Challenges and Opportunities of Computer–Based Learning for Senior Citizens

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INTRODUCTION

This entry starts with an argument on how computer-based learning (CBL) can benefit senior citizens, then reviews the effects of aging on CBL. It finally discusses how the CBL material should be designed for senior citizens to facilitate their learning experience.

COMPUTER-BASED LEARNING FOR SENIOR CITIZENS

The European Union (EU) in its recent communication "eEurope: An Information Society for All" (CEC, 2000) stated that the benefits of the information society must reach all Europeans. Developments in information society technology offer great opportunities to overcome social, economic, cultural, and other barriers for people with special needs, especially older people and people with disabilities. But as stated by the EU communication, despite the fact that Europe has the world's oldest population structure (United Nations, 2003), the European industry has so far failed to exploit the full market potential for products and services targeted at people with special needs (CEC).

CBL products and services are no exception of this trend. When it comes to computer usage, the number of older people who have already gained at least some experience with a PC (personal computer) is considerable. According to SeniorWatch (2003), some 49 million older people across Europe have used a computer at least once in their life, and around 27 million currently live in a household with Internet access. Similar results have been found in surveys conducted in the United Kingdom. The so-called silver surfers now represent 12% of Internet users in the United Kingdom with 37% of 60- to 64-year-olds now online at home ("Over 60s," 2003). The surveys also revealed a higher level of computer ownership (50%) among the 60 to 64 age group than among the 18 to 30 year olds (46%). What is then missing is the availability of services that allow older people to take full advantage of computers in the context of CBL.

Learning in the form of CBL provides both a challenge and an advantage for senior citizens. It can broaden their horizons, allow them to refresh and improve their acquired life experiences and knowledge, and give them an opportunity for social interaction. Literature acknowledges that senior citizens are motivated by intellectual stimulation, increased understanding of a field of study, and social interaction with peers (Leptak, 1989). However, senior citizens require the CBL products and services to be adapted to their needs and requirements.

The first adaptation is related to the learning method. Seniors learn best if they can contribute to group activities and have some control over what they learn, especially by utilizing their own experience and interests (Agruso, 1978; Clark, 1995). Peer learning has been proven to be beneficial for senior citizens in face-to-face learning settings (Clark, Heller, Rafman, & Walker, 1997). The peer learning model epitomizes three acknowledged theories of adult learning: andragogy, self-directed learning, and perspective transformation (Marriam, 1993). Peer learning is student-directed, planned by the learners themselves, and undertaken to suit their personal circumstances (Clark et al.).

The second adaptation is related to the design of the CBL material. Aging-related decline in perceptual, motor, and cognitive abilities experienced by senior citizens dictate that the CBL material incorporate features that can alleviate these declines. To enable the designers to incorporate these features, the following section describes these aging-related declines to enhance their understanding.

AGING-RELATED DECLINES

Relatively little research exists that relates the effects of aging to CBL. However, there is extensive research that analyzes age-related differences in cognitive, motor, and perceptual abilities. In general, cognitive-aging literature shows that aging causes decline in the abilities to sense, process information, and respond to stimuli. These declines can negatively affect older users' ability to perform computer-related tasks.

In this section we present a summary of available literature that addresses such age declines. It is advised that designers of CBL systems for senior citizens should take these issues into consideration.

VISION AND AGING

There are 2 million people with vision problems in the United Kingdom and 90% are over 60 (RNIB, 2003). Fozard (1990) suggests that problems with vision tend to appear in the early 40s. At this age, people have a decline in visual acuity (ability to see fine detail) and begin to notice difficulty in adjusting focus for near vision. They usually experience a significant decline in contrast sensitivity (the ability of individuals to detect differences in illumination levels) by the age of 50 (Owsley, Sekuler, & Siemsen, 1983). They may also experience higher sensitivity to glare (Kline & Scialfa, 1996) and reduced sensitivity to color, especially in the blue-green range (Helve & Krause, 1972).

At around 60 years of age, older adults may show a reduction in the width of the visual field (Cerella, 1985), a reduced ability to detect flicker, particularly in the peripheral visual field (Casson, Johnson, & Nelson-Quigg, 1993), and problems with persistence (the sensation of continued presence of the stimulus after presentation of the stimulus has ceased; McFarland, Warren, & Karis, 1958). Seniors also appear to have a decline in processing visual information (Fozard, 1990; Kline & Szafran, 1975). The ability to recognize figures that are embedded within other figures is reduced (Capitani, Della, Lucchelli, Soave, & Spinnler, 1988), and there is a decline in the ability to recognize objects that are fragmented or incomplete (Frazier & Hoyer, 1992; Salthouse & Prill, 1988) and in locating a target figure in a field of distracters (Ellis, Goldberg, & Detweiler, 1996; Hess, Detweiler, & Ellis, 1999; Plude & Hoyer, 1986).

It should be noted that if the target location is constant, there is little or no difference due to aging (Carlson, Hasher, Connelly, & Zacks, 1995; Farkaas & Hoyer, 1980). Older people appear to benefit more than younger people when presented with advance cues indicating the future location of a visual search target (Kline & Scialfa, 1996). However, older people appear to learn visual searches at the level of the specific targets presented, and unlike young people they do not show transfer of learning to new searches where the specific examples have changed but the categories have not (Fisk, Rogers, Cooper, & Gilbert, 1997).

In terms of font sizes, Charness and Dijkstra (1999) reported that older adults were slowed more than younger adults by smaller fonts when reading prose text. They proposed using 12- or 14-point type. Ellis and Kurniawan (2000) proposed that the visual sensing limitations of older users could be better addressed if designers

1. used only sans serif fonts (Arial, Helvetica, Verdana), and
2. used black type on a white background.

Both Ellis and Kurniawan (2000) and Czaja (1997) recommend that designers should create links that

1. are distinct and easy to see,
2. are fairly large (at least 180x22 pixels for a graphic button), and
3. have plenty of open space around them.

HEARING AND AGING

About 20% of people between 45 and 54 years of age have some hearing impairment; this rises to 75% for those between 75 and 79 years of age (Fozard, 1990; Kline & Scialfa, 1996). Seniors show a loss in the ability to detect tones over all frequencies (Rockstein & Sussman, 1979; Schieber, 1992) and miss attention-getting sounds with peaks over 2,500 Hz (Berkowitz & Casali, 1990; Huey, Buckley, & Lerner, 1994). By the age of 80, they may miss 25% of the words in a conversation (Feldman & Reger, 1967).

Coren (1994) instructed participants to listen to speech sounds and to indicate the level they preferred for listening. This experiment showed a huge difference in hearing comfort level for younger and older

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