
Eyes on Our World : Can Technology, Aids and Devices Enhance the Life and Learning of People with Vision Impairment?

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It is a twenty-first century belief with which we concur that the emerging global world requires learners to be problem solvers i.e., that it promotes and requires proactive and reactive learners. Passivity, rote learning, and dependence on imposition are insufficient adaptive procedures in the democratic context of essential empowerment. In such a context, learners must exercise their freedom; doing so requires deliberate and engaging flexibility with one's know-how about gaining further knowledge. Encouraging learners' proactivity, reactivity and the sense of balance that enables productive application of both perspectives is a major societal goal, served by the institution of education. It presents significant challenges for teachers, particularly those whose students have vision impairment and the attendant intensity and uniqueness in problems confronted by children, teens and adults with low vision or blindness. The authors present here some background and exemplification of their work in demonstrating that technology, aids and devices do enhance the life and learning of people with vision impairment

Educators' response to the complications of challenges for students with low vision and blindness focuses on helping them build a culture of personal independence. *Orientation and mobility* have become the keystone in these efforts. In its most common form, it is the organisational system that helps students know, negotiate and grow their physical space with increasing independence. A second form is a creation-of-world view where students use literacy to know, negotiate and grow their mind. It targets students' receptive and expressive written communication. Its objective is to improve access to all forms of written information readily available to the rest of the community and to increase the quality of literacy outcomes. Success in both forms provides an orientation to learnerly behaviour and a mobility across the physical and mind spaces that does such things as free-up choices within commercially available written material, with options in a school's curriculum and with targets for work and leisure. It is a lifestyle objective.

While independence is a very desirable objective, vision impairment does impose limitations. However, the nature and extent of such limitations are the subject of advances in technology, and adaptations of it to learning and teaching situations. Technology in the forms of electronic devices, optical/non optical low vision aids and forms of pedagogical adaptation is a critical "watch" for educators. It is plentiful and of extensive variety with potential to link directly with classroom activities and to increase students' control over educational materials (Bishop, 1996). Additionally, students with

low vision can increase the efficiency with which they use their vision using technology, aids and devices (Griffin, Williams, Davis & Engleman 2002 and become more independent as learners in a classroom, rather than relying on adults' inputs to prepare and negotiate materials for them.

There are some horizon prospects in the work of adapting technology to educational accommodations for people with low vision or blindness. For example, robotics technology holds promise for bringing sound and message cues more efficiently into the domains of health and safety, security and instruction. A robot that sees where a person of low vision does not, for example by reacting in "at home" situations to smoke or intruders could activate an alarm and initiate an appropriate phone call. This has great potential for accelerating independence through enhanced orientation and mobility training. Elsewhere (Bartlett, Tourky, Estivill-Castro & Seamon, 2003a), researchers from education and robotics have imagined spectacles that incorporate a laser sensor that sees obstacles in the walk path of an individual and is coordinated with black-box intelligence to alert him/her to safer alternatives. First steps in an exploration of this imagination have begun with very young children who have low vision negotiating the differences between toy and tool as they play with a robot dog (Bartlett et al., 2003b; Estivill-Castro, Bartlett, Tourky & Seamon, 2003). However, there are nearer and available technologies that are already in the experiences of individuals who are blind or who have low vision, and in the day-to-day work of educators who help them seek independence. Among the university students and wider community members who use the Griffith University Vision Impairment Laboratory, there are regular instances where people have auditioned different technological aids in order to determine their suitability for use in their own everyday environments. We consider that this aspect of our work demonstrates a person-centred screening of technology that is mindful of the different needs of people with vision impairment, rather than a disability-centred one. The objective of this work is achievement of a better quality of life for individuals with visual impairments, greater independence and more functional orientation and mobility.

From personal experience working with adults, adolescents, and young children with visual impairment, we believe it is impossible to recommend any one item without deep knowledge of both the person, her/his attributes and needs, and the range of items that may best satisfy the person's needs using his/her attributes. As Rothstien & Evans (1995) observed, change-agents must look at the individual first and then at ways to meet their needs. We add that it is vital to include a training and education component to ensure an appropriate initial matching and to plan for adaptations.

There are important sensitivities involved in doing these things. We consider personal, collaborative consultation is an essential and professional context for working in this way. Workable decisions are made and considered tentative until a child or adult has had opportunity to work solo and in evaluative frame with the technology. Typically at the Vision Laboratory, individuals borrow items they have selected and trial them for a short period of one to two weeks, exploring more fully – and independently - the range and quality of accommodations such items make in the physical and mind spaces of their own environments.

The following accounts represent a variety of experiences reported by participants at the Vision Laboratory. The first three relate to people with low vision, the fourth to a person with blindness:

1. Closed-circuit TV (CCTV)

- 1.1 "This equipment really solves my problem. I want to be able to continue to read the paper and have a cup of coffee each morning. This is what I really miss in my life most." (SP, aged 91 years, attends the Chatter Club - a clinic for elderly people who are visually impaired)

[The VI Lab does not supply this equipment – it is expensive and fragile. However, we found someone who could and did. The cost was within S's capacity to pay and the matching of S's needs and capability to operate CCTV provided her with the means to monitor daily news and other community events and information that were her priorities.]

- 1.2 "This is very good, I can see all the reading, I can read all the material. But, this is very expensive and I cannot carry it with me everywhere." (TS, aged 61, attends the ChatterClub)

- 1.3 "It does solve the problem for me but the price does not justify it and I have great difficulty coming to terms with spending that amount of money on myself." (JR, aged 54)

[We found someone to construct one for her. The cost was approximately 30% of the retail price. The design was not as elegant and compact, but technically it satisfied his reading and writing needs, the cost problem was solved, and the person's life and learning enhanced.]

- 1.4 Another person found that a coloured CCTV allowed her to see her grandchildren's photos, drawings and letters. The grandchildren lived in England; the grandmother's space stretched there from her home in Brisbane. (VO, aged 66, attends the Chatter Club)

2. Large print software programs with and without voice output

[Many in the field seem to believe that a large print software program is a solution to all reading and writing problems encountered by individuals with severe low vision.

But, findings reported here illustrate how the one technology does not fulfil each person's needs.]

Of 65 people sampled who were computer literate and of various ages, 40 expressed a preference for large print accompanied by a voice output. 7 reported it did not help them because the screen was too big and they got dizzy. The remaining 18 persons preferred a large font size with a voice output that highlighted each word spoken. They reported that they do not lose their place when reading because they use the highlighted word as an anchor for focusing

and scanning. All individuals have acuity of 6/60 or less. All 65 individuals needed various hand-held, or stand magnifiers with or without light to complement the use of computer-based programs.

3. Low Vision

For many people one or more simple and relatively-inexpensive aids for near vision and/or for distance provide very satisfactory assistance in relation to their stated needs.

- 3.1 One lady who is fortuitously blind, now misses preparing special soup for her grandchildren as she had done regularly for them before on one afternoon each week. Canned soup was not an acceptable substitute for her "Start-from-scratch" recipes; in fact she became rather agitated when it was suggested. We supplied a magnifier, which freed both hands for holding and preparing the vegetables. A 50cm circumference magnifier with an adjustable cord attached and which hangs and rests at right angles to the chest provided an area of sufficient magnification for cutting vegetables. It did what was needed for the woman's soup-making and the feeling of involvement with her young grandchildren that this brought. It did not help with reading. However, this lady told us, "I did not read much before I lost my good vision and I don't want to start now." (FF, aged 61, attends the Chatter Club)
- 3.2 Another lady wanted a "lady-like" magnifier to carry in her purse so that she could read prices on items, see specifications of items she was considering for purchase, and use at church. An intensive search of Australian and overseas catalogues located a very light square magnifier about 5cm by 5cm. It moves in and out on a pin in a leather pocket of different colours and patterns. She chose a red leather pocket and embossed on the outside her initials in gold. She was so proud of it that she brought it back to show us. (FE, aged 38, attends the Chatter Club)
- 3.3 One person wanted to be able to see as much as possible when a passenger in a moving car. A mounted distant vision monocular with the appropriate fixed magnification power was mounted on a special adjustable frame and resulted in a happy passenger. (CN, aged 54, attends the Chatter Club)

4. Blindness

Synthesized speech: There is a particular synthesized speech program that acts as a reader and a writer, thought by most people working in the field with individuals who are blind as the best for all and the solution to all computer literate individuals who are blind.

- 4.1 One person who lost her vision wanted to continue acting as a bookkeeper for the family business. She reported that this program had shortcomings for her needs as there is no immediate feedback while scanning and this led to inefficiencies in her bookkeeping. A different program that provides simultaneous feedback as voice output while scanning suited her needs. Although some persons would consider this program as deficient, because of its scanning-only feature, it was the solution to her problem. (GD, aged 51, attends the Chatter Club)
- 4.2 Another person had a unique problem when he lost his vision. He had severe arthritis in the hands but expressed a strong desire to continue using a computer. He considered the reading program as 'wonderful' but only as a reader and not a writer, as his fingers could not use a traditional keyboard. He was introduced to a specially designed software program through which the keyboard can be turned into a Braille input mode using only six keys plus the space bar, the return key and backspace key. He was ready and was able to learn the basic Braille (only alphabets and numbers), so that all the input is through Braille mode, with conventional text appearing on the screen and read by the synthesized voice. (AS, aged 62 years)

New developments

The authors have presented a range of technology that as aids and devices that have alleviated or overcome particular problems for people with vision impairment with whom we have collaborated in finding available solutions for confronting problems. We have used lifestyle examples to do this. As educators we also want to signal new hardware/software programs currently being undertaken at Griffith University to develop an electronic robot that can be used as a toy to teach pre-orientation skills to toddlers and preschoolers.

This AIBO technology has been modified by us to include tactile signposting for operators who have vision impairments. This was our first major outcome. The modifications have proven successful and very young children have become adept at finding a topographical feature of the robot dog that corresponds with synchronised instructions that command its different functions (e.g. dance, sing a song, get happy or sad). Our second major finding is very Piagetian. Young children, whether or not they have a vision impairment, call our robot a "dog". They do this despite the earnest prompting of our info-engineer colleagues that it is a robot (Bartlett et al., 2003a). They do it despite the vocal properties of speech and song that AIBO presents in the robot (Estivill-Castro et al., 2003). The third finding is remarkable in relation to children with vision impairment. Though our sample size is small at this point, our toddlers and youngsters have shown strong signs of learning through engagement with the robot dog. Our toddler reached, a significant moment in the orientation development of a child with vision impairment. She reached to touch "Miranda", our robot dog. Tracking studies

from her mother produced immediate and consistent generalisation to the TV where she insists now on doing the ON/OFF and channel changing, and to the radio. The technology has increased her space, widened her world of experience and potential experience and propelled her independence.

Our preschoolers and Year 1 children have developed a talk about Miranda and other robots we have used that is different in content and quality since introduction to the technology. The talk with their teachers, parents and us in spatial and relational language – "under", "over there", "coming here" as they manipulate the robotic features of what have become educational toys in special classes at Narbethong School and the homes of our special people. They also do things differently. They are familiar with Miranda and her friends as interesting toys. But now, they attempt to activate the more difficult and work-like features (finding the power source, removing a battery to test the effects and replacing it) rather than the elementary ones that characterised our early visits (touching Miranda's head to have her dance).

The curiosity and challenge involved in this is a metaphor on which teachers will attempt to build as the children move toward more formal aspects of their schooling. For now, we see very young learners actively setting goals for their play. We see robotics providing motivation for child to perform teacher-set tasks aimed at developing orientation and mobility. We see children motivated to practice, and to build from today's experience as they move into tomorrow's environment.

Conclusion

Can Technology, Aids and Devices Enhance the Life and Learning of People with Vision Impairment?

We see the question as easily answered. Of course they can. The concerns we have lie more with whether educators realise that we must play a part in ongoing research that the Age of Technology has excited and that is linked with the Age of Communication. Second, part of that concern is that we remember the values of consideration and respect when engaging in development such that technology for its own sake does not become the master of issues inherent in the simple question guiding this paper. Such values are the key to success in clever and educative uses of technology as aids and devices to facilitate the independence, productivity and happiness of people with vision impairment.

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