

An Instructional Strategy Integrating Tactile Aids and Purpose to Teach Audio Learners to Use a Computer

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ABSTRACT

Studies tracking bi-modal use of tactile and audio information show that tactile representations of visual information support the retention and cognition of that information by people with vision impairments [8]. However, the ability to form mental images of graphical information supported with bi-modal tactile/audio formats is not naturally performed by people who are blind [1]. Instructors teaching people with low-vision how to use a computer utilizing specialized screen reader applications do not presently have instructional aids, curriculum, or experience in helping students learn how to form the mental images used in computer applications [3, 9].

Keywords

Screen readers, mental representations, tactile, purpose, assistive technology, home pages, low-vision, blind.

INTRODUCTION

Current studies have identified the need for all computer users to form mental images of computer and Web based applications [1, 7, 3]. One method used by people with visual impairments to access computer information is with specialized screen readers. People with visual impairments have problems forming mental images of information on a computer screen because of the difficulty of translating audio descriptions of the graphical information. Additionally, they often have little previous experience with the visual representations used in computer design [3]. The purpose of this study is to develop a curriculum to help audio learners to use a computer by first forming mental images of the primary graphical elements used in computer design and then reinforce these representations by designing their own Internet homepage.

USING TACTILE AIDS TO SUPPORT AUDIO CUES

Computer application designers use graphical interfaces to facilitate navigation, the organization of information, and the explanation of information on computer systems [3]. Mental representations of the graphical images are formed during the reading process in the visual cortex and then stored in long-term memory. Studies using PET scanning technologies associate specific brain locations with the processing of differing sensorial informational modalities of audio, tactile, and vision [5]. Cross-modal links exist so that when one modality is injured or lost, the other sensory modalities offset the cognitive loss by supplying needed information to other brain locations. Other studies have established that tactile and audio cross-modal links allow people with loss of vision to develop and use mental images for higher cognitive learning processes similar to those people with vision [5, 8].

LEARNER CENTERED OUTCOMES

Harper, Yesilada, Stevens, and Goble [3] suggest five dimensions to characterize Internet browsing behaviors:

1. Context. The organization of resources and how they are presented.
2. Behavioral. Browsing behaviors are the orientation, exploratory scanning, or the ability of movement of the user.
3. Motivation. The motivation has a direct correlation with the user's purpose and goals.
4. Cognitive. The cognitive quotient of scanning derives from the user's plan to accomplish a browsing purpose.
5. Resource. The user's ability to form a mental image and effectively carry out a browsing plan.

Mick and Fournier [6] found that the emotional frustration over not being able to resolve common computer problems often is the reason a person with a disability will give up trying to learn how to use a computer. Coping strategies based on a personal and relevant purpose have been linked to greater motivation to overcome these barriers.

Learner outcomes were identified within three areas; the proficiency of developing mental representations of Web elements [4, 5, 7, 8, 9] computer coping skills [6], and

finding a purpose to use the Internet that leads to an increased motivation to learn [2, 4].

STRATEGIES USING TACTILES AND PURPOSE

Walth and Wattenberg [9] developed tactile representations of computer application screens to help students who are blind learn to develop mental images from the audio information heard from a screen reader. The screen reader provides complex information about screen images, allowing users to navigate, orientate themselves to the content of the page, and make user decisions. Walth and Wattenberg found diverse experiential knowledge of what those images meant among people with visual impairments, ranging from those born without vision to those that have lost their vision as adults.

Twenty-three graphic representations of computer screens were developed depicting the Desktop, using the Start functions, opening and setting up a screen reader, using a word processor, and navigating between file folders [9]. Additional curriculum was developed to teach Internet navigation using tactile representations depicting twenty-five basic elements used in Web design. The effectiveness of the tactile aids was evaluated by a heuristic evaluation. The evaluation attempted to uncover the problems of learners trying to create mental representations from the audio cues of a screen reader. Specialized heuristics were developed by Walth and Wattenberg for these evaluations.

Home pages have been found to be the most visible and identifiable Web genre associated with a person's interests, personality, and emotional perspective [2]. The home page allows a person to present personal information to others, to foster positive social behaviors, and support social learning. Walth and Wattenberg integrated the creation of personal home pages within their instructional strategies, promoting a motivational purpose.

Walth and Wattenberg felt that their instructional strategies could also be adaptable for students with other disabilities. Eight students with visual impairments, four students with learning disabilities, and three students with deafness participated in the first computer class. Additional classes have had similar student participation. The tactile images and the ability to have a presence on the Internet as a personal home page became key factors motivating and encouraging the students to cope with the inevitable frustrations of learning how to use a computer.

FUTURE RESEARCH

Walth and Wattenberg's instructional strategies enabled their students to feel more confident about using computers and navigating on the Internet. Further study of how to utilize tactile representations for diverse computer applications for audio learners is needed. Studies are also needed exploring if bi-modal information can aid students with other disabilities learn. Additionally, the use of home

pages supporting the development of positive social skills and behaviors could help people with disabilities feel more connected with others and their communities.

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