The Elderly & Computer Technology:
Designing and Developing a Web-Based Learning System
for
Senior Citizens Students

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Spring 2010
Introduction

My 60 year old father got excited when I showed him some new technological capabilities he could do on his computer; my 80 year old grandfather’s eyes lit up as he suddenly understood how to email one of his World War II buddies; and a graduate studies professor admitted to me that she feels very naïve about the technology so many younger students seem proficient in. As I had more interactions with the older generation working with computers, I realized there is an increasing need for instruction in the area of computer technology for the senior citizen student. In fact, when I was very young, I enjoyed showing my ninety year old great grandpa what we could do with a computer. These brief sessions with him resulted in great grandpa being amazed and somewhat fearful of these machines. White (2008) stated that today’s senior citizens grew up during a time that was technology-free as far as computers, and that many actually have “technophobia.” Unlike my great grandfather who is no longer with us, today’s senior citizens can not easily avoid using computers.

Rationale

Research tells us that the age group of senior citizens is the fastest growing and soon to be the largest population in our country. Kiel (2005) stated that the older adult is the fastest growing population with a 20% increase expected over the next ten years; soon we could have over 54 million people over the age of 65, and by 205, there could be 75 million in that age group.

Unfortunately, they are also one of the most computer illiterate age groups of our society. Kiel’s (2005) report is supported by a study done by the National Telecommunications and Information Administration (NTIA) revealing that over 50% of all households in our country have computers, but for people aged 60 or over, less than 25% have computers in their homes.
Also, Morrell, Mayhorn, and Bennett’s (2000) study revealed that less than 5% of the older adults rank themselves as comfortable using computers. However, the senior citizen is frequently faced with the fact that computer sometimes the only method for them. More health care providers ask their patients to renew prescriptions via the internet, and doctors often give websites for patients to understand health concerns. Morrell, Mayhorn, and Bennett (2000) reported that the topic the elderly student wants to conduct on the internet involves locating information about their health. Yet, findings in a study by Bow, Williamson, and Wale (1996) on over 100 people over the age of 50 stated that the older adults avoided using the computer to access this information - some because they did not understand the usefulness of the machine, others because they had never used one before, and even some simply because the mouse was too difficult for them to maneuver.

More reliance on computers occurs in other areas of our life too. Financial institutions are becoming more automated through online banking, and even for a senior citizen to enroll in a college class for free requires computer use at many institutions. More people are living longer; more technology is being developed. These two factors combine to lead us to Alpay et al. (2004) calling the elderly the “unwired population” and that we need more “initiatives put in place to ease seniors into Internet use” (p. 185). The issue of computer literacy for our elderly population is an important one both in the sheer numbers of our population affected as well as the sociological implications. Bow, Williamson, and Wale (1996) compared what we ask of the senior citizen to do when faced with a computer as similar to asking a 30 year old with no flying experience to be the pilot of a Boeing 747. Bow, Williamson, and Wale’s (1996) research showed 36% of their study of seniors didn’t use the computer because they did not know how, 28% said they didn’t use a computer because they never needed to before and didn’t intend to in
the future, and 13% said they had tried to use one but were not comfortable with the technology.

So there are mental, emotional, and physical benefits possible for the elderly who have some computer literacy, and more will be discussed further in the literature. McConatha, McConatha, Deaner, and Dermigny (1995) found that the elderly population “has been underexposed to the possibilities computers hold,” yet becoming computer literate can lead to an increased sense of control and an improvement in the person’s psychological fitness (p. 131). “Computer technology may represent one way of limiting the isolation faced by the aged” (Chaparro et al., 2000, p. 633). Accessing information also provides independence as well as enable the elderly to be part of the “information and communication revolution” (Bow, Williamson, & Wale, 1996). National Telecommunications and Information Administration (NTIA) states that having access to the internet has become important for economic success and personal advancement (Kiel, 2005). The rationale is strong for designing and teaching computer basics to the elderly.

**Purpose**

In considering these implications, I designed my Web Based Learning System as a site to assist the older student in the instruction of internet navigation searches. As noted in the rationale as well as the literature, this growing population has increasing reasons to be proficient in computer literacy, particularly in conducting internet searches. My purposes of studying this issue were to increase my understanding of this unique student population and also increase my competence in instructional technology for the adult learner, to provide them with a successful lesson in learning the basics to navigate the internet. “The rapidity with which computers have taken over our lives has left one societal group lagging behind significantly in the area of
computer literacy” (Saunders, 2004, p. 574). My purpose was to focus on decreasing that lag for as many senior citizens as possible.

**Research Questions** - Some of the questions to be addressed in this study include:

- What are the demographics of this age group?
- What are the contributing factors of their computer illiteracy?
- How does computer illiteracy affect them personally or socially, and then what is the effect of the older adult and computer use have on society?
- What are some of the special needs in teaching technology to this student population of older students?

**Literature Review**

Many of the earlier studies concerning elderly and their use of computers originated outside of the United States, in places such as Denmark, Italy, Germany, Japan, Australia. Often this literature focused on two main areas: senior citizens and using email and senior citizens and accessing health care information via the computer. Recently, though, more studies are being conducted in the United States, and the literature looked at many areas of this elderly population and their thoughts on and use of technology. Some empirical studies include Alpay’s et al. (2004) study in the development of a website to meet the specific design issues for senior citizens, Eastman and Iyer’s (2004) method involved attempting to gather data on over 1,000 elderly people and their attitudes toward accessing the internet and using computers, and Morrell, Mayhorn, and Bennett (2000) researched the issues that the older adults face with computer use. Kiel (2005), Saunders (2004), and Phang et al. (2003) also each developed a study on the topic of the elderly and computers taking their participants through a certain methodology.
and leading to specific results that are helpful as well as encouraging. The Iowa Legal Aid and the Iowa Association of Senior Centers followed older adults through three years as they learned to access information via computers (Saunders, 2004). Opalinski’s study (2001) resulted in an understanding of how the older adults gain independence as well as socialization, and McConatha (1995) found that senior citizens who use computers experience a decrease in depression as well as an increase in their cognitive abilities and their daily living skills.

Some literature were also specific studies concerning web design for the elderly user, illustrating that more technology specialists have begun to realize the importance of providing for this group of people. Seals et al. (2008), Stephanides (2001), Saito, Saito, Notomi, and Saito (2008), Holzinger (2002), and Zaphiris, Ghiawadwala, and Mughal (2005) all present their methodology and results of age-centered research based web design guidelines. A variety of other literature was reviewed as well and is also triangulated throughout this paper with the studies and the theoretical aspects of this topic. These include cognitive aspects (such as memory and thinking processes that change with age), psychological aspects (including the user’s attitudes towards and fears about technology), and physical aspects (such as vision challenges, physical accessibility issues) of the elderly computer user. These theoretical issues will be discussed as we address each of the research questions posted. Let’s first consider the classification of the older student and the demographics of this population of learners.

- What are the demographics of this age group?

The most significant trait of this audience of computer users is their age. They are what our society classifies as senior citizens, although there is some gray area of what the beginning age is for that label. AARP (American Association for Retired Persons) offers membership for those reaching the age of 50; Bob Evans Restaurant gives discounts to people at the age of 55;
the University of Akron offers free tuition to people who are 60 years or older; Social Security payments usually begin at the age of 62; and, our federal government labels 65 as the official age of a senior citizen to begin Medicare coverage. Morrell, Mayhorn, and Bennett (2000) classified their study participants into three age groups: middle age (40-59), young-old (60-74), and old-old (75-92) and studied over 500 people to analyze their computer use and interest in technology. They found that the predominant computer users in these age groups are usually white, married men with good incomes, often retirement pensions, and higher educational backgrounds (Morrell, Mayhorn, and Bennett, 2000). The largest group of non-users are the older women (60+) and black men, who had little opportunity to use the internet (no access to a computer) and no instruction (teaching of the steps) on the procedure (Morrell, Mayhorn, Bennett, 2000). The Pew Study of men and women using the internet, a large study conducted in 2005 found similar demographic user results of the older women “dramatically trailing behind the older men” in computer use (Fallows, 2005).

Opalinski (2001) also studied the older adults and the digital divide of over 100 participants and found that 22% live alone and 73% live with a spouse, with 83% unemployed (mostly retired) and only 36% with some post-secondary education. Fallows (2005) in the Pew Study found that of the older generation using the internet, the majority are white males, with older women lagging about 15% behind in the numbers. An interesting comparison is that almost 90% of women aged 18-26 go online while less than a fourth of that will attempt to log on in the age group of 65+ years (Fallows, 2005).

The AARP (Association for Advancement of Retired Persons) (2000) states that less than 8% of people over the age of 65 years use a computer on a regular basis, and the main reason they do so is just for email access. The 2000 US Census reported close to 38 million baby
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boomers in the age group of 45 to 54 years. Today, ten years later, this group is becoming senior citizens, making millions of people a population group to be concerned about. Why then are so few individuals of such a large population group not using the technology that has become part of the daily routine of the other younger populations?

**What are the contributing factors of their computer illiteracy?**

The factors range in variety and extent when dealing with the older student and their lack of use of technology. Holzinger, Searle, and Nischelwitzer (2007) said “computer literacy is highly related to computer anxiety” (p. 925). This anxiety can come from psychological and physical conditions of the users. Saunders’ (2004) study found that most of their participants’ information about the value of computers has come from their children, but that the participants aged 65 to 89, were overwhelmed with fears: fear of breaking a computer, the cost of a computer, too much to learn at their age, can’t teach themselves, the need to rely on someone else, and security issues. Other studies are similar. Morrell, Mayhorn, and Bennett (2000) state that older adults might not use the internet because they do not know the benefits of something they have never been exposed to. Morrell, Mayhorn, and Bennett (2000) found that there were two main reasons the older adult did not use internet, and these were either lack of access to a computer or a lack of knowledge about how to access the web.

Theoretical aspects of this issue are focused on the aspect of learning and the education with technology as well as the physical aspects of mobility, and all are discussed in the literature. First, older adult students desire to know the specific benefits they will gain if they put forth the effort to learn something new, and second, adult learners have a sensitive self esteem when facing the question of having the ability to learn (Kiel, 2005). Using the computer for a search needed to be a “search for relevant information” for the elderly user, otherwise they do not see
the point of the effort (Alpay, et al., 2004). Holzinger, Searle, and Nischelwitzer (2007) found that the reduced use of a computer by the elderly is a result of not understanding the benefits of the technology as well as a reluctance to learn the skills because of their perceived lack of knowledge and ability. Bow, Williamson, and Wales (1996) stated that “only a very small percentage of the older adults in the sample were completely positive in their feelings toward using a computer.”

Additionally, many of the older persons do not have the basic computer fundamentals to teach themselves to access or search the internet. Eastman and Iyer (2004) conducted a study on the elderly attitudes and usage of the internet. They found that currently only 21% learn the internet from taking a class and 34% get help from a relative, but the majority of others try to teach themselves; however, “there were more respondents who were unsatisfied with their current skills to use the internet than those who were satisfied” (Eastman & Iyer, 2004, p. 214). Eastman and Iyer (2004) also found “solid support for our hypothesis that seniors would be more willing to use the internet if convenient training classes were held” (p. 218).

Another aspect hindering the senior citizens from jumping online is their fear concerning security issues as well as what they see as a complicated and confusing machine. Eastman and Iyer’s study (2004) concluded that the elderly are more “willing to use the internet if they felt it was safe and easy to use” (Eastman & Iyer, 2004, p. 218). This has important implications in how we approach the instruction of these learners as well as the design of the WBLS.

There is also the physiological theories that we are working with learners whose cognitive abilities have changed as they aged. With this in mind, the WBLS should avoid the “deep hierarchy in the information structure (which is linked to the problem of remembering and the decrease in working memory efficiency)” (Alpay et al., 2004, p. 190). Normally, learning
does become more difficult the older a person gets, but we can still learn. Cognitive abilities do change and even slow down as people age, but “lowering the complexity of applications or the user application interaction for the (novice) elderly users could be a vital factor for design and development” (Holzinger, Searle, & Nischelwitzer, 2007, p. 924).

Finally there is the physical aspect of working on a computer. The elderly must deal with more physical challenges than most of the other populations; these can include vision and hearing impairments normal with the aging process as well as physical mobility issues such as arthritis. Holzinger, Searle, and Nishelwitzer (2007) found five distinct human factors that differ between the old and the young: the time it takes to perform a task, speed of performance, error rate, retention over time, and subjective satisfaction with the use of fine motor skills that are required for most of our computer systems today. Bow, Williamson, and Wale (1995) found their participants had physical difficulties with a variety of aspects in searching the internet, with using the mouse and scrolling as the top two problems to grasp.

The changes in vision and auditory abilities include many aspects that might be influenced by a web design, such as ability to discriminate color and ability to focus on detail (Holzinger, Searle, & Nischelwitzer, 2007). “The potential benefits of the computer will not be fully realized if the design of the computer and the associated input devices does not accommodate the needs of the older users” (Chaparro et al., 2000, p. 633). In fact, Chaparro’s (et al., 2000) study resulted in finding that older adults may avoid using a computer because of the necessity to manipulate a mouse or trackball, so again the design must consider all aspects of the user’s needs. The AARP states that at least 20% of all people over the age of 65 have mobility limitation issues.
Putting all these theoretical aspects together is important for web development and design for this group of users. Phang’s (et al., 2003) study sums up the hurdles of hundreds of older people in China using a web design called eGovernment, in which the researchers found that the students won’t use the computer if there is no perceived usefulness of the search, no perceived ease of use, and a perceived lack of safety on the internet. So, they followed the National Institute on Aging’s checklist for web designers to create a site of large, plain type, plain color combinations, and simple steps – all user friendly considerations (Phang et al., 2003). Holzinger, Searle, and Nischelwitzer (2007) states “increasing acceptability must be based not only on a thorough knowledge of the requirements of the elderly but also on their misgivings” about using technology (p. 923).

-How does computer illiteracy affect them personally or socially, and what are the effects on society of the older adult using or not using the computer?

The inability to use the technology tools that are all around us can make for some definite frustration for many different people; however for the elderly, this frustration can be particularly intense. Not only do they not know how to use the computer but often it appears that everyone else around them is successful with these strange machines. For example, the inability to look up a book when he visits the local library or work the computer kiosk at the doctor’s office when everyone else is registering for their appointment can have a profound effect on the elderly who may have already begun to feel like they are on the fringe of society. Not being familiar with the technology can create feelings of being nervous around computers, suspicious of others using computers, and discomfort when asked to try using computers (Phang et al., 2003).

Kiel (2005) studied the learning theories in working with elderly students; “to change behavior, such as depression and withdrawal in the elderly, the environmental stimuli must be
changed” (p. 20). Instead frustration, computer literacy can help the elderly break free of their aging bodies, communicate with long lost friends and distant family, and bring back the sense of independence and empowerment that many elderly tend to lose over time. Kiel’s (2005) study included over 200 people aged 56 to 89 and the results indicated that using the internet “made life easier” (p. 22). The use of computers in the lives of the elderly can create what McConatha, McConatha, Deaner, and Dermigny (1995) called “environmental enrichment” (p. 130). The use of the internet can reduce the social isolation often experienced among the elderly (Mellor, Firth, and Moore, 2008). Mellor, Firth, and Moore (2008) also explain in their study that the health issues and physical challenges experienced by the elderly makes using the internet at home a solution for the social isolation problem.

Studies also suggest that the use of a computer can increase and improve brain function in older adults. Merriam and Cunningham (1990) report that “people who are mentally active have a slower rate of mental decline” than those who do not stay mentally active. McConatha, McConatha, Deaner, and Dermigny (1995) studied residents in three different nursing homes and found that those receiving computer training reported improved cognitive functions. Certainly learning something new such as navigating the world wide web is a mentally active lesson that can have positive impacts on one cognitively. Speed of learning and perceptual skills decline as we age but “the elderly are still capable of learning” (Kiel, 2005, p. 21). The study by Eastman and Iyer (2004) also tells us that the majority of senior citizens who use the internet are doing so for email access to friends and relatives, but that they want to expand their other uses and use the world wide web. Morrell, Mayhorn, and Bennett (2000) states that the opportunities for the elderly are endless with the internet, including some thing as simple and yet important socially as accessing the local community senior activities calendar.
Alpay’s study (et al., 2004) also revealed through their usability test that the participation design of the website is “closely linked to patient empowerment and motivation” (p. 191). In other words, the elderly are the largest group of healthcare consumers, and Alpay’s site of SeniorGezond gives the person the opportunity to be involved in his/her own care. Kiel (2005) stated that the older adults have a need to be seen and treated by others as being capable of self-direction. Navigating the internet can fit this learning theory.

Saunders (2004) concludes that the benefits of senior citizens learning the technology outweigh their fears. Seniors can enjoy the psychosocial benefits of using a computer, the wealth of online information at their fingertips, and the ability to connect with family and friends (Saunders, 2004).

- What are some of the special needs in teaching technology to this student population of older students?

Of course we must be careful that the use of the computer does not lead to more depression or frustration. Phang (et al., 2003) found in their research that the senior citizen will panic quickly when faced with an error message. Words like “illegal operation” or “error” should be replaced with more positive messages such as “please try again” or “contact us at this phone number” (Phang et al., 2003). Just as the use of technology can be a huge benefit to the senior citizen, it can “also become a barrier if the elderly patients cannot easily and effectively use it to meet their needs” (Alpay et al., 2004, p. 191). The older adult has some specific needs as a student, and Smith (2008) tells us that there are definite cognitive changes as well as motor skills that become more deficient in the elderly student. The instructor of the older adult computer classes must be mindful of these needs. Smith (2008) says that the deterioration of vision, hearing, short-term memory, and motor skills can make it difficult for seniors to understand and
navigate web sites. This is important in development and design. “Making a system more usable could be accomplished by altering its design until the knowledge if adequately simplified” (Holzinger et al., 2007 p. 924).

Further research confirms that older adults recognize images more easily and frequently than recalling words or numbers (Merriam & Cunningham, 1990). Saito, Saito, Notomi, and Saito (2007) report that Japan has a rapidly growing aging population and the change in vision with age makes it important for web designers to “take measures to improve Web accessibility by considering human visual characteristics” (p. 41). The combinations of background color and character color is important with this user. Saito, Saito, Notomi, and Saito (2007) used chromaticity and a score of background colors with elder users (68+ years old) as they viewed a computer screen in a private booth and compared the results to those of younger users (averaging 24 years old). Saito, Saito, Notomi, and Saito (2007) discovered that the use of blue against a white background is one of the most recognizable color contrasts, so the use of that as web address links is helpful for all users but especially for the elderly adults because of the wavelength of a blue component. Changes in the vision of the elderly is one of the most important considerations for the web designer. Hozinger, Searle, and Nischelwitzer (2007) lists the following abilities that decline with age – and each could influence the use of technology and need to be considerations by web designers: ability to see detail, ability to focus on close objects, ability to discriminate color, ability to detect contrast, ability to adapt to darker conditions, susceptibility to glare, necessity for more lighting, and a narrowing of the peripheral vision fields.

In another earlier study, Holzinger (2002) specifically states that the important motto in designing web sites for the elderly is to follow the phrase “less is more.” Holzinger’s (2002)
book, *User-Centered Interface Design for Disabled and Elderly People*, was a clinical study done with older patients with little or no computer experience and a design of a patient communications system on a PC. These students included people with visual impairments and restricted motor ability, and the designers’ core philosophy was that a “minimalist design” would serve these users best (Holzinger, 2002, p. 36).

Stephanides (2001) explains the necessity for “adaptive techniques” for the “emerging information society” as there is more attention today on providing for the disabled and/or elderly individual. In designing a web based learning system for the older student, there needs to be a conscious effort on the part of the designer to consider “breaking away from the typical user interface” (Stephanides, 2001, p. 172). A web based learning system called SeniorGezond was developed in the Netherlands as a pilot WBLS for the elderly student (Alpay et al., 2004). SeniorGezond followed the “strong need to develop senior friendly applications and websites that are directly customized for the elderly population” (Alpay et al., 2004, p. 189). Some early literature discussed the need for web designers to “design for all” but that is not always the best concept for the user who has the “normal age associated declines in health (such as vision and hearing impairment, and changes in cognitive abilities and motor skills) that will limit the use of electronic technology” (Alpay, et al., 2004, p. 189). We must design the site with these learners and their needs in mind.

There is also more to the design than just what appears on the screen when providing the older learner with instruction in computer technology. Chaparro et al. (2000) found that general user interfaces demand the use of a mouse or trackball, both of which may be difficult for the elderly to manipulate. Changes in “reduced muscle strength, reduced range of motion, and increased difficulty executing fine motor movements” are some of the age related challenges for
the elderly (Chaparro et al., 2000, p. 633). Sarnoff (2001) encourages more of keyboard only input features, which seems like a strong concept.

Results

Holzinger, Searle, and Nischelwitzer’s (2007) summary is a clear result for us. “Designers and developers need to understand their [elderly] needs, which need not necessarily be just bigger brighter virtual keyboards and larger script. Their [elderly] motivation is different, their frustration level is lower and they may have to overcome previous, negative experience (p. 924). Similarly, the implications from the various studies including Eastman and Iyer (2004) who specify the necessity for a safe atmosphere and an easy approach to using the internet for the older adult. Providing a beginner’s computer class to learn about internet searches through my WBLS would provide the older student with the safe environment as well as the security of not needing to enter any personal information during this learning system. The design of the WBLS as only several steps and screens also contributes to the ease of using the internet for these students.

Alpay et al. (2004) used interviews and observations of qualitative analysis to collect the data and explain the results of the senior citizens using the SeniorGezond web site. Some of their findings as well as the other literature were influential in the address of the points in my WBLS. Alpay’s et al. (2004) pilot with SeniorGezond resulted in a clear need for “no distracting features and using color conservatively” (p. 188). In fact, the words “restful website” was used by the elderly participants (Alpay et al., 2004, p. 188). I followed the results of the studies that stressed avoiding “too much text” and other demands of the user (Alpay et al., 2004, p. 188). Another aspect of the WBLS design study was that they initially used a case based approach, which did not work well for the elderly participants, and instead switched to more of a sequence design of
steps, similar to the method I used in my WBLS (Alpay et al., 2004). I also revised some areas of my WBLS as a result of these studies, changing the video to a power point where I added text captions so as to not rely on the hearing ability of the user (Sarnoff, 2001).

White (2008) states that the vocabulary of computer technology is often a whole new language to the older student. The terminology, such as “refresh, browse, cursor, scroll,” were important for the senior citizen to learn as a foundation for the navigation search. According to Saito, Saito, Notomi, and Saito (2007), I made every link consistent in the blue wording and underlined it as well to increase the recognition factor. “The combination of blue and underlining is empirically and intuitively seen as representing a link and thus is effectively understandable and accessible” (Saito, Saito, Notomi, & Saito, 2007, p. 42). Smith (2008) stressed that “designers should focus on removing obvious obstacles to Web site usability, obstacles such as the poor use of background colors, font sizes, inconsistent page layouts, and the presentation of pages cluttered with ads and miscellaneous information” (p. 80). Holzinger, Searle, and Nischelwitzer (2007) called this “cognitive congeniality” and stressed the need for designers to avoid “cognitive overload” of the elderly computer user (p. 928).

At times, I had to resist adding some flourish or design to my site as I focused on the simplicity and clarity of the pages for the older learner’s eyes. A few recognizable icons such as the Google image and an icon for the power point presentation were enough for the home page site. My side bar of blue underlined links was carried consistently throughout each page of the site – as was the Home icon that a student could go back to the beginning if needed. I also kept consistent the location of my contact information should they want help outside of the class time. Additionally, I utilized pale yellow as a background color sparingly as Saito, Saito, Notomi, and Saito (2007) showed that background color as the best one for “high visibility” (p. 45).
Throughout, I kept Holzinger’s design philosophy (2002) of “less is more” for the elderly students as my focus. Sarnoff (2001) stated that websites need to use simple clear language, even being redundant. She also cautioned that older adults will avoid websites that have excessive advertising with blinking and moving graphics that are not only distracting but also could produce seizures for people with certain disorders like epilepsy (Sarnoff, 2001).

Further study for design and development is important as this population grows larger and becomes more immersed in the technology available or even demanded of them. The “adaptive techniques” (Stephanides, 2001) designers need to consider will only continue to grow and expand along with this booming population. Of course, the fifty-year olds may have more interaction with computers today than the seventy year olds, but in a few years, those fifty year olds may not have the eyesight, the mental capacities, and other abilities and will require more recognition of their age related changes which must give way for technical changes. Holzinger, Searle, and Nischelwitzer’s (2007) research included the findings of the use of AgeSim suit, an outfit to wear that completely covers the body that simulates the physical barriers of the elderly. The most frustrating part of the exercise for the young healthy man wearing the suit was when he needed to use a stylus with simulated arthritic fingers and couldn’t see the device due to reduced vision capabilities. The participant reported frustration at how complicated a simple act was for him in the AgeSim suit (Holzinger, Searle, & Nischelwitzer, 2007).

Chaparro’s et al. study (2000) of over 100 adults aged 60+ years and their range of motion and grip strength in using a computer found that the elderly struggled more with a mouse than a track ball. The trackball may have the benefit of being manipulated with just one finger or thumb instead of the wrist postures that are needed with a mouse (Chaparro et al., 2000). However, neither the mouse or the trackball are the most ideal tool for users with physical
limitations, which most adults over the age of 60 exhibited in the tests of ulnar deviations, wrist flexion, and grip strength in Chaparro’s et al. 2000 research. Sarnoff (2001) studied if websites follow the ADA (American Disabilities Act) and as a result believes that there needs to be more adaptability. Using joysticks or adopted keyboards instead of the mouse or trackball are some of Sarnoff’s (2001) suggestions. With the baby boomers now becoming senior citizens, the design of computers must adapt to their needs, both in the web site design and the hardware material.

Finally, this literature led me to two different reports that detailed the specific guidelines necessary for designing web sites for the older user. First is the National Institute of Aging and their checklist for “making your web site senior friendly.” Set up specifically for users aged 60 and older, the checklist helps the designer create the web based learning system that is readable, easily navigated, and interesting to the older adults. Next was the Senior Friendly Usability guidelines of 38 details that are categorized under 11 points such as use of graphics, text design, links, use of color, and more (Zaphiris, Ghiawadwala, & Mughal, 2005).

**Conclusion and Reflection**

I have revised and adapted my WBLS design according to the literature findings and guidelines. There is an entire population we need to provide instructional technology for. This is a group of students who, for the most part, are eager to learn as long as the instructor is patient and the web site is not frustrating. Some specific targets will continue to be my focus for student learning via a WBLS: simplicity, clarity, and consistency. Through the study of the literature as well as an understanding of the learner, I know those aspects are important in any WBLS but even more critical when working with the elderly student. As Saunders (2004) stated, there are two main trends happening at the same time: “the aging of our population and an increased
societal reliance on computers” (p. 573). Along those same lines, if the seniors can access information on the internet, there is the possibility that they will seek more information independently and even help alter even things like their health care (Kiel, 2005). The psychological benefits of independence are great; the physical relief of being able to work from their homes is a great advantage; and the cognitive theory of keeping one’s mind active is another positive reason to consider providing web based learning systems for the elderly in every community. “The residents who received computer training reported more overall satisfaction with their environment, an increased feeling of control over their daily activities, as well as a sense of being in touch with and aware of the outside community” (McConatha, McConatha, Deaner, & Dermigny, 1995). Eventually, classes for the elderly student will probably not be necessary, as children today basically grow up with a firm foundation and knowledge of the computer. But for the next several decades, there is a group of people that we can consider and develop more classes and WBLS for them.

My WBLS development and design reflects the research findings with the use of simple icons, avoidance of pull downs, clear and concise language, no double clicks, conservative colors, spacing between the images and lines, a help contact provided, no scroll bars, no overlapping windows, and no animation (Zaphiris, Ghiawadwala, & Mughal, 2005). Alpay’s (et al., 2004) study also emphasized the need for the participants to “search for relevant information,” and I developed my WBLS lesson upon the surveyed interest topics of the elderly as well as promoted the students to select search topics that were of personal interest to them. (p. 187). I stayed conscious of my learner and their cognitive and psychological needs as well as their physical concerns, and I attempted to develop a web site that works well for the setting of the community course lab as well as for the individual student. The literature revealed that this is
just the tip of the iceberg for the study of this subject, so there can be future adjustments and improvements.

A future consideration might be a way to incorporate what Holzinger (2002) found as a good method with the elderly using a computer for the first time: thinking aloud. The users vocalize their thoughts and feelings during their interaction with the system (Holzinger, 2002). Although this would work fine with the small group for my prototype, it is more of a challenge in the setting of a full classroom. I might ask students to take turns voicing their thoughts. My fiancé’s family is from Holland, and I showed her parents the SeniorGezond website that they were able to translate to me. This also involved them communicating aloud to me their reactions to the website just as Holzinger (2002) suggested. Without my prompting, they had similar reactions as the results in Alpay’s et al. (2004) study of a useful and easy to use system. These users are in their 60s and were excited to pass this site along to their parents currently living in Holland who are in their 80s.

I next shared my WBLS that I called Senior Searches with my future in-laws and logged their process, sequencing, and interaction with the site. The overall conclusion was one of interest and ease at the navigation of the site. They both commented that they would like more pictures and graphics, but both of them are a little more computer literate than others in their age group. When I showed it to two other senior citizens in their 60s and 70s, they immediately remarked at how uncluttered the screen was compared to when they tried to work on the computer with family. And finally, my user test with a 91 year old neighbor, Fran, was very insightful. She was very uncomfortable with the mouse and couldn’t understand the concept of that instrument working with something on a screen. Fran wanted to keep touching the screen as she worked through the navigation and got frustrated with the mouse, clearly an unfamiliar tool
for her. This collaborates with the findings in the study discussed by Morrell, Mayhorn, and Bennett (2000) of the mouse problems that many elderly users needed to overcome.

Therefore, another important design consideration is the research regarding the use of touch screens for the elderly student. Holzinger (2002) found that a touch screen was simple and easy to use as long as the design of the web site included buttons to push that were large enough and easy to see. “Most patients reported that they ‘liked this kind of computer’ and all the patients who have never used a computer before found that touch screen interface simple to use” (Holzinger, 2002, p. 39). This leads me to consider using touch screens with a WBLS for the elderly down the road.

Lastly, I conducted a usability test with a small group of senior citizens who signed up for a community college basic computer class. Their enthusiasm and excitement in trying my web site was encouraging, especially their appreciation for a site developed specifically when them in mind. Some of the conclusions I reached is the necessity for both the attention to adaptive techniques as well as computer courses for the elderly. This only fuels my interest in pursuing more avenues to working with this population in this area of technology. My school district is seriously exploring the possibility of offering beginning computer classes in our lab to senior citizens as a result of my work on this topic. The findings of the Pew Study telling us that more older women are less likely than the older men to access the internet gives us some guidance in pursuing that audience of learners (Fallows, 2005). Along those lines, I am considering suggesting a women only class that might make the students feel more comfortable and find some collaboration fun among themselves.

Another specific conclusion I have reached is that much of the theory in designing a web based learning system as well as the instruction of the older student should be similar
considerations for all learners. Too quickly the technology teacher makes judgments that the learner understands the terminology or the assumption that the directions were sequenced to follow easy; however, Stephanides (2001) even notes in her research that the “pace of the technological changes” and the “range of our population . . . extends beyond the population of the disabled and elderly users to include all people” (p. 160). So I will always respect the differences of our learners and recognize the needs as we develop our designs – no matter their age.

Lastly, as I noted much of the literature I was first exposed to was from other countries and America is now following suit with the look at their elderly population and technology. However, a global perspective is definitely an important approach to this topic. We cannot probably imagine the implications of the predicted numbers of senior citizens, but research suggests that they will exceed one billion people across the world by the year 2020 (Zaphiris, Ghiawadwala, & Mughal, 2005). Seventy percent of us will live past the age of 65 and almost half will live to see 80 (Zaphiris, Ghiawadwala, & Mughal, 2005). More of us need to be aware of the statistics and needs of this population and design our web sites accordingly.
References


National Institute on Aging: “Making your web site senior friendly: a checklist.”

www.nia.nih.gov


