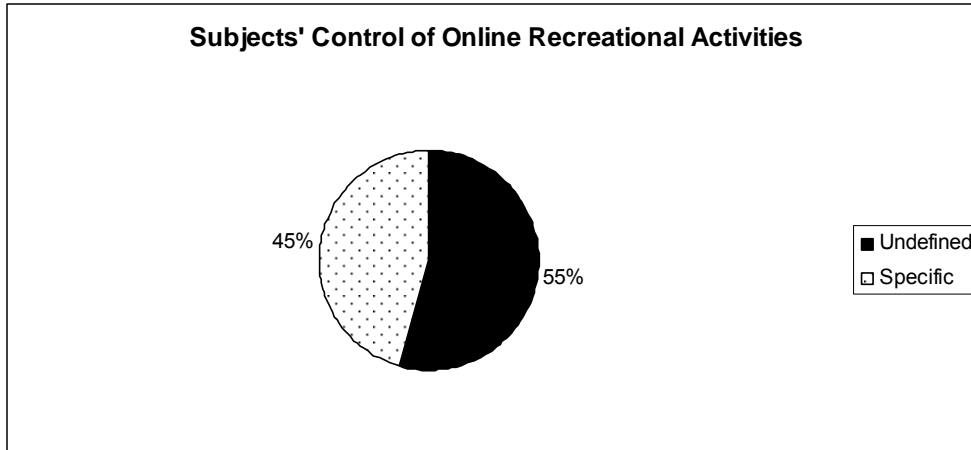


Figure 5: Subjects' recreational goals.

The two subcategories of recreational online goals do not imply that individuals without specific goals should not go online. This study also suggests that subjects shifted between undefined and specific recreational uses of the Internet, not unlike that of most Internet users. For example, Wade's undefined recreational interest in the Internet shifted to a more specific and purposeful recreational goal during the session where he visited the music website www.johnnycash.com. He took command, explored the site, and demonstrated that learning had occurred during previous sessions. Wade showed initiative and quiet pleasure as he selected song clips links in order and methodically listened to each clip twice before moving to subsequent clips without prompting. In his later sessions, however, he did not ask to return to that site and wanted the computer coach to direct the activities.

Summary of Training Time and Activities

Eleven of 12 potential subjects (92%) became actual subjects in this study. This high percentage suggests that many adults with developmental disabilities will choose to go online when given the opportunity, a finding that supports Cullen's

research (2001) reporting that people with disabilities are demanding increased access to the Internet.

Four of the five subjects with specific recreational goals desired ongoing training and were invited to participate in long-term training. They served as key informants because they were moving towards more serious uses of the Internet. What they were doing was worthwhile and significant to them, and they did not want to stop their online activities. At the conclusion of the study, means of continuing their online activities were discussed (e.g., using the computer at the library, having support workers assist their use at the service provider agency). However, the other subjects who wanted to use the Internet for undefined recreational purposes were satisfied with their short-term training and the outcome of being introduced to recreational uses of the Internet.

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. The four long-term subjects (36%) were classified as key informants and received between 10 and 13 hours of training. The seven short-term subjects (64%) received up to six hours of training.

Figure 6 shows how all 11 subjects spent their training time according to the three training activities (i.e., text-based e-mail, voice e-mail, and Internet browsing). As Figure 6 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.

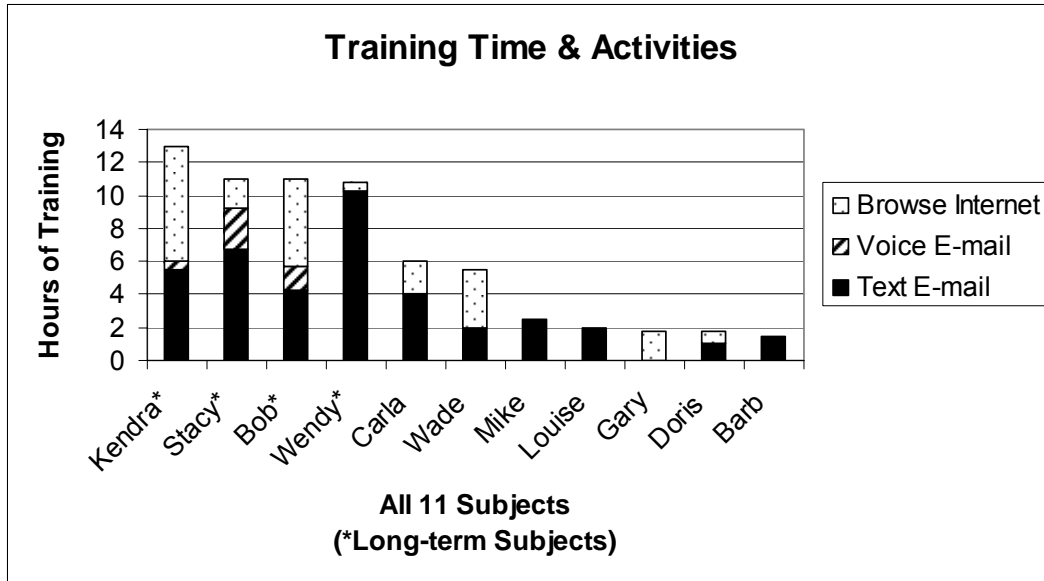


Figure 6. Training time and activities for each subject.

Figure 7 shows the same information as Figure 6 in a different format, illustrating that the percentage of time spent in both forms of e-mail training (93%) far exceeded the time spent in web search training (7%).

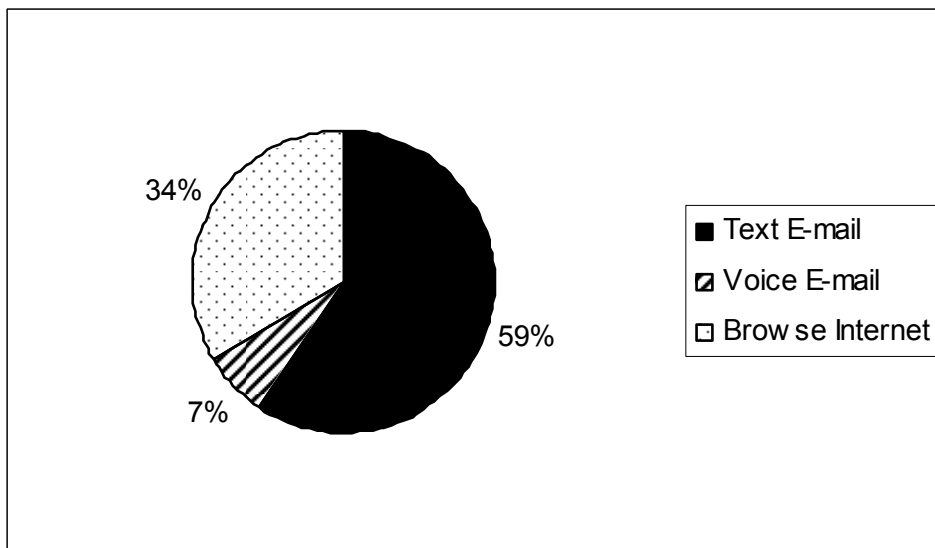


Figure 7. Training time and activities for all subjects.

When the four long-term subjects' data were considered alone, e-mail training (90%) was still predominant over web search training (10%). This result may have been partially influenced by the researcher's interest in voice e-mail.

Internet Resources Accessed

Subjects surfed the Internet if they did not have a strong interest in e-mail or could not obtain at least one e-mail address for a correspondent other than the researcher. The Google search engine (www.google.ca) was used to locate websites. Subjects quickly entered and exited websites until they located an appealing and easy-to-navigate website, typically ones that offered audio and graphic resources along with the textual information. A screen reader (Read & Write) was used if necessary. Sites to be explored further were bookmarked for easy retrieval. Topics of particular interest included the following:

- sports (e.g., WWE wrestling, bowling, snowshoeing, hockey, speed skating)
- singers (e.g., Shania Twain, Moe Bandy, Johnny Cash)
- television shows and television stars (e.g., *MacGyver*, *The Young & Restless*, *Seventh Heaven*, *Full House*)
- movie stars and their movies (e.g., Adam Sandler, Drew Barrymore)
- animals (e.g., dogs, horses)
- other (e.g., recipes, snow, ice, guitars, Australia, Halloween).
- NorthEast Community Online's stories, e-mail, Internet safety, photo album, and community news.

Results of Using NorthEast Community Online's E-mail System

Protocols were developed during training as subjects used the NorthEast Community Online e-mail system, as discussed in Chapter III. The decision to set up subjects with this e-mail agent without investigating other possible agents provided desirable results even though one issue arose.

It was a suitable e-mail agent for both text and voice e-mail users for many reasons. The site restricts who can join the community and who can obtain an e-mail address (users apply to receive an e-mail account), thus the intranet e-mail system gives the appearance of security and may be preferable to other free e-mail accounts due to its apparent exclusivity. The Inbox and Compose boxes were attractive and uncluttered. Buttons were easy to locate. Support was immediately available when it was requested. No subject received unsolicited mail during the study, although the potential to receive unwanted e-mail would increase as subjects continued to connect online with more people and organizations. The community's Spam Assess filter may not have been able to stop all unsolicited e-mail as even the best spam filters have limitations.

The only issue arising with the NorthEast Community Online was its domain name. At one point during the study, users were required to type the axon sign and domain name in the login box. This increased the difficulty of logging on for the subjects who did not need voice e-mail. This study shows that the domain name is an important part of an e-mail address as users will try to remember it, spell it, and type it. This study also shows that the most appropriate e-mail address for many voice and text e-mail users is one that is safe, easily typed, and easily memorized.

Subjects' E-mail Networks

Over the seven months of the study, the four long-term subjects e-mailed a total of 21 contact people (excluding the researcher). They had an average of 5.25 contacts each, with a range of three to eight contacts per subject.

Eleven of the 21 contacts (52%) resided in the same town, a fact not to be discounted because people who reside or work in close proximity commonly use e-mail to communicate with each other even though they could communicate face-to-face or over the telephone. Three of the four long-term subjects (75%) also connected with people they were less likely to see. As Figure 8 shows, 14% of the long-term subjects' contacts resided elsewhere in Alberta, 19% resided outside of Alberta, and 14% lived outside of North America.

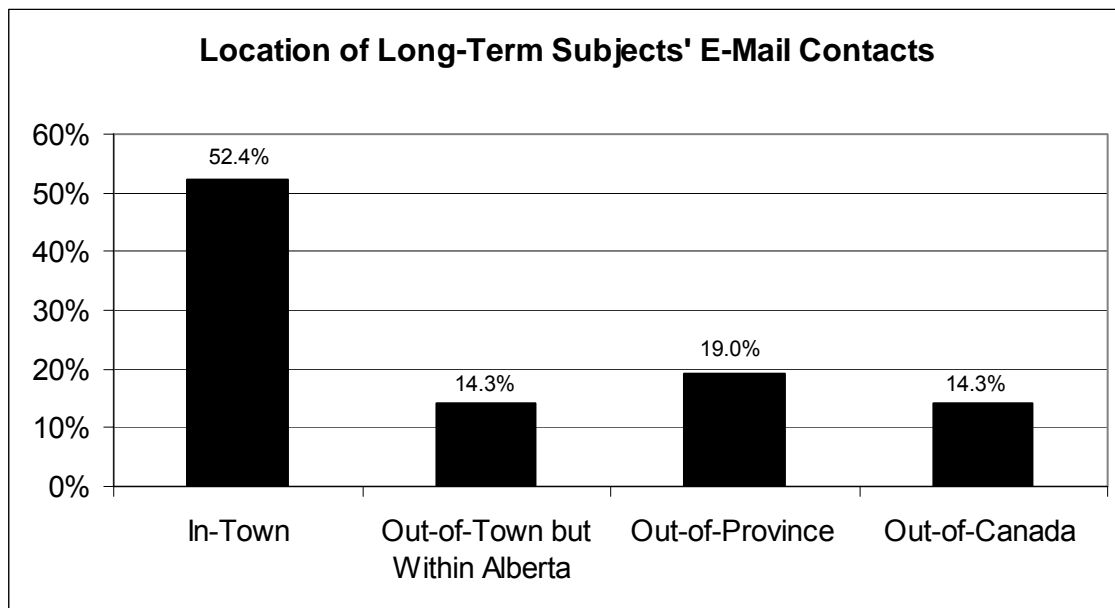


Figure 8. Location of long-term subjects' e-mail contacts.

Examples of E-mail Messages Subjects Sent

A total of 10 subjects used e-mail (Figure 6). They sent approximately 73 e-mail messages to their correspondents, a significant number considering the fact that some subjects needed 10 to 20 minutes in order to compose and send a single message containing two or three sentences. Below are several examples of messages the subjects composed. All formatting, spelling and wording have been preserved; however, messages have redacted to preserve confidentiality.

Kendra's message. This text e-mail message to a support worker was composed in 10 minutes, after Kendra had received five months of training. She concentrated deeply while composing and said the words quietly to herself as she found the letters on the keyboard. Kendra was clearly proud of her friendly message that favorably referred to the worker's husband.

Hi [support worker's name] whatyou doing for fun you are have family
[support worker's name] you have good man Kendra

Kendra also sent this message in about 10 minutes:

[support worker's name] are good friend. [support worker's name]

Doris' message. This message was composed and sent within 10 minutes:

I like doing this stuff wit you [researcher's name]. on this computer. I
can do the work on the computer. You are nice person to work with
[researcher's first name]. if you are like me to work with [researcher's
first name]. I like work with you [researcher's first name]. Love Doris.
To [researcher's full name].

Bob's message. Below is a transcription of a voice e-mail Bob recorded. He sent the message within two minutes, near the end of the study, without prompting:

[researcher's name]. Thank you for working with me at the office for e-mail every Tuesday. Thank you.

Wendy's message. This message was sent to the researcher a month after the study concluded. It demonstrates an expansion of Wendy's social network, as e-mail provided her with a means of communicating more frequently with her brother who lived overseas:

To [researcher]
Thankyou for helping me learn how to email. Having lot's of fun. I got a letter from my brother in Tiawan. It was good to hear from you.
Happy Easter.
From Wendy

Results of Using Assistive Technologies

One assumption of the study was that low literacy skills hinder the online activities of adults with developmental disabilities. This assumption proved to be partially correct for this group of subjects. Eight of the 11 subjects (73%) displayed difficulties in reading, writing, spelling, keyboarding, and/or composing messages (expressing ideas as text). Of these eight, seven subjects participated in the study long enough to receive training in the use of voice e-mail and the screen reader.

(Mike's participation was too short term for him to be introduced to these assistive technologies.) Figure 9 shows which subjects used assistive technologies.

As Figure 9 indicates, the screen reader was used for accessing the content of websites more often (63%) than voice e-mail was used (37%). The higher usage of the screen reader was at least partially attributable to the delay in obtaining an appropriate voice e-mail program. This delay resulted in voice e-mail being unavailable for part of the study, primarily for the short-term subjects.

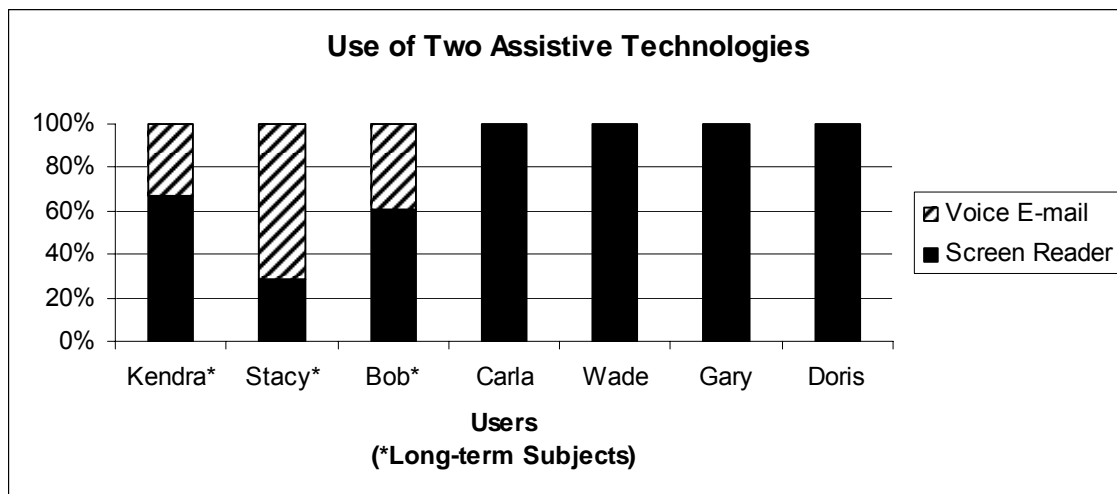


Figure 9. Use of two assistive technologies (all seven users).

A different picture emerged when the data for the three long-term subjects who used assistive technology were separated from the data for the short-term subjects (see asterisks in Figure 9). Kendra, Stacy, and Bob had more opportunities to use both assistive technologies, and they used them almost equally (51% for voice e-mail, 49% for screen reader). This result coincides with the data in Figure 4, which shows that these three long-term subjects spent approximately half of their training time on e-mail and the other half on web searches.

Another assumption of this study was that assistive technology would make online activities more accessible, and again this assumption was partially correct. One assistive technology used in this study did not make online activities more accessible. Voyager Suite's Web Trek web search software allowed users to click on pictures instead of typing key words while searching for information and provided users with Google's typical listing of research results; however, no further assistance was provided. Subjects with reading and writing difficulties still needed another assistive technology, such as a screen reader, to access the results listed and the text-based information within the websites.

The other assistive technology used in this study, however, facilitated online activity and increased subjects' enjoyment of their online activities. The screen reader (Read & Write) made text-based information in websites 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 booted up, 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. Small glitches in the program may have prevented it from working accurately all the time (i.e., the play button occasionally did not work and programs sometimes froze), or the older computer may have had difficulty running it; however, the subjects seemed pleased with this assistive tool because of its novelty and the increased independence and privacy it provided.

The ICanEmail voice e-mail software also facilitated online activity. Like the screen reader, voice e-mail allowed subjects to use their comparatively stronger modes of communication (i.e., listening and speaking). Its operational simplicity became apparent when three long-term subjects, who were using text e-mail, tried voice e-mail. Kendra and Bob often did not know what to say when composing a text message, and frequently asked for help with spelling. However, with ICanEmail, they quickly recorded simple voice e-mail messages with little help; the content and audio quality of these messages was similar to recordings on a telephone answering machine. Even voice e-mails from subjects with speech difficulties could be easily understood by recipients who were accustomed to their speech nuances as a result of face-to-face interactions.

As mentioned earlier, three of the 11 subjects (27%) were able to socialize online with others and access Internet resources without using assistive technology. The assumption that voice e-mail was more appropriate for the target population than text e-mail was found to be inaccurate. Stacy's experience best illustrates how voice e-mail clearly facilitates online activity, yet is not suitable for use in certain situations.

Stacy was comfortable with text-based e-mail and was approaching independence, but wanted to try voice e-mail. She had already received more than six hours of text e-mail training; she was comfortable with the procedures for processing incoming and outgoing text-based e-mail, although she had occasional frustrations when translating ideas into text and when spelling words.

After receiving two hours of voice e-mail training, she was given less than 30 minutes of instruction in how to use ICanEmail. The following week, she independently accessed her ICanEmail inbox, opened a message, deleted it, and sent out two voice e-mails in less than 15 minutes, entirely unassisted, while someone else claimed the computer coach's attention on another matter. Her experience clearly illustrates that voice e-mail is easier to use than text e-mail; however, unlike Bob and Kendra, voice e-mail was not appropriate for Stacy. An increase in usability was not enough to compensate for decreased access to e-mail and a conflict with other literacy-building activities (see Table 2, characteristics numbered 1, 6, and 7.)

Although voice e-mail users easily entered e-mail, did less reading and writing, and used built-in verbal prompts and icons that increased independence, it was concluded that ease of use cannot be the sole consideration when deciding which type of e-mail, voice or text, more appropriately serves a subject's needs. Each has its unique benefits and limitations. Table 2 shows a comparison between text e-mail and voice e-mail, rating each on eight important characteristics.

Table 2*A Comparison between Text-based E-mail and Voice E-mail*

Desirable characteristic	Rating for text e-mail	Rating for voice e-mail
1. Accessibility	<i>High:</i> accessible on any computer connected to the Internet.	<i>Moderate:</i> users restricted to computer(s) with the software installed.
2. Security	<i>High:</i> users must enter usernames and passwords correctly. This reduces unauthorized access.	<i>Low:</i> one click on a user's name or picture opens the account—the user's or any other account set up in the assistive software.
3. Privacy	<i>High:</i> Privacy is possible as long as other people cannot see the screen.	<i>Low:</i> Bystanders can overhear private audio messages while the user is recording them and can hear incoming messages unless headphones are used.
4. Affordability	<i>High:</i> Many e-mail accounts are free.	<i>Low:</i> The programs used in this study cost between \$150 and \$650.
5. Ability to process a variety of incoming messages	<i>High:</i> hyperlinks in messages work. Users can open attachments in many formats (gif, jpeg, doc, mp3, wav, ppt, etc.).	<i>Moderate:</i> picture and voice attachments can be easily opened, but messages with addresses to interactive websites and e-cards are not accessible as hyperlinks.
6. Ease of use	<i>Moderate:</i> requires training and memorization.	<i>High:</i> Users find the program easy to open and use. Few keyboarding skills are needed. Built in-prompts reduce memorization and promote independence, success, and achievement. However, voice-mail recipients must know how to access attachments.
7. Supports literacy developmental activities	<i>High:</i> allows practical application and practice of reading, writing, and spelling skills. Reinforces and supplements literacy development activities.	<i>Low:</i> reduces the need for reading, writing and spelling. May reduce motivation to improve basic literacy skills.
8. Personalization	<i>Moderate:</i> Competent writers and readers can personally connect with each other through written text.	<i>High:</i> Audio messages with recognizable voices and accompanying tones are generally considered to be less impersonal than text messages.

The comparison in Table 2 helps to illustrate why voice e-mail was not suitable for Stacy: (1) She was capable of using text-based e-mail; (2) Text-based e-mail gave her a practical application for the literacy skills she was working on (she used computer games at the agency to improve her spelling); and (3) Independent use of text e-mail was essential as she needed to find other Internet access (e.g., computers at the public library, friends' houses, or the local Internet café). Stacy's situation does not rule out the possibility that other adults with developmental disabilities may use voice and text e-mail interchangeably. For example, voice e-mail may be selected when users want to send a long message but have limited keyboarding skills. Text e-mail might be used, however, when users want to send a business-like message as opposed to a personalized message.

The results of this study suggest that adults with developmental disabilities should initially use text e-mail until it becomes apparent that text-based e-mail is overly challenging to use. The transition is typically not problematic because the same e-mail address can usually be used in conjunction with a voice e-mail program in the event that voice e-mail is deemed necessary.

Answer to Subquestion 3 (Phase 3: Determine Outcomes)

The third subquestion was, "What are the immediate outcomes and possible future outcomes when adults with developmental disabilities have access to online technologies?"

Participants' opinions varied about the importance and necessity of having access to online technologies, although the key informants unanimously voiced their appreciation for having access to online technologies. Participants tended to be fairly

realistic about the current and future benefits that online technology might provide, as well as the drawbacks of providing access and training. A discussion is provided below, detailing the immediate and possible future outcomes of individuals with developmental disabilities having access to online technologies from the perspectives of parents and guardians, the host agency's staff, the subjects themselves, and the researcher.

Outcomes According to Parents/Guardians

Wendy's parent/guardian. Wendy's mother personally used e-mail regularly and was enthusiastic about the study. She did not reside in the same province as Wendy and sent e-mails regularly. Wendy laughed hard when she received one e-mail with the subject line reading, "Card from Blackie" (the family's dog). This participant asked for Wendy's address to be "simplified." She said, "I would like to see her address easier to remember....I have to look up her address every time" because "there's 'extra typing'". She also wanted Wendy's identity to be protected by having an address that did not reveal Wendy's name or gender. She found e-mail was a superior communication tool to a telephone at times, as it was a way to say "Hi" without dealing with emotional issues. She explained that there was "no voice coming back with intonation," which sometimes occurred during their telephone conversations. This participant's highly enthusiastic opinion was that the project was "wonderful" for Wendy.

Bob's parent/guardian. Bob's mother used computer technologies for business purposes and resided in the same town as Bob. She reported that Bob was "very excited about e-mail." She mentioned receiving and opening both Bob's text

and voice e-mails, but did not mention why she did not reply to the messages. This participant also felt that the project was worthwhile and hoped it would continue. She mentioned that Bob “loves computer work” and had a computer at home, but no one had shown him how to use it. She also noted that Bob would not be able to obtain Internet or e-mail at home because he “can’t afford the hook up” with the disability funding he receives. She also mentioned that independence on computer seemed like a possibility for Bob because “once he gets into something he really likes, he can do it himself.” She was very much in favor of ICT training, saying, “Even when he was a little boy going to school...I said if he would have used computers, he would have learned a lot more.” She also mentioned that “things were improving” as far as computer access for children with disabilities in schools, and noted that Bob’s reading and math skills seemed to be increasing since he began using the computer reading and math programs at the host agency. She mentioned that the study’s training was “excellent” for Bob because he was progressively losing strength in his fingers, upper body, and legs, noting that computer work “is something he can still do...for a long time [because] it doesn’t take strength.” Working on a computer is “important to him and could become even more important.” Overall, she offered support for ICT training on measured and rational grounds.

Kendra’s parent/guardian. This participant acknowledged that Kendra had enjoyed the project, but saw few beneficial outcomes. She viewed online technologies as valuable when they were used as tools to accomplish serious purposes and less worthwhile when they were used recreationally. She had to deal

with an unanticipated and unpleasant outcome of Kendra's newly found interest in going online, which was one factor that likely influenced her opinion.

This participant did not correspond via e-mail with Kendra and did not appear to use ICT at work or at home. She made the observation that Kendra was "enthusiastic" about the training sessions "but for the wrong reasons." She felt that using the Internet to access information about movie stars had little value, and that Kendra was able to pursue this interest offline. She also pointed out that computers are expensive and that people do "little things to their computers all the time and then have the trouble and expense of fixing the problems." She thought that Kendra might inadvertently cause a computer malfunction and, therefore, did not see using a computer as an appropriate activity for Kendra.

This opinion may have been formed because she experienced a "downside" to the project. Kendra had a "dinosaur computer" at her apartment, and training was giving Kendra "false hope." Kendra thought the old computer at her apartment had Internet access, was disappointed to learn that it did not, and became intent upon obtaining a new computer and Internet access. Several months into the study, a telephone company's sales representative called Kendra and offered a free modem for signing up for high-speed Internet access. Kendra signed up over the telephone. Kendra's parent/guardian was "angry" at the Internet provider and upset about having to resolve the issue and return the modem. This participant decided that the best course of action was to remove the old computer from Kendra's apartment.

One positive aspect she mentioned was that the project was a good "break in the routine," because if people keep doing the "same old thing"...people are "not

motivated.” She notes that the project also gave the Kendra “another view of how computers could be used” and “an awareness of different ways to communicate,” but also pointed out that Kendra did not really “understand the big picture.” Overall, this participant’s support of ICT training was reluctant and limited. She felt that online activities might be more beneficial for other individuals, but not for Kendra.

Outcomes According to Agency Workers

Bob’s support worker. Bob’s support worker noted that subjects had fun with the project and learned a lot. She suggested that some learners would benefit from instruction twice per week. For Bob, the project was “too short” even though he participated for all seven months. She mentioned that some of her other clients had “computer and e-mail goals” so the project “fit in perfectly.” She mentioned that Individual Program Plans (IPPs) were reviewed every six months, and if any of her clients want to continue ICT training, she would help, but added that learning how to use online technologies had to be the client’s choice. She also mentioned that some staff at the agency needed ICT training. She did not have any suggestions for future projects, but mentioned that “what you do for a project depends on the individual; everybody is so different.” Her opinion was that online activity was feasible and somewhat beneficial, but not something that should be emphasized over other support activities.

Wendy’s support worker. Wendy’s support worker had stopped using e-mail at home because she was receiving too much “junk mail.” However, she felt that having access to e-mail was beneficial for Wendy because Wendy was “interested,” had realized that the Internet was “not just for games,” and that Wendy’s ability to

communicate with her out-of-town contacts was “helpful.” This support worker agreed to help Wendy access her e-mail after the project ended. This support worker also noted that mobility issues may prevent some clients from using the community’s computer lab and the computers at the public library. She suggested that clients could benefit from additional e-mail training projects.

Barb and Wade’s support worker. This participant was competent with ICT and had carefully considered, valuable opinions about online inclusion. She identified several positive outcomes of the study:

1. She pointed out that instruction in using the Internet “carries over to the coffee shop.” She explained by saying, “When someone is talking about computers and the Internet in a restaurant,” subjects who participated in the study could “relate” because they too had these experiences. She said that computer training provides clients with “the language of the day.” Her comments suggest that the study helped subjects take a step towards full inclusion—the ability to participate “with other citizens in ordinary life activities of working, socializing and conducting daily affairs” and the ability to have “control and choice in the activities of their daily lives” (PDD, 2005, Mission, Vision and Values section).
2. She mentioned that “technology...is the way of the world” and pointed out that their new clients come out of high school knowing something about the Internet and computers; therefore, the agency needs to build upon the ICT skills clients gained at school. Support activities need to “address where they’re at.”

3. ICT technologies were motivating. She pointed out that Wade had been using the same computer programs for literacy learning for the past 15 years and thought this could be one reason why Wade did not choose to go on the computer when she provided him with literacy instruction yet signed up for e-mail and Internet training. She noted that Wade had particularly enjoyed the Johnny Cash website (www.johnnycash.com) because it had audio (song clips) and he was learning to play the guitar and thought he navigated through that site particularly well. She was especially pleased with the Read & Write program and planned to incorporate that technology into her work with clients.

This support worker's feedback was realistic and helpful because it also identified several drawbacks to the study, as noted below.

1. E-mail activity may not be feasible for all adults with developmental disabilities. Many have "limited" or "no social contacts" to e-mail, and "families don't have computers."
2. Technology problems can arise, and if they are not resolved quickly, users will "lose interest." She was primarily referring to Barb's experience. Barb had independent access to her e-mail until she re-registered for an account with the same username and different passwords. For a month or two, she struggled on her own to understand why her e-mail account was suddenly inaccessible. Barb's frustrations grew, and she stopped using e-mail altogether until a computer coach (the researcher) became available and was able to resolve the difficulty.

3. She pointed out that a staff's ICT skills influence programming. At her agency, some staff members have limited computer skills and "don't know how to use e-mail." She identified the staff's need for ICT training.
4. She noted that conducting training within a host agency may limit inclusion. She pointed out that the agency's philosophy is to "do it in the community" as opposed to doing it in segregated settings such as sheltered workshops. Using computers accessible to the general public instead of those at the agency would have been a way to make projects such as this one more inclusive.

Other feedback from agency staff. A secretary in the front office said, "We see people out here everyday waiting for you, and they always seem eager to do e-mail." Another secretary mentioned that she was surprised when Louise "stopped me on the street" to talk about e-mail because this client was usually "pretty quiet." One support worker pointed out that adults with developmental disabilities forget things easily and need refresher training. Another support worker, an e-mail correspondent for Kendra, mentioned that it was a "shame" to see the project "discontinue."

Program Coordinator. The Program Coordinator was pleased that everyone who wanted to participate in the study had a chance to do so. She felt that it was effective to have "you do the screening" after she referred clients who met the initial criteria of being "not good readers," rather than having staff designate who would receive Internet and e-mail training. She noted that subjects "enjoyed the opportunity to use the computer," and some "especially enjoyed spending time with you." She felt people in the study had become more "computer-wise" and felt the project had

“opened up [another] avenue of communication” for subjects, a “new method” of communication which is “important for this population.”

She felt that the support workers’ overall reaction to the study was favorable. Initially, she anticipated that subjects would conduct e-mail and Internet activities on their own after several months of training. However, after Kendra and Stacy attempted to go online without the computer coach, she changed her mind. Kendra froze the computer and may have accidentally changed the computer settings, and Stacy needed help at a time when no one was available to provide the assistance. A tentative policy arose reflecting the host agency personnel’s preference that clients would use the Internet with supervision, primarily because they might “mess things up” on the computer, such as inadvertently changing settings or performing commands that might damage the computer or the programs.

The Program Coordinator expressed willingness to host another project should the opportunity arise. She reported that the study complemented the agency’s other projects. She also asked for a progress report that could be used for each subject’s next IPP review. She requested and received information about the client’s e-mail accounts, a simple instruction sheet on how to access e-mail, a list of what had been taught, and recommendations for future training.

Outcomes According to Key Informants

All subjects used the Internet, like millions of other people around the world. They reported outcomes similar to those reported in the literature.

- *Going online is an enjoyable, leisure-time pursuit.* All 11 subjects experienced new online activities and doing so provided immediate

entertainment. Evidence to support this claim comes from subject observation. All attended regularly, and laughed and smiled while performing activities. They said things like it was “fun” to work with a computer coach and that they “liked” doing the activities. Engaging in pleasurable activities can be achieved in other ways (e.g., bowling, visiting libraries, reading books), but using digital technologies for recreation is commonplace (Madden & Raine, 2003, p. 16). Increasing numbers of people of all ages are incorporating online technologies into their recreational lifestyles. People with developmental disabilities should be no exception.

- *Going online is educational.* Even the short-term subjects gained a some basic computer skills (e.g., how to start up Internet Explorer, scroll, exit programs, shut off the computer, and turn up the volume on the speakers). Insight was also gained. For example, Carla learned that the information on the Internet is not always accurate. When she performed a web search, she was surprised when different websites gave conflicting information.
- *ICT competencies develop over time.* The four subjects who participated in the study for several months gained more ICT skills. During interviews, they reported that that they learned “a lot.” This perception appears to be accurate because they needed fewer prompts and became more adept at performing commands so they were able to perform more online activities during later training sessions. They learned how to navigate between and

within websites, operate more than one program at a time, and compose e-mail messages. These subjects wanted more training.

- *Going online is meaningful.* Eaton defines a task 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. Stacy waited in the parking lot for the researcher on the last day of training in order to say “thank you,” to give the researcher a hearty hug, and to tell the researcher that she was “special.” Stacy was tearful because she suspected 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.
- *E-mail facilitates the finding of information and the creation a social network.* Below is a text e-mail message that Wendy sent to the researcher six months after training ended (her support worker was supervising her online activity and providing occasional, minor assistance). It shows that her online activity continued to be enjoyable, educational, and meaningful.

To [researcher's name]
How are you doing?
It has been a while since we talked. I'm doing well with email, I write to Mom and friends all the time and also receive emails too. I was wondering if you knew of any pen pals over the internet that I could write to. Hope to see you soon.
From Wendy [last name]

One final note about subjects' recall of learning and the accuracy of subjects' perceptions needs to be made. Kendra participated in the study for seven months. When she was asked about her favorite training activities, she said, "Can't remember." However, when various online activities were mentioned, she recalled doing them and reported enjoying them. Another long-term subject, Bob, said his sister had sent him many e-mails, yet a review of the e-mail documents shows that no family member replied to any of his e-mails. While his memory may have been faulty on this recollection (or perhaps it was wishful thinking), he accurately and independently remembered many details about receiving e-cards, posting his story on the NorthEast Community Online website, and the topics he explored during web searches.

Outcomes According to Researcher

The host agency's ICT experiences expanded. This was an unanticipated outcome. Workers were peripherally exposed to online and assistive technologies. They observed ICT training and/or talked to the clients about it. No one at the agency was acquainted with voice e-mail or the Read & Write program. Towards the end of the study, the computer coach showed one support worker how to reboot a computer, taught another how to use Read & Write, and helped a secretary access

her Inbox in the agency's newly acquired in-house e-mail system. One support worker decided to use Read & Write after the study ended.

Two other unanticipated outcomes may have occurred as a result of this study. First, the study may have influenced the agency's decision to implement an in-house e-mail system for its staff six months after the study began. A second outcome may have been the agency upgrading of clients' computer hardware. The older computer, which limited what the clients could do, was replaced six months into the study with a more powerful computer capable of running several programs at once and accessing multimedia websites.

These unexpected outcomes highlight two erroneous assumptions made prior to the study: (a) that the host agency's staff was familiar with computers, web searches, and e-mail; and (b) that the agency's staff used e-mail, a basic workplace technology. Figure 10 illustrates that fact that in some instances, subjects were performing basic computer and online tasks unfamiliar to some of the host agency's staff members. This finding may help to explain why some support workers' were reluctant to have subjects access the Internet independently on the agency's computer.

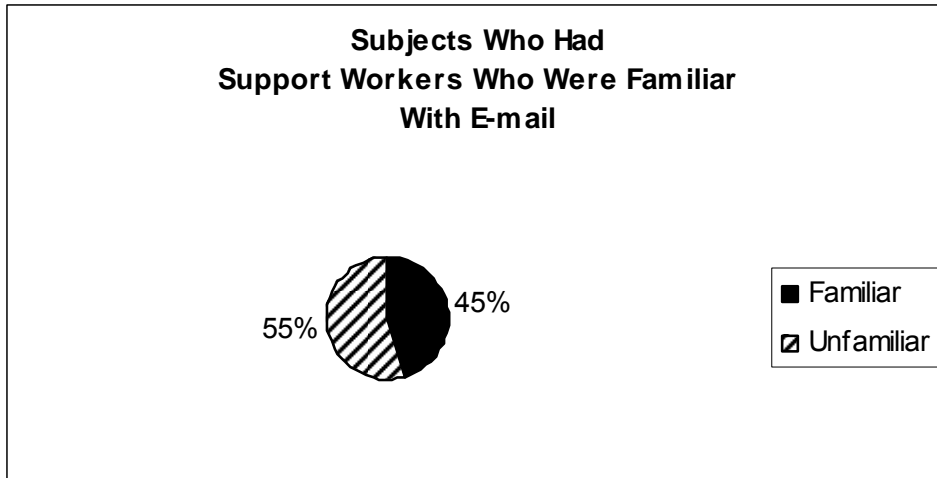


Figure 10. Support workers who were familiar with e-mail.

Subjects' communication networks expanded. 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 because she continued to e-mail the researcher 12 months after the study ended.

Self-determination was promoted. Subjects were encouraged to make recreational decisions and direct their training activities. Wendy ensured that her e-mail activity would continue by enlisting her support worker. Subjects had experiences which they could choose to include in their future individualized program plans.

Skills were developed. The study did not set out to quantitatively measure the skills gained or measure the time to achieve mastery of skills, but steps were taken

towards helping adults with developmental disabilities develop the ICT skills society finds important enough to offer in schools (see Table 1). Table 3 below is a duplicate of Table 1, but now indicates which of the online skills were taught during this study.

Table 3*Comparison between ICT Training Grades 1-6 and This Study*

Web-based ICT Training Developed in Grades 1-6 and This Study	
Basic computer operations training grades 1-6	This Study
Turn on hard drive and monitor & 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 & maximize windows	✓
Input data using the 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 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	not taught
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 grades 1 - 6	This Study
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)	not taught
Access websites using keyword searches in a search engine	✓
Safety	✓

(table continues)

Table 3 (continued)

Web-based ICT Training Developed in Grades 1-6 and This Study	
E-mail training grades 1 - 6	This Study
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	✓
Use forward command	not taught
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	not taught
Use address book; add addresses in book	✓
open e-card	✓
click on link in e-mail	✓

Note. 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).

Table 4 summarizes the immediate outcomes of training for each subject in terms of skills introduced and gained. Table 4 also shows the direction of future training and possible outcomes based on each subject's interests. Long-term subjects gained more skills than short-term subjects.

Table 4*Immediate Outcomes of Training and Possible Future Outcomes*

Outcomes						
Skills introduced and gained during this study				Future training directions if the study had continued		
	Basic computer operations	Web browsing	E-mail	Interest in participating in a learning community	Interest in informal e-learning	Interest in formal e-learning
Kendra*	✓	✓	✓	x	✓	x
Stacy*	✓	✓	✓	x	✓	✓
Bob*	✓	✓	✓	✓	✓	x
Wendy *	✓	x	✓	x	✓	✓
Carla	✓	✓	✓	✓	x	x
Wade	✓	✓	x	x	x	x
Mike	✓	x	x	x	x	x
Louise	✓	x	✓	x	✓	x
Gary	✓	x	x	x	x	x
Doris	✓	✓	✓	x	x	x
Barb	✓	✓	✓	✓	✓	x
Total	11	7	8	3	7	2
%	100%	64%	73%	27%	64%	50%

*Long-term subjects (key informants)

Online inclusion was promoted. Having the skills and opportunities to do what other people do when they go online is a step towards 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.

Outcome of independent use of Internet partially achieved. The study assumed that subjects would be able to use e-mail and the Internet independently after several hours of training and would access the Internet outside of the host agency. Two subjects, Barb and Carla, had already developed skills in using web-based ICT when the study began. At the end of the study, they were the only ones able to independently access the Internet on computers outside of the agency.

Outcome of developing ICT skills to facilitate e-learning was partially achieved. The assumption that some subjects would be ready for e-learning by the end of the study was correct. Two of the four long-term subjects appeared to be ready for formal e-learning by the end of the study. Stacy was especially interested in e-learning, saying, "That's what I was aiming for." Five other subjects were ready for informal e-learning. They were confident that they could use ICT to find information they needed to satisfy their interests or to help make decisions, but were uninterested or unwilling to engage in a formal e-learning experience.

Literacy gains as a potential future outcome. Research shows that frequent reading can make people better readers, especially if they are motivated to read. Flores states that "research demonstrates that exposure to books, coupled with active participation in meaningful related activities around the written and spoken word are key in acquiring literacy skills, not to mention the additional skills gained in social reciprocity and communication" (as cited in T/TAC, 2001, Early Childhood Corner section). Although this comment is in relation to learning in early childhood, it could also relate to adults given that literacy is now seen as a life-long journey. When people read digital text online, they are using and possibly developing literacy

skills. Observations of Stacy provides evidence that her literacy skills and confidence may have increased. She went from being overwhelmed by the information on the screen in her Inbox and in individual messages at the beginning of the study, to systematically reading aloud each word on the screen, moving from the top of the page to the bottom. By the end of the study, she was easily able to move through the text and appeared to understand what she read.

Summary of Results

This chapter began by recalling that the purpose of the study—to provide training and appropriate technology to a group of adults with developmental disabilities so they could use e-mail to create social networks and access Internet resources. This chapter provided information about the subjects, their ICT training, their Internet searches, their e-mail networks, and their use of assistive technology.

This study showed that participants had varying degrees of enthusiasm about ICT training and the outcomes. For example, the subjects themselves (11 adults with developmental disabilities) were interested in either short-term, introductory training or in long-term, specific training. Some of the parents, guardians, and support workers were clearly in favor of online inclusion efforts while others did not use online technologies themselves and, therefore, did not perceive the value of usefulness in making online technologies accessible to adults with developmental disabilities. This finding—that some non-users are disinterested and reluctant to use the Internet—is consistent with other research. Studies on the attitudes of unconnected populations reveal that (a) some non-users view Internet content as irrelevant and unsuitable; (b) some non-users are concerned about safety or want to

avoid unpleasant online experiences; (c) some non-users lack ICT skills; (d) others lack awareness of how the Internet could meet their individual needs (Cullen, 2001; EKOS, 2001 ; PIAC, 2000; Sciadas, 2005).

The results presented in this chapter shows that all research questions were answered and that the overall purpose of the study was achieved. Subjects were given access to appropriate technologies and training. As a result, they participated in a popular and meaningful everyday activity, gained ICT skills, communicated with others through e-mail, and obtained information from the World Wide Web. In addition, some subjects became prepared for e-learning.

CHAPTER V

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 want 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 is 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 enhance the lives of individuals with developmental disabilities by expanding their recreational pastimes.
4. Subjects with a foundation of basic ICT skills are ready to use the Internet for more serious purposes.

The four findings that emerged from this study are described in further detail below. It is important to note that these four conclusions cannot be generalized to other settings or to all adults with developmental disabilities due to the limitations of the multiple-case study design itself (Yin, 1999). Case studies are not representative of entire populations, and their findings are not considered to be generalizable.

The 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, a finding that supports Cullen's (2001) research on the Digital Divide. They chose to go online when given access to (a) 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, et al., 2005; Waddell, 1999; Williams, 2003).

Training is a complex, time-consuming, and often costly process that involves assessing unique needs, identifying suitable technologies, and implementing individualized training. For example, in this study, some, but not all, subjects required accessibility features such as StickyKeys, Toggle Keys, an alphabetic keyboard, a reduced double-clicking speed, and a left-handed mouse. Three of the

11 subjects had difficulty operating a standard mouse and would have benefited from an assistive mouse device, at an approximate cost of \$130 (www.aroga.com) or a specialized trackball (approximate cost \$550). Only six subjects needed a screen reader; a basic version of this application software may cost \$400 for a single license. Two of the four key informants required a modified e-mail system that was voice-based rather than text-based; application software can cost between \$150 and \$650. ICT training would have had fewer challenges if all subjects required similar assistive aids and technologies. However, the subjects had diverse and unique needs. The results of this study may have been altered if the researcher would have sought experts in the field of assistive technologies to assess individual needs and identify which emerging technologies are most beneficial and cost-effective.

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 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 of the Digital Divide which show that attitudes are a factor as to why some people do not use the Internet (Cullen, 2001; EKOS, 2001; PIAC, 2000; Sciadas, 2005).

This study contributes to the literature by suggesting that the attitudes of adults with developmental disabilities 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 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 were able to continue.

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 (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 are 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 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 to ask a relative about his or her health. They discovered an online community of people who have similar concerns (e.g., transportation issues), and they were able to locate basic information, such as the date of Oilers' next home game. These online activities, at a minimum, reduced boredom and isolation, and added variety to their daily lives. Online activities provided an enjoyable, mental exercise, much like that found in offline activities like crossword and jigsaw puzzles. ICT skills gave subjects additional ways to have fun and more ways to fill up the time not designated for essential tasks like working, self-care, and sleeping.
2. *Going online for recreation resulted in learning.* The subjects in this study experienced cognitive stimulation similar to that described in Think and Link's (2003) research project. They recalled procedures, solved small

problems, and tried to memorize new tasks in order to perform a variety of recreational activities. Subjects' enthusiasm for training also illustrated the joy of learning discussed in the lifelong learning literature. Many subjects wanted to learn how to go online—they were enthusiastic and excited about this new opportunity. Learning how to use the Internet was enjoyable because learning how 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 study's 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.).

ICT Skills Could Improve Subjects' Lives in Critical Ways

This study identified the immediate outcomes of gaining ICT skills and speculated about future outcomes. As shown in Table 4, 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. For example, Wendy learned how to send e-mail to relatives in Taiwan, 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; Miller, 1987; Jeffreys & Gall, 1996; PIAC, 2000; Think and Link, n.d.; Triggs, 1998; Veenhof, et al., 2005; Vincent, et al., 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 (p. 13).

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 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.

Suggestions for Further Research

The topics described below warrant further investigation.

1. *Determine if literacy levels increase as ICT skills are gained.* Research has shown that ICT skills and literacy are entwined (Abbott, 1998; Langford, 1998; National Institute for Literacy, n.d.; Partnership for 21st Century Skills, 2004; Swan, 1999; Veenhof, et al, 2005). Adults with developmental disabilities often have deficits in literacy skills, but literacy gains may occur as online technologies are used. For example, motivation may be higher when people use both regular and modified computer technologies to read, write, listen, and communicate with others. The wide variety of information found during online searches may promote reading

as the user is accessing personally relevant information. Research has shown that e-mail is an enjoyable and effective mechanism for teaching writing (Wollman-Bonilla, 2004, Overview section).

2. *Seek other community settings in which to teach ICT skills to adults with developmental disabilities and settings where they can use these skills.*

Learners need practical applications of newly-developed skills and authentic reasons to develop additional skills. They need opportunities to contribute to the good of the community. As Jeffreys and Gall (1996) point out, “the life of all in the community is enriched and maintained through the participation of all of its members in education, employment, home life, recreation and interpersonal interactions” (p. 118).

3. *Identify Internet-based learning opportunities currently available to adults with developmental disabilities who have basic ICT skills. Several subjects in this study developed the skills and motivation to participate in informal and formal e-learning. However, few opportunities exist for Internet-based learning that meets their interests and needs. Follow-up studies are needed to investigate suitable informal and formal e-learning opportunities.*

4. *Identify useful online technologies, including assistive technologies to facilitate online activities for this population. Further research is needed to identify the types of assistive technologies available and suitable for adults with developmental disabilities. Assistive technologies designed specifically those with intellectual disabilities are needed. For example, the*

screen reader Read & Write is designed for users with learning disabilities and has a complicated interface than is less than ideal for users with developmental disabilities.

5. *Provide assistive online technologies, such as voice e-mail and screen readers, to other populations and observe the outcomes.* Recent research shows that assistive technologies are useful for a wide range of people, not only those with disabilities (Forrester Research Inc., 2004, p. 10). Accessible technology makes “computing easier”, “more convenient, and more comfortable to use” (Forrester Research Inc., 2004, p. 10); therefore, many people who do not “consider themselves as having an impairment or disability” could benefit from assistive technology (Forrester Research Inc., 2004, p. 44). Such investigations may provide a larger market for assistive technology thus driving improvements (Forrester Research Inc., 2004, p. 10).

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.

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APPENDIX A

Letter of Invitation to Participate

[researcher address]

Photo of
researcher

August 15, 2003

Dear Member of the Northeast PDD Community,

My name is Rhonda and that's my picture. I'm a student at Athabasca University. I'm doing a special project and I need your help. I'm looking for some people in the Northeast Community who want to learn how to use e-mail. Here is list of what you would do if you decide to help me:

1. You and I will meet several times at [agency] to use the computer.
2. I will teach you to use the Internet.
3. I will teach you how to use e-mail so that you can talk to your friends and to me.
4. I will train other people in the Northeast Community to use e-mail. You can e-mail them if you want to.
5. You will tell me a little bit about the e-mails you are sending and receiving. You will tell me if you like or don't like using e-mail to talk to people.
6. I will also talk to your support worker or anyone who helps you with your e-mail.
7. It will be O.K. if you want to stop meeting with me or want to stop using e-mail. You can quit anytime.

If you decide to help me, there's something important for you to know. Many people will read my report: my teachers, people in Alberta, people in Canada, even people outside of Canada. I won't use your name in the report so that you have privacy.

Think carefully before you agree to help with this special project. You have the right to say "no." It's O.K. if you aren't interested in helping me. I won't mind. Before you say "yes" or "no," talk to several people. Show them this letter and the extra pages of information. If you have questions, call me at [phone number].

Thanks for thinking about helping me. If your answer is "yes", tell [contact person at agency] so she can sign you up for this special project and arrange our first meeting.

Yours truly,

Rhonda Van De Keere

APPENDIX B

Detailed Information about the Study for Other Participants

Invitation to Participate in a Research Project

I am a master's student at Athabasca University. I am seeking volunteers who have a connection with the Northeast Persons with Developmental Disabilities Community to participate in a research study. The study will explore the building of basic computer, Internet and e-mail skills. The study will also explore the usefulness of voice e-mail. This project described below was approved by Athabasca University's Research Ethics Board on August 13, 2003.

Researcher:

Rhonda Van De Keere
[Address]
[Telephone]
[Fax]
[E-mail address]

Supervisor of Researcher:

Dr. Susan Moisey
Associate Professor, Centre for Distance Education, Athabasca University
[Address]
[Telephone]
[Fax]
[E-mail address]

Responsibilities of the Participants:

Participants include adults with developmental disabilities, their guardians and their support workers. Adults with developmental disabilities will meet with the researcher for training. After training, all participants will be asked their opinions about the training, skills gained, and other aspects of the project.

Research Purpose:

Adults with developmental disabilities often have reading and writing difficulties that prevent them from using web-based information and communication technology. If they are not able to use the Internet to communicate, they are barred from participating in a variety of online activities, including e-learning, that are now part of everyday life. The purpose of the study will be to investigate how audiographic e-mail can be used to help individuals with developmental disabilities overcome literacy-related barriers and enhance their communication capabilities. Additional details about the research questions are available upon request.

Data Collection Methods:

The researcher will make notes about technology, training, and skills gained. The researcher will conduct unstructured interviews.

Duration And Nature Of The Participation:

There will be approximately 5 – 15 training sessions that are 30 and 60 minutes in length. The training sessions started August 2003 and may conclude April 2004.

Risks and Benefits:

Risks: The developmentally disabled adults in the study face no greater risks than those they encounter in their everyday lives when they seek information from others in order to make decisions involving support services, housing, employment, transportation, recreation, and education. Many adults today accept the risks associated with web-based information and communication technology because they believe that the benefits outweigh the risks, but extra precautions will be taken to protect this more vulnerable population by asking the PDD community to refer participants, by selecting participants who have access to secure computers, by seeking guardian consent and support worker consent, and by using appropriate e-mail systems/technology. Participants will also be educated about Internet safety as part of the risk-reduction strategy.

Outcomes and Benefits:

- Participants are likely to gain basic computer skills, which are useful in a society where people use computer technologies in many ways in their everyday lives as tools and for entertainment.
- Internet and E-mail training may strengthen developmentally disabled adults' networking capabilities, decision-making abilities, and inclusion in e-learning opportunities.
- Participants are likely to experience satisfaction and pleasure that comes from being able to connect with others to voice hopes, needs, opinions, experiences, knowledge and feelings.

Support for Benefits Exceeding Risks: Organizations closely involved with the targeted population support the inclusion of developmentally disabled adults in the research activities that affect them:

- the Northeast PDD website, <http://www.pdd.org/Provincial/crp/index.htm> and <http://www.pdd.org/provincial/crp/PrinciplesandValuesCRP.doc>
- The NorthEast Community Online's project report submitted to the Office of Learning Technologies (OLT) at http://cde.athabasca.ca/showcase/OLTmois1/olt_report.pdf. See also www.ne-community.com.

Right To Refuse: Participants have the right to refuse to participate in the study. If they do participate, they may withdraw at any time during the period in which data is being collected without prejudice. They have the right to refuse to answer any questions posed to them.

Privacy, Confidentiality and Anonymity: All participant identities will be protected.

All information will be held confidential, except when legislation or a professional code of conduct requires that it be reported.

Thank you for reading over this information and considering this invitation to participate. If you have any questions, please call me collect at [phone number]. I can also be reached by fax at [fax number] or by e-mail at [address]. Once again, I want to assure you that the study described above has received full approval by Athabasca University's Research Ethics Board and [name], CEO of the Northeast PDD.

Yours truly,

Rhonda Van De Keere

APPENDIX C

Consent Forms

SUBJECT CONSENT

I would like to participate in this project.

Subject's Name: _____

Signature: _____

I give my consent for _____ [subject's name] _____ to participate in this project.

Support Worker or Guardian's Name: _____

Signature: _____

PARTICIPANT CONSENT

I have read and understood the information provided to me about Rhonda Van De Keere's thesis project at Athabasca University. I agree to participate in this study on the understanding that I may refuse to answer certain questions and that I may withdraw during the data collection period.

Name: _____

Signature: _____

APPENDIX D

Interview Questions for Subjects

1. What did you think of meeting with me to do e-mail and Internet on the computer?
2. Were our sessions interesting or boring? Why?
3. What did we do that you liked?
4. Which would you rather do, regular e-mail or voice e-mail. Why?
5. If you had a chance to sign up for more e-mail and Internet training would you? What would you like to learn?
6. Why did you like the new computer?
7. Were our meetings too short, too long, or just right? Why?
8. Did you like doing e-mail? Why or why not?
9. Did you learn a little or a lot in our meetings? What did you learn?
10. Would you consider going to the library to get your e-mail? Why or why not?
11. What is your e-mail address? If family or friends say I want to e-mail you, could you write out your address for them? Write your address on this piece of paper for me.
12. Anything else you want to tell me about this project?

APPENDIX E

Set-Up and Training Protocols for Computer Coaches

Protocols for the First Meeting

(Obtaining Consent to Participate and Assessing Goals)

1. *Introduce potential trainees to the coach.*
A friendly discussion during the first meeting allows the computer coach to make a personal connection with each potential trainee and demonstrate what a computer coach does.
2. *Introduce potential trainees to a simple computer activity if appropriate.*
Potential trainees with Internet experience do not need to demonstrate their ability to perform a simple computer activity and should immediately proceed to Step 3. The other potential trainees should sit directly behind the computer and use a simple program and complete a simple computer activity, such as a point-and-click puzzle or a short, 1-3 minute game. The simple computer activity assesses the individual's interest in operating a computer and ability to use a mouse. The coach should offer encouragement such as "Nice work" and "Keep going" and prompts when necessary. The first activity needs to be short and successful, easy but not boring.
3. *Obtain informed consent.*
Potential trainees should be asked if they would like to use the Internet. Their agreement may be interpreted as consent to participate in training. If they choose to end the session, invite them to return for additional training. Some may choose to return and others may not. If they return for additional training, consider this to be informed consent.
4. *Introduce trainees to an appropriate online activity.*
Enter an appropriate website with pictures and audio, such as NorthEast Community Online (www.ne-community.com), which is a virtual community designed for people with developmental disabilities. If the address is difficult to type, the website can be bookmarked or added to the Favorites menu for easy access.

- If trainees are unfamiliar with basic computer operations or if time is short, they can select a topic of interest within the website and read it aloud. If reading aloud is difficult, they can select audio version of the information or browse through the pictures.
- If trainees are primarily interested in e-mail activities and time permits, they can use e-mail, either accessing an existing account or registering for a text-based account. To register, trainees can read or be read the registration questions, and then be coached typed their answers. Select an easy-to-remember and easy-to-spell password. The computer coach should record this information and store it in a secure location.
- Individuals who have e-mail accounts can demonstrate their e-mail skills or describe what they want to learn about e-mail.

5. *Assess training needs.*

The process of assessing literacy skills, interests, ICT skills, and assistive technology needs occurs while trainees access a website so that an individualized training program can be established. (In general, browsing the Internet tends to be an easier and more satisfying activity for first time Internet users than registering for e-mail.)

- Literacy skills can be evaluated as trainees read aloud (e.g., website information, the e-mail registration questions, screen prompts). Reading difficulties indicate the need for a screen reader.
- Reaction to websites designed for adults with developmental disabilities will determine whether or not future training sessions will include further exploration of the website and participation in the online community.
- An interest in exploring other websites can be assessed by asking about hobbies and interests.
- The need for e-mail training can be assessed by asking trainees if they will be able to obtain an e-mail address of someone they can e-mail.
- ICT skills can be assessed by noting how many verbal prompts and how much physical assistance is required to successfully access and navigate within the website (e.g., how to double click, how to type the address, how to click on links, what to type, and how to exit).
 - a. A scroll box can be called “an elevator”; trainees can be asked to “use the elevator to take us to the top” instead of “scroll.”

- b. If additional help is needed, the coach can give verbal instructions in plain language, use simple analogies, and use a pen to point out relevant screen icons and keyboard keys (e.g., “This picture here of the hourglass or timer means we have to wait.” “Here is the hyphen. It’s a little line.”).
- c. Double clicking can be demonstrated by the coaching resting a hand on the desk and tapping on the desk with the right index finger and saying “1, 2” at the appropriate double-clicking speed.

If additional help is still required, minimal physical assistance can be provided, such as preventing the mouse from moving while trainees click or double click. (Note: a reduced double-clicking speed may be only partially helpful.) Assistance can be given by the coach pressing the mouse cord, right where it attaches to the mouse, down onto the desk so that the mouse stays in place while the trainee presses the button once or twice.

If more physical assistance with double clicking is required, the coach can place a hand over the trainee’s hand so that the double click is done together. The coach should not touch the mouse or keyboard unless help is needed. If the coach needs to use the mouse or keyboard to demonstrate a task, the coach should ask for permission to use the input devices (e.g., “May I show you what to do?” “Now try that on your own.”).

Individuals who have continuing difficulties operating the mouse should have access to a modified mouse.

6. *Facilitate fun and success.*

Trainees should be able to browse the Internet and/or use e-mail in ways they choose with varying amounts of verbal and physical assistance right from the initial meeting. They can, from the outset, successfully perform typical operations include opening programs, selecting commands from menus, spotting links, using the mouse, scrolling, navigating forward and backward in a website, adjusting the speaker volume, typing, and exiting programs. Successfully operating a computer is fun (watching someone else operate a computer is not fun). During the activities, the coach should offer encouragement and work at each individual’s preferred pace.

7. *Close the session and confirm consent.*

At the end of the session, the coach can confirm that the trainee wishes to participate in regular training sessions. It is good practice to record training times and dates on a nearby calendar or personal planner for easy reference.

8. *Record and analyze data.*

Computer coaches should take notes during the first meeting, such as the day and time of the observation, the length of the observation, the trainee's choice of activities, web pages or e-mail documents observed, reactions to activities, technology issues, literacy skills, interests, ICT skills, assistive technology needs, and the environment. Reflective notes can be added about the interactions, training methods, outcomes, setting, or technology. These data will help the coach individualize training and improve protocols. This information will also be useful for future IPPs.

Protocols for Determining the Length of Training

(Determining Undefined and Specific Recreational Goals)

Most trainees will be interested in learning how to use the Internet initially for recreational rather than serious purposes. Even when a trainee is seeking online recreation, it still is useful to identify which of two recreational goals individuals hold so that training methods can be adjusted to suit individual needs. Below is a summary of the two recreational goals.

1. *Undefined recreational goals:* These individuals want the coach to guide the recreational activities. Therefore, the coach will need to do more preparation work before the training sessions finding interesting online activities to perform (finding suitable websites or sending the trainee e-mail to process). Training may be short term (e.g., 30-minute sessions, once a week, for a period of a couple months) and consist of a range of activities intending to introduce individuals to typical activities people do on the Internet.
2. *Specific recreational goals:* These individuals want to guide their own recreational activities. Trainees with specific recreational goals are entertained by achieving specific, self-selected tasks, such as contacting out-of-town relatives and finding information to satisfy their personal curiosities. The coach will need to provide long-term training (e.g. 45-minute sessions, once or twice a week, over a period of 6 or more months). The coach may have less preparation work to do before the training session because trainees are likely to have e-mail from their correspondents to process and ideas for web searches. Some preparation work is needed as the coach should have new Internet activities or websites ready to offer as options for the trainee to explore or decline to explore.

Identifying Trainees with Undefined Recreational Goals

Individuals with undefined recreational goals tend to display three characteristics:

1. *They are likely to limit the training time.*
Some trainees may attend sessions and continually express a desire for ongoing training, but may elect to end sessions after one short activity. Trainees may also indicate a desire to attend future sessions, but

frequently cancel sessions for reasons unrelated to health or transportation issues. These trainees are unlikely to express disappointment when the training ends after several sessions as they are only interested in an introduction to the Internet rather than intensive or ongoing training.

2. *They may be content to let the computer coach direct the activities.*
Trainees with undefined recreational goals may not give suggestions for activities (e.g., suggest topics to research on the Internet). Some individuals may rarely speak during sessions and may not make selections when given two choices during training. These trainees are likely to need the computer coach to make suggestions for online activities that focus on the fun aspects of using the Internet (e.g., visit websites with multimedia and access interactive e-cards). They are seeking an introduction to online recreation and often do not know what activities are possible.

Some will participate in computer and Internet training yet elect to not use the computer at others times (e.g., they will choose to receive literacy and numeracy training in traditional ways rather than using a computer). For them, at this time, the computer is preferred for recreation and not for serious or educational purposes.

3. *They may perform basic computer operations rapidly or tentatively.*
Some trainees may perform computer commands as rapidly as possible and move through as many web pages as possible, surfing the Internet by clicking, double clicking, scrolling, using links, and navigating forward and backward. Observation of these online behaviors may be similar to watching someone play a video or computer game where people make many rapid, fine motor movements with the input devices, and the screen display constantly changes. Using the computer in this way is likely to be entertaining. Trainees will observe some information and see some pictures as they surf through a variety of coach-led activities. Others may operate the computer in an opposite way to the *gaming* approach. They may use the mouse tentatively, perhaps with only one finger and without resting a hand over the mouse. In both cases, individuals are exploring the computer and view Internet activity as a novel pastime, a change of pace from other leisure time pursuits.

Identifying Trainees with Specific Recreational Goals

Individuals with specific recreational goals tend to display three characteristics.

1. *They usually prefer long training sessions and want ongoing training.* Trainees with specific recreational goals tend to become immersed in online activities for 30 minutes and longer. They may seek extra time whenever it becomes available (e.g., when other trainees are absent, the office stays open late, or they may decide to observe other trainees' sessions). Unlike trainees with undefined recreational goals, trainees with specific recreational goals usually do not want their online activities to end and will request ongoing sessions unless they are able to use the Internet independently.
2. *They are likely to control the training activities.* Some trainees will select personally meaningful web search topics to explore in anticipation of their next training session. They may write them down on paper or even their hands so they will not forget. These trainees are likely to sit down at the computer and immediately list what they wanted to do and in what order. They have recreation preferences and want to give input into the training activities. They may say what they do not want to do. Some may set one specific, practical and purposeful learning goal (e.g., fix a password problem and learn one or two new things about e-mail), and then discontinue their training once that goal is achieved.
3. *They connect with the textual, visual, and auditory information within e-mail messages and websites.* Trainees who give input about what to see and what to do are likely to spend time examining the information on the screen and talking about it with the coach.

Protocols for Training Sessions

(General Guidelines for Computer Operations, Web Search, and E-mail Training)

1. *Select technology carefully and stay up-to-date.*

Adults with developmental disabilities need a computer capable of processing multimedia because text information is less accessible than audio and graphic information. It needs to have high-speed connectivity so that multimedia quickly downloads. It will need speakers and a microphone. A headset will be needed if the computer is not located in a private area. A wireless mouse and keyboard are optional but useful as they allow users to freely position the devices for convenient access.

The settings on the computer need to be individualized for each user. Some may need an enlarged screen display, but others will not. Most will benefit from reduced double-clicking speed and ToggleKeys. Some will need a left-handed mouse and StickyKeys.

Some individuals will require assistive technology, which often requires significant computer memory and processing capability. Assistive technology specialists will be needed to help identify which merging assistive technologies are most suitable to match individuals' unique needs. The assistive technologies shown to be beneficial include an alphabetical keyboard (rather than a QWERTY keyboard). The reason for this is for typing but also for retyping. For example, trainees often type with one or two fingers and make frequent errors. A fairly common practice is to delete all characters and start over, retyping everything, rather than editing the incorrect letters or inserting the missing characters. This typing and retyping requires a search all over the keyboard to find the letters. An alphabetical keyboard places letters in logical sequence for many users. Internet activity is also facilitated with a screen reader, a modified mouse, and voice e-mail.

2. *Encourage decision-making and goal setting.*

Both strategies facilitate individualized instruction. Individualized instruction is necessary as adults' interests, abilities, and previous learning experiences are not identical and cannot be served with the same instructional strategy. Asking individuals to make decisions and set goals increases the relevance of training activities and enhances motivation. Both strategies also promote self-determination.

Begin sessions by having a friendly conversation and asking trainees if they have any activities they would like to do. If they do not, ask them to make a choice between two activities, typically either e-mail or web browsing, and then to make more choices within each activity. For example, trainees can be asked, “What do you want to do first, open that e-mail from me or send someone an e-mail?” or “Do you want to keep that e-mail message from your mom or throw it away?” If trainees do not know what they want to investigate during web browsing, they can be asked what kind of information they would seek in a library. Other prompts can be provided if necessary, such as “What’s your favorite sport?” and “What hockey team do you like?”

3. *Make the online experience authentic by honoring choices and decisions.* People with developmental disabilities need to explore the world and not be overprotected. Denying them access to online technologies because risks exist also denies them the benefits of these technologies. Certainly the risks are real, but they can be effectively managed with measures such as a secure e-mail system, Internet filtering software, safety training, and appropriate supports.

Risk of being annoyed. Trainees will experience some of the typical annoyances that happen to all Internet users at some time or another. For example, they will have to reboot the computer after it freezes during an operation. They will encounter hardware and software that will not always work or will have shortcomings. Even with high-speed Internet connectivity, occasionally they will be frustrated by slow response times and want the computer to work faster. If the computer settings are not individualized, they will be annoyed by extra scrolling, double-clicks that do not work, and a mouse that is hard to use. They will have to deal with pop up windows. They may find inaccurate information on the Internet, experience Internet commercialism, and possibly encounter aggressive marketers. They will find that their choices sometimes lead them in directions they do not want to go, and they may be disappointed to be unable to do tasks they want to do. All Internet users face and manage these risks—most people continue using the Internet despite annoyances because they believe that, overall, the benefits outweigh the annoyances.

Other more serious risks: The longer trainees use the Internet and e-mail, the greater likelihood that they will encounter more serious risks such as spam, viruses, or offensive material such as pornography. However, these are realistic online experiences; trainees can be guided through them without being overly protected. Internet users of all ages and all over the world learn to manage these more serious problems as they believe that the Internet is still useful to them as both for recreation and as a tool for more serious purposes.

4. *Promote success during enjoyable training activities.*

Coaches need to give trainees practice in previously taught tasks. They also need to introduce new tasks when appropriate. They need to offer variety in training activities to maintain motivation and participation. ICT can offer great diversity in tasks and richness in learning experiences.

Assistive technology should be used when necessary as it does make online tasks easier to do and therefore makes Internet activities more enjoyable.

Coaches need to provide appropriate verbal and physical assistance. Enjoyment, learning, and personal agency are gained by doing, not watching. Trainees should sit directly behind the computer and be asked and allowed to perform all computer operations (e.g., the coach should not touch the mouse, keyboard, or speaker volume button unless it is necessary and only after asking the trainee's permission). Trainees need an appropriate level of assistance, not too much and not too little. Coaches need to give verbal prompts and offer physical assistance only when necessary so trainees can take responsibility and feel satisfied about successfully performing the desired activities. Two typical prompts are the following: (1) "See this X up in the corner? Click on it to put everything away and leave the computer ready for the next person. Good. We're back to where we first started"; and (2) "The computer isn't working. We have to turn it off in a special and safe way. Hold down this Ctrl key and this Alt key. Good. Now push this Delete key once. Good. We'll just wait until the computer gets itself going again."

As individuals gain more experience and skills, verbal cues can be reduced. For example, when trying to access e-mail, invite trainees to "just try something" to see if they end up where they want to be. As they perform tasks, the coach needs to give encouragement and praise.

5. *Begin by using plain language and simple analogies.*

For example, recording a voice e-mail message can be compared to leaving a message on an answering machine. If individuals are having difficulty composing a message, ask them, "What would you say if you telephoned this person right now?" When using the screen reader, coach should point out that the icons for operating the software look like VCR or CD player buttons. The animated Internet Explorer icon in the upper right corner of the window that shows that a page is loading should be pointed out as an important cue (e.g., "See it moving? That means the computer is trying to do that job for you, so we have to wait.")

Plain language can gradually be replaced with official terminology for some individuals (e.g., “scroll”, “exit,” “shut-down”, and “inbox”).

6. *Gradually reduce assistance and do not expect that all users will become fully independent.*

Individuals may not become independent after several months of training. However, even if they cannot access the Internet independently, going online still has value as a supervised and supported recreational activity. Trainees who are approaching independence and do not use voice e-mail can benefit from using a variety of computers in a variety of locations so that they learn that they are not tied to one computer. This also promotes community inclusion.

7. *Commit an appropriate amount of time to training.*

For individuals with undefined recreational goals, 30-minute training sessions once a week over a two-month period was appropriate for providing an introduction to online recreation. For individuals with specific recreational goals, at least six months of training is required. Also consider having longer sessions (45-minute sessions) and/or meeting twice a week. A 45-minute training session is essential for individuals who have mobility issues and need time to position themselves at the computer and to gather up their belongings at the end of the training session.

8. *Plan for future training and close the session.*

Skills and interests should be continually assessed. Coaches should always ask for suggestions for the next training sessions. Trainees should also be thanked for attending the session.

9. *Record and analyze data.*

As training events and e-mail documents are observed, notes can be taken in order to plan for future training sessions, to refine training protocols, and to gather data for future IPPs.

10. *Obtain ongoing consent.*

The desire to continue to participate in the study can be confirmed by asking individuals if they would like to discontinue training or meet again the following week.

Protocols Specifically for Web Search Training

1. *Plan a lesson that offers access appropriate websites.*

During web searches, trainees should be asked to select the research topic. A search engine such as www.google.ca can be used. Trainees can be asked which websites they want to bookmark for easy access in the future.

Even though trainees should always be asked to select the web search topics, the coach should also research each individual's interests prior to each session to locate a few appropriate websites, particularly those with multimedia (e.g., music, interactive games). Trainees with undefined recreational goals can be given the option to go directly to these sites. Trainees with specific recreational goals can be offered the option to explore these coach-selected sites if time remains after performing their self-selected recreational activities.

2. *Use assistive technology only when necessary.*

As web pages are displayed, the coach can note whether or not individuals can read the information. If they are quite capable of reading the information displayed on the screen, no screen reader should be used. If individuals have difficulty reading, do not want to read the information, or ask the coach to read the information, a screen reader should be used. An alphabetic keyboard, a modified mouse, and other assistive technologies may also be useful for some individuals.

3. *Identify and use appropriate assistive technologies.*

Some modified web search software may not be useful. For example, some web search assistive software has users click on a picture of a general search topics (e.g., sports), then a click on a picture of a more specific topic (e.g., baseball). At this point, the assistance is done and the user is left with a text-based list of websites with no further pictures or audio help. Additional help is often needed to access the text-based information, so a second assistive technology will need to be opened and used. This kind of modified web search software does not provide sufficient or appropriate help. Moreover, running two assistive technologies adds complexity to web searches. It is less complicated to pick one most needed assistive technology. For example, trainees can directly type keywords into a search engine (the coach helps with spelling), click on a link in the results list, and then use a screen reader for further assistance with reading.

4. *Develop assistive technology skills using the methods used to develop other ICT skills.*

Individuals who need the screen reader can run it with prompts through the steps while instructions are given in plain language and analogies are provided.

- If a screen reader is being used for the first time, coaches will help users select the type of voice they wished to hear (male, female, English accent, electronic, etc.), the pitch, and the reading speed.
- Users will need to minimize the website window in order to open the screen reader (preferably opening it with a double click on the icon located on the desktop). Users then maximize the website's window. The screen reader tool bar will automatically appear on top of whatever web page is open.
- Once into the program, users select the text that they want to hear, and a separate window opens where the selected text is displayed. Some text-to-speech programs highlight individual words in the window as they are spoken. In this way, users are able to follow along with the text while it is being read. Users can stop the reading with another button on the toolbar, a square button similar in appearance to the stop button on a CD player.
- As soon as all selected text has been read aloud, the screen reader text window closes, and the users are returned to the web page where the screen reader toolbar remains. The same text can be read again, but people usually prefer to select new text to be read.

Protocols for Determining Readiness for E-mail Training

Individuals are ready for e-mail instruction if all of the following conditions are met:

1. They express an interest in e-mail or select e-mail when presented with the option to either surf the Internet or use e-mail.
2. They are interested in participating activities lasting at least 20 minutes.
3. They are able to provide at least e-mail address of a person who has volunteered to be an e-mail correspondent.

Protocols for Selecting an E-mail Address and E-Mail Agent (Voice and Text)

Below are guidelines for selecting suitable text and voice e-mail addresses and a rationale for each guideline.

1. *Use short and simple e-mail addresses.*

Short and simple addresses are essential for time-efficiency reasons. As they log onto text-based e-mail, most trainees will search all over the keyboard to find the letters. Longer addresses take longer to type, an important consideration if training sessions are short.

Short and simple e-mail addresses also facilitate memorization. Text e-mail users should be encouraged to memorize their usernames and passwords, but voice e-mail users should also be coached to memorize both. This allows them to exchange e-mail addresses with potential correspondents, send e-cards to others, and access their e-mail on many computers.

2. *If feasible, use a Mail User Agent (MUA) with a short domain name and simple log in procedures.*

A login box that already has the axon sign (@) and domain name filled in for users is easy to use. The axon sign is a requirement in an address, yet it is difficult to remember because it is an unusual character unlikely to be encountered in literacy training. It is difficult for most trainees to find on the keyboard and time-consuming to type because it requires the shift key. (Using the shift key is more difficult for individuals who type with one hand; therefore, StickyKeys are useful. StickyKeys is a Windows Accessibility Option which allow users to lock the Shift, Ctrl, Alt, Option, and Command keys so that they do not have to press two keys simultaneously.)

3. *Select addresses with easy-to-spell words.*

The domain name is part of an e-mail address, and e-mail users need to type it frequently and memorize it; therefore, select the MUA carefully. An individual with long or difficult to spell name may wish to avoid using it as part of his or her username.

4. *Avoid addresses that have periods.*
A default address with period between the user's first and last name is challenging to remember because trainees are taught in literacy classes to put a space between words and their first and last names. No punctuation or character between the first and last name may be easier to recall than a period.

5. *Avoid abbreviations and use addresses that make sense when screen readers read them.*
When selecting a MUA and username, consider how the screen reader will read aloud the address.

6. *Avoid hyphens and underscores.*
Both are common in website and e-mail addresses, but they are lesser-used punctuation and are less likely to be discussed in basic literacy training, so trainees may not be familiar with them. Hyphens and underscores are time-consuming to type and easy to mistype; many people confuse the hyphen and underscore because they are similar in appearance and are typed with the same key on the keyboard.

7. *E-mail addresses may need to protect the identify of the user.*
Some trainees, support workers, guardians, and other stakeholders not will want names and/or gender revealed in e-mail addresses. A pseudonym can be used in these situations.

Protocols for Selecting the Form of E-mail Training (Voice or Text)

Coaches should set trainees up to use text-based e-mail and later set up them on voice e-mail if necessary; the same text-based account can be accessed through a voice e-mail program. Voice e-mail is easier to use than text e-mail; however, it should only be used if individuals:

1. are unable to read aloud a simple e-mail message (two short sentences);
2. need help composing a sentence of three to five words;
3. have ongoing difficulties remembering procedures or knowing which buttons to use;
4. are unlikely to want to send and receive e-cards;
5. have ongoing access for six or more months to a secure computer equipped with a voice e-mail program; and
6. the use of voice e-mail will not adversely affect their literacy development activities.

Protocols for Both Voice and Text E-mail Training

1. *Expose trainees to a variety of e-mail messages.*
Once they start using either text or voice e-mail, the coach should regularly send e-mail messages so that trainees can practice opening, closing, replying, and sending e-mail. Coaches can send pictures as both voice and text e-mail users are likely to find pictures to be an appealing and effective form of communication. Coaches can send interactive e-cards (rather than regular e-cards), such as those at www.hallmark.com, as mini educational, multimedia games. E-cards are particularly useful for individuals with undefined recreational goals and those who need to develop basic computer skills. Some recipients will play the interactive e-cards several times. Interactive e-cards allow recipients to practice mouse control by requiring them to accurately, and often quickly, move the mouse pointer to click on moving targets such as flying ghosts on Halloween cards, to connect dots to create a turkey on a Thanksgiving card, or to squish bubbles into colored happy faces.
2. *Accommodate lower-level reading skills.*
Many individuals need text messages with short sentences and no contractions.
3. *Send e-mail messages with links to interactive and multimedia websites.*
Text e-mail users will be able to click on the hyperlinks and easily enter the sites. Voice e-mail users, however, will have to go through a longer and more complicated process of accessing the website outside of voice e-mail (they will need to type the address into the browser). Interactive websites are good for experiential learning and can help people develop an intuitive sense of how to work in an online environment. (For an example of an appropriate interactive website, see <http://www.broenink-art.nl/maukie2.swf>. Users randomly move the mouse pointer and discover that a cartoon cat's head follows. They discover that when the pointer is directly positioned on the cat's forehead and not moved, the cat meows. When the pointer stops directly on the cat's chest, the cat purrs.)
4. *Selectively forward only appropriate e-mail jokes and inspirational writings.*
Messages should be edited for length and content prior to forwarding. Correspondents must delete unimportant text headers that contain screens of information about previous senders and recipients. Correspondents also need to add a personalized message at the beginning of the forwarded text. Correspondents need to delete hard-to-

understand items in lists and pare down the volume of text to a manageable amount, generally no more than two or three screens of scrolling.

5. *Do not forward chain letter e-mails where recipients are pressured to forward the content to others.*

Trainees may not understand that forwarding is optional; they may worry about not performing the forwarding request. Chain letters also highlight a potentially upsetting reality—many adults with developmental disabilities have limited correspondents and therefore can not comply with a request such as, “Forward this e-mail to five people you care about within the next 24 hours and you will receive a blessing and good luck.”

6. *Messages with words in all capitals may be inappropriate.*

Screen readers may say each letter aloud instead of speaking the capitalized word. Words can be emphasized in other ways (e.g., italics, quotation marks). Acronyms should be spelled out.

7. *Continually seek additional e-mail correspondents.*

Trainees should be encouraged to obtain e-mail addresses of correspondents other than the coach. They may provide a support worker’s e-mail address (someone who lived in town and someone they frequently see in person), but e-mail addresses for friends and family members residing out-of-town are preferable. Having at least one out-of-town correspondent is helpful as it shows the usefulness of e-mail. If out-of-town relatives and friends are unavailable as correspondents, the coach should seek an appropriate e-mail buddies (www.ebuddies.org).

8. *Gradually increase e-mail privacy.*

As individuals began to independently compose messages, the coach can make notes, look away, or do something to appear busy and avoid reading private messages unless specifically asked for assistance (e.g., spelling or a procedure).

Protocols Specifically for Voice E-mail Training

1. *Seek appropriate and reliable voice e-mail application software from a company that offers technical support.*

Set up procedures should not be overly complicated or time consuming. The assistive software should be well tested to ensure that it does not have design errors.

An easy-to-use voice e-mail application allows users to easily access their e-mail accounts by simply clicking on their own picture and/or name. To open mail in Inbox, they should be able to click on the message. The text messages will automatically converted to audio and read aloud by the voice e-mail's built-in text-to-speech reader; voice e-mail messages will automatically play when opened and the sender's actual voice will be heard. When trainees want to send e-mail, they should be able to simply click on a recipients' name and/or picture (entered into the address book in advance by the coach), click on a record button, talk into a microphone, and send the e-mail which will arrive in a text e-mail account as a blank text message with an audio file attachment. The voice e-mail program should not freeze if there is a high volume of e-mail moving from the text-based account into the voice e-mail program. Incoming and outgoing e-mail should not be lost during the sending or opening process.

A program such as ICanEmail (<http://www.rjcooper.com/icanemail/index.html>) is suitable because it is inexpensive (\$150), works reliably, and technical support is available when questions arise. It has an audio and graphic interface and is designed for persons with special needs. It provides easy access to already-established text-based accounts.

2. *Develop assistive technology skills using the same methods for developing other ICT skills.*

Instruction should include plain language and analogies. For example, some users may be hesitant about recording their voices for the first time in voice e-mail. Their comfort levels will rise by using the analogy that recording a voice e-mail is like leaving a message on a telephone answering machine. Assistive technologies users should also be asked to direct their learning activities. For example, individuals may choose to replay a message and decide to send it. They may decide to re-recorded a message. Trainees should be given practice on previously learned tasks and presented with new tasks. They should be given only as much verbal or physical assistance as is necessary to ensure success. They should receive praise for desirable learning attitudes and be congratulated on accomplishments.

Protocols Regarding E-mail Correspondents

E-mail training is more likely to result in successful outcomes when suitable correspondents are selected, and they send appropriate e-mail.

1. *The computer coach must have advanced ICT skills and make a significant time commitment.*
A computer coach will send many appropriate and increasing complex e-mails that relate to learners' individual needs and interests. The coach must be prepared to provide support for several months and do preparatory work before sessions so that trainees are always guaranteed to have e-mail to process. The coach's e-mails can contain a simple instruction ("Do not keep this message from me. Find the word Delete at the top of this message. Click on it. ") The coach can also ask the recipient to reply and answer a question ("What are your daughters' names?"). The coach can also suggest relevant websites to visit.
2. *Additional correspondents with time and skills are needed.*
Someone who resides in the same town is acceptable, but an out-of-town correspondent is preferable. Contacts at a distance best illustrate real world applications of e-mail and its value as a communication tool. If a contact resides in town, ideally the trainee should not see this person daily or be present while the trainee is accessing e-mail. Correspondents need to be able to open attachments (voice), send attachments (pictures), and have other basic ICT skills.
3. *Agreeing to be a correspondent implies a willingness to reply promptly to text or voice e-mails and/or to send at least one e-mail message per week on a regular basis for several months.*
People who give their addresses to trainees are implying that they are willing to connect via e-mail on a regular basis.