Innovations in Tertiary online for Students who are blind or vision impaired

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Abstract— **The provision of accessible information is vital to the pursuit of education for people with a vision impairment. The improvements of disability-related policy in tertiary environments have resulted in measurable improvements in the adoption of Universal design concepts in the development of print and electronic curriculums.**

Yet despite this progress in policy, many tertiary institutions face a notable lack of practical policy implementation. People who are blind or vision impaired struggle in the Tertiary environments due to inadequate resources and technical expertise in the support structure.

In order to take a proactive approach towards this issue, Curtin University of Technology recently completed pilot project to develop the necessary procedures, tools and training (staff and students) that addresses difficulties faced by this important group of students.

The overall aim of the project was to identify the issues confronting students with a vision impairment at Curtin University, as well as the issues and factors that could contribute to their success at tertiary education.

These include the provision of training to educators, the creation of alternative electronic information and the provision of accessible library and information resources.

Index Terms— **Accessibility, Disability, Vision Impaired**

I. INTRODUCTION

In 2003, the Australian Bureau of Statistics (ABS) conducted a Survey of Disability, Ageing and Carers (SDAC). This survey revealed that one in five people in Australia (3,958,300 or 20.0%) aged between 15 and 64 had a reported disability [1]. In Australia, it is estimated that there are 300,000 people who are blind or vision impaired, and this number is increasing. Research suggests that there will be a 25% increase over the next 15 years in the number of people aged 15-64 who are blind vision impaired.

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Not everyone who is blind or vision impaired has the same visual acuity (Table1). While some people who are blind have very limited or no vision, most vision impaired people have some functional vision. This makes the task of designing and developing learning materials complex because information may need to be presented in different ways.

Condition	Impact
Ocular Albinism	Difficulties with scanning, tracking, depth perception, rapidly shifting visual points, reading
Cataracts	Wide variation in visual acuity (thought full visual field usually maintained) and near and far vision often adversely affected
Diabetic Retinopathy	Fluctuating visual acuity, distortion of vision, and possible impairment of visual field
Glaucoma	Progressive loss of visual field, poor visual acuity, impaired peripheral and night vision, and difficulty in adapting between light and dark
Macular Degeneration	Loss or central vision (hence reliance on eccentric or sideways looking), difficulty in discerning fine detail and reading, and problems in colour discrimination (especially reds and greens)
Nystagmus	Blurred vision, difficulty in scanning and tracking, and problems with depth perception
Optic Atrophy	Variable loss of vision and/or total blindness
Retinitis Pigmentosa	Night blindness, narrowed field of vision (resulting in tunnel vision)

Table 1. Impact of vision impairment conditions [2]

Vision is the primary integrated sense within learning and development [3], [4]. With up to 80% of traditional education presented in a visual format students with vision impairment are unable to access information that is common to other students [4], [5], leading to differential conceptualisations and understanding of phenomena. While computer-based learning has opened opportunities for many students with disabilities, it remains primarily vision dependent. Students, or potential students with vision impairment are thus doubly disadvantaged, as even programmes taught in traditional face-to-face mode use computer-based information as an adjunct to teaching and learning.

One of the main deprivations caused by blindness is the problem of access to information. Visualisation is an increasingly important method for people to understand complex information (using tables, graphs and network diagrams, etc.) and also to navigate around structured information. Computer-based visualisation techniques, however, depend almost entirely on high-resolution graphics and for vision-impaired users the problems of using complex visual displays are great. There are currently only limited methods for presenting information non-visually and these do not provide an equivalent speed and ease of use to their graphical counterparts. This means it is impossible for blind people to use visualisation techniques, therefore further depriving their opportunities to learn [6]. As information and communication technologies advance rapidly, universities need to continually monitor the accessibility of new technologies in order to ensure students with print disability have equitable access to information

At the Human Rights and Equal Opportunity commission (HREOC) National Forum in 2002, it was acknowledged that there is a need for national standards for the provision of accessible tertiary materials for students with print disabilities. Increasing numbers of students, rapidly advancing technology, rising costs and changes in curriculum have led to heightened pressures on universities and other materials providers.

A 12-month project at Curtin University of Technology, funded by the Higher Education Equity Program (HEEP) in 2004 was designed to support Vision Impaired students. This project was designed to capitalize on the existing research and expertise of the project team. An action research methodology was employed to extend current work in this area, and at the same time developed an educational framework, including principles, priorities and specific information on teaching and learning strategies to make information on learning environments accessible to students with vision impairment.

It is recognised that Curtin University has for many years sought to embed services, support and procedures pertaining to students with disabilities and/or medical conditions in the mainstream activities of the university. This project aimed to complement and build on this work. Although the number of Curtin students with a vision impairment is relatively small, this group requires increased levels of support. As the difficulties faced by blind and vision impaired students are a combination of sensory and mobility difficulties, the benefits of this project could also be applied to other disability groups through the provision of more accessible educational information and university environments.

II. AIM OF PROJECT

The issue of providing accessible information and learning materials is becoming a key concern for many providers of electronic information. There are many people with disabilities who find accessing Web pages difficult and among these, vision impaired users are one of the disability groups with the greatest need. The Web is a highly visual environment and most designers use this aspect of the environment as a critical element in their interface and information design. Such strategies, while providing many opportunities and affordances for mainstream users, provide limiting and impeding outcomes for vision impaired users.

At present, the leader in establishing accessibility guidelines for Web page developing is the Web Accessibility Initiative (WAI), a sub-committee of the World Wide Web Consortium (W3C). The goal of this group includes development of a high degree of usability for people with disabilities [7]

The W3C guidelines explain how to make Web pages accessible to people with disabilities. These guidelines are intended to provide the information needed by Web developers and Web designers to design accessible Web pages. To follow them assists also to make Web content more available to all users, for whatever user agent e.g., desktop browser, voice browser, mobile phone [8]. Following these guidelines also help users find information on the Web more quickly. W3C does not discourage content developers from using images, video etc., but rather they explain how to apply multimedia content, which is more accessible to a wide audience.

However, serious accessibility problems are posed for blind users and users with vision impairments (VI) because most Web pages focus on visual displays which do not distinguish between colours [9]. For example, it is quite common to see combinations of background and foreground colours that make pages virtually unreadable for colour blind users. Therefore, design attention is needed to cater for the visually impaired user. "Supporting Vision Impaired Students at Curtin University of Technology" aimed to address these concerns.

III. METHOD

The project was led by an interdisciplinary project team, and employed a research officer for one year to work within the Department of Electrical and Computing Engineering. The project addressed the objectives through a three-stage process. The first stage focused on identifying how current students in the target equity group are able to interact with the university environment. This included environmental and structural issues throughout the campus, as well as the interactions with staff, interactions with students, and knowledge of learning resources within the campus environment. This initial stage provided information as to how effective the current environment and systems are in regard to the needs of the target equity group. This would help to develop an understanding of the current university policies and procedures both in terms of the students, and in terms of classroom interactions between academic staff and students within the target group.

The second stage involved the development of pro-active solutions and strategies for the current issues faced by the target equity group. This process focused on how issues

relating to student learning needs could be resolved prior to the commencement of classes for the semester. This will also enable the development of an effective electronic information explaining the resources and facilities as outlined in the project objectives for students with disabilities.

The third stage involved liaising with the university academic and general staff in ensuring they understand the teaching and learning issues faced by students in the target equity group in relation to accessing curriculum, teaching and learning approaches, and assessment requirements for courses and units. This process assisted in the creation of curriculum and teaching and learning resources based on Universal access and design concepts with a clear understanding as to the responsibilities of both the students and the academic staff in the provision of this information to assist student learning.

Although the function of the learning management system such as WebCT improved gradually, many barriers still remain for many group of users including people who are vision impaired. According to the research, difficulties emerged even if the course content was fully accessible due to specific accessibility issues within WebCT.

Here are some of the accessibility issues with WebCT:

• Specific tools in WebCT are not accessible, for example, Whiteboard and Chat feature;

• Popup windows and new browser windows are a barrier for vision impaired users;

• Timed quizzes may not suit all students;

• Images without alt tags; and

• The close placement of main navigation elements is difficult for individuals using screen readers especially for individuals with motor skill difficulties.

Here are some of the ways to increase accessibility of the WebCT

• Avoid using Chat and Whiteboard feature or provide text alternatives to vision impaired students to participate, for example, e-mail, alternative format for course materials

• Try not to apply too many hyperlinks

• Try not to apply too much information in one page

• Timed quizzes may not suit all students;

• Try to apply images with alt tags; and

• Try to hide the course menu as drop down navigation menu is part of inaccessible WebCT

IV. RESULTS

The project achieved the following:

• The development of effective electronic information for students with visual impairment disabilities, and online materials (WebCT) to aid staff in the creation of curriculum material based on universal access/design concepts;

• The development of resources which ensured that the target equity group have an understanding of the available university resources prior to the commencement of their course. Resources include campus layout maps, faculty-specific resources, descriptions of campus and equity-specific services;

• Provision of orientation and course information to students within the target equity group in an accessible format, ensuring that students in the target equity group have a clear understanding of how to lodge requests for unforeseen equity issues;

• Identifying the required Assistive Technology (AT) access to assist the learning process for the target equity group; and

• Raising awareness of senior management within the university regarding accessibility issues.

V. FINDINGS AND RECCOMMENDATIONS FROM THE PROJECT

Studies such as this help us understand the nature of accessible information and the difficulties faced in providing resources to this equity group. At the end of the project, the research team found significant ways to improve access to information for people with a vision impairment. Figure 1 shows part of the electronic information for staff through WebCT
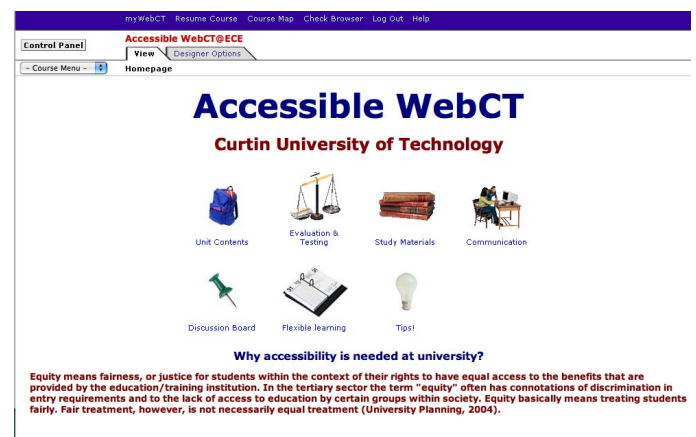

Fig1. Orientation and interface design of electronic information for staff (through WebCT)

The recommendations from the project are as follows:

General Recommendations: Services and information providers from each school and division, and administrative areas at Curtin are using IT resources, as medium of delivery should urgently improve accessibility and usability of the services they provide through the Universal Design scheme.

Finding 1: Most Websites under this research project fail to satisfy most basic Web Accessibility Initiatives guidelines, especially Web sites under office of the vice-chancellor, Curtin University homepage, and also each schools and divisions homepage. In addition, the results of the evaluations undertaken by vision-impaired users show that they have characteristics such as too low in colour contrast (white colour text on yellow background for navigation bar on Curtin homepage), too small font design etc., that make most Web sites are very difficult, if not impossible, for users with certain impairments, especially those who are vision impaired to navigate the Web site. (See Fig. 2) This results both from lack of interest and have inadequate understanding of the needs of disabled users and how to create accessible Web sites.
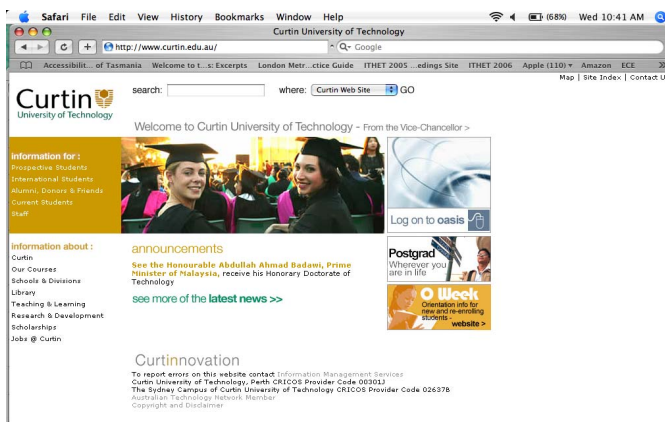

Fig 2. Curtin University homepage with low in colour contrast design

Recommendation 1: Corporate Web Services or Web site commissioners at university should formulate written policies to promote an understanding, and provide information for meeting the needs of disabled users as part of staff orientation day then continue to staff development seminars.

As a minimum, such policies and information to staff should:

- explain what standard of accessibility is to be achieved;
- include the result of HEEP 2004 project (online materials for staff) as part of the staff development program;
- ensure that disabled people with range of sensory, cognitive and mobility impairments are involved from early stage in the process of Web site design and development;

- ensure that all specifications of requirements pass to each Curtin staff that is in charge in Web development/design before posting the Website or Webpage; and
- ensure that there is a process of maintaining such standards whenever a Web site or Web page is modified.

Recommendation 2: Support services from the equity officers could adopt a more pro-active approach to resolving equity issues.

As a minimum, such pro-active policies and information to students should:

- provide disability-specific orientation programs to ensure that students are aware of disability services on campus, complimenting existing orientation programs

- orientation should include campus navigation, library, equity room and how to cope with university teaching and learning life and study routines (through the CD ROM as the result from HEEP 2004 project);

- a student mentoring system between existing students who are blind or vision impaired and new students who are blind or vision impaired;

- advertising of orientation and other such equity services prior to the start of semester through blind and vision impaired support organizations such as the Association for the Blind of WA; and

- ensuring an understanding of the IT tools and services available on campus and how such tools interact with University-specific IT system and applications. For example, the use of JAWS text-to-speech software with EndNote, SPSS, etc.

Recommendation 3: That the University should provide counseling regarding the selection of an appropriate career path prior to the completion of a degree

As a minimum such implementation should include:

- Students with a vision impairment being identified prior to their course completion and presented with the opportunity for career advice
- Provide valuable information regarding the transition form the tertiary environment to the workforce
- A realistic explanation regarding their employment opportunities in their chosen field and to identify areas of likely career prospects

Recommendation 4: The similar areas of study, which are designed to support people who are blind or vision impaired should have an opportunity to meet and discuss emerging ideas.

Recommendation 5: Disability-related areas at Curtin University should focus on the implementation of recommendations made in reports to ensure results and to prevent duplication of effort in later years. For example, a research conducted in 1997 was largely repeated through this research.

Recommendation 6: Closer working relationships between different areas of Curtin University are required to ensure that there is consistent support for people with disabilities. For example, the creation accessible campus maps need to be coordinated between properties, equity officers, and public relations personnel etc.

Recommendation 7: Tactile paths and signage are required around campus to ensure that blind and vision impaired people are able to successfully negotiate around campus. Examples should include tactile paths around key areas of the University, paths within key buildings such as the library and tactile information in lifts and other facilities.

Furthermore, According to Education Standards: Disability Standards for Education 2005 [10] (approved November 8, 2005**)** and the accompanying Guidance Notes apply to all education providers and include all their modes of course delivery. The Education Standards extend the Disability Discrimination Act in a number of areas. The primary purpose of the Standards is to clarify, and make more explicit, the obligations of all education and service providers under the DDA, and the rights of people with disabilities in relation to education and training.

Parts 4 to 8 of the Education Standards cover the following areas:
- Enrolment (Part 4);
- Participation (Part 5);
- Curriculum Development, Accreditation and Delivery (Part 6);
- Student Support Services (Part 7); and
- Elimination of Harassment and Victimisation (Part 8) [10].

VI. CONCLUSION

Online materials for staff and CDRom for students are built and now being tested and will be reported on with further studies to explore the success. It is important to note the limitations of the research as only a small number of the participation are currently involved in the research. But overall the outcome seems positive. Students and staff gained the knowledge of accessible online learning through the Screen reader software and screen magnifier. All of the result and issues involved in the design and development of this project results will aim to improve better information and learning resources for students and staff with vision impaired.

The outcomes of this project will contribute to significantly improved information and learning resources for the target equity group, ensuring that Curtin has processes, procedures and resources in place to address current equity requirements and meet new Disability Standards for Education 2005. These outcomes will have an important significance in that they will stimulate and support the need for more equitable and efficient delivery of education and training services to tertiary students with visual impairment. Improved information and access will be available to students at the start of the learning process each semester. Furthermore, this research will lead to changes in Curtin's electronic information, and accessible online data, which will benefit all Curtin students, not just those in the target equity group.

The current study being undertaken with "Supporting Vision Impaired Students at Curtin University of Technology" is looking to explore how the vision impaired students respond to the alternative interface that has been applied/developed by staff. The study will observe vision impaired users interacting with the system and the efficiency of their interactions and how these are supported or hindered by the interface and implementation that has been developed. The study will seek to explore those aspects of the design which contribute to the quality of the learning experience for the vision impaired students and to establish possible design guidelines from these that can apply to the development of other learning settings for the vision impaired.

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