

Implementing quality, accessible learning: A pilot program in developing accessible online learning resources

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***Abstract:** In 1998 the Australian National Training Authority (ANTA) undertook a commitment to develop a range of web-based learning resources for the Vocational Education and Training (VET) sector. The result is a collection of resources, suggested learning strategies and supporting material known as Toolboxes.*

While toolboxes have provided a quality resource for online learners, they have not always been accessible to learners with a disability. In recognition of this ANTA, in conjunction with the Australian Flexible Learning Framework (AFL), has selected three of the toolboxes currently being developed to conform to the World Wide Web Consortium (W3C) Web Content Accessibility Priority 1 Guidelines. WestOne Services, in conjunction with Challenger TAFE and WestCoast College of TAFE, is currently developing two of these ANTA toolboxes. The toolboxes are a work-in-progress examining the tools and techniques that can be used to facilitate the implementation of accessible learning resources.

***Keywords:** accessible online learning*

Introduction

WestOne Online was founded early in 1998 to provide interactive, online training materials for the VET sector in Western Australia. We were a new organisation working in a relatively young industry and while we had conducted some preliminary research into accessibility, it was too early to make any qualified decisions on access and equity issues.

As we gradually became more proficient and confident, we were able to devote more energy to improving our underpinning knowledge and skills. Our investigation into the provision of accessible web content can be traced back to 1999, to a preliminary exploration in the way users with Acquired Brain Injury (ABI) accessed electronic resources. A WestOne instructional designer attended a workshop on ABI and drafted a report that detailed practical strategies that could be implemented in the instructional design of courseware (see Appendix A).

By late 2000 we were experimenting with strategies to make the online content of our products more accessible to users of adaptive technologies. This entailed the provision of text alternatives for visual content, using bypass links and adapting interactions so that the content presented therein might be accessible via a screen reader. The next year we provided the Association for the Blind of WA with samples of our courses for evaluation. These users tested our learning material using the Jaws® screen reader. Feedback identified a fundamental issue in designing and developing for web accessibility – interface and navigation design. If a screen reader user cannot enter a site or navigate around it in a satisfactory manner, then all the other work such as giving pages and frames descriptive titles or embedding alternative tags is wasted since these pages would not be easily accessible to such a user.

This paper articulates the processes that went to the shaping of a set of ‘best practice guidelines’ and approaches to designing and developing for web accessibility, and our experiences in implementing these.

Two factors became obvious fairly quickly:

1. Web-based course materials rely heavily on multimedia such as graphics, audio and interactions to convey their message.
2. Many disabled people do not wish to be singled out for special treatment, but prefer to be able to use mainstream products.

The two appeared to be incompatible, but a solution had to be found. Not only were the issues of social justice taken seriously, but there was a legal requirement on us not “...to discriminate against another person on the ground of the other person’s disability...” (The Disability Discrimination Act (1992) Section 24.1.) The legal requirement was reinforced by the decision against the Sydney Organising Committee for the Olympic games (2000) and the recent legislation in the USA requiring all federal agencies to have their web sites compliant to section 508 by June 21, 2001.

Another problem identified in WestOne’s early forays into accessible web design was the fact that disabilities can be widely different and each group has its own needs. For example, vision-impaired people may use screen magnification software, such as ZoomText (<http://www.aisquared.com/index.htm>), while the blind use screen readers.

The needs of the disabled may actually be difficult to reconcile with the needs of the majority of users. For instance, both the blind and the dyslexic require punctuation to break up list items – the punctuation both prevents the list being read as a single item by a screen reader, and assists in cognitive understanding. However, while the punctuation can be hidden against the background colour for screen readers, it needs to be visible for the dyslexic – and this visibility means that products do not conform to ‘generally accepted’ standards.

The challenge, then, is to develop accessible learning resources without compromising the quality and richness of learning in the online environment. Our first steps in achieving this vision were in the development and implementation of a set of best practice guidelines for designing and developing accessible web content.

'Best practice guidelines' project

WestOne initiated a research project with the aim of consolidating a set of instructional design and development 'best practice guidelines' to assist in the production of web-based learning material that conformed with W3C Web Content Accessibility Priority 1 Guidelines (<http://www.w3.org/TR/WCAG10/>).

These Guidelines address common barriers in Web pages which people with physical, visual, hearing and cognitive/neurological disorders might encounter, and aim to improve the usability of websites for these users. Implementing these Guidelines can provide web content that is available to all users, regardless of user agent or physical and technological constraints.

The Priority 1 Guidelines indicate checkpoints that all developers of Web content must address, "... otherwise, one or more groups will find it impossible to access information in the document. Satisfying this checkpoint is a basic requirement for some groups to be able to use Web documents" (W3C, 1999). Priority 2 and 3 Guidelines focus on lower-priority elements that web content developers should address to improve access to web documents. A complete list of Priority 1 checkpoints is available in Appendix B.

To test and support the development of our own 'best practice guidelines', we produced a prototype based on an existing Horticulture unit. The prototype was tested for functionality using the Jaws screen reader (<http://www.freedomscientific.com/index.html>), one of the more widely-used assistive technologies for the blind. In particular, the prototype was used to test how Jaws processed:

- scripted interactions
- text alternatives
- content in frames
- tables
- in-line graphics
- form elements
- Adobe® Acrobat® PDF documents.

The prototype was also used to test the implementation of strategies for creating meaningful and relevant alternatives to non-accessible elements or interactions, such as complex graphics and multimedia elements constructed using Macromedia® Director® or Macromedia® Flash™ which a screen reader such as Jaws was unable to process.

The prototype was user-tested by Greg Madsen, President of Blind Citizens WA, who is experienced in using Jaws to access electronic resources, and his feedback and suggestions were incorporated into our 'best practice guidelines'. While feedback was positive and highlighted the importance of implementing Priority 1 guidelines, interestingly, one aspect took on particular significance. In addressing the Priority 1 Guidelines, the prototype provided an alternative interface and navigation that bypassed the script used to produce the standard interface. This script allowed for the dynamic generation of navigational links, that the user accessed to explore different aspects of the unit. The alternative interface presented itself as

such: an ‘alternative’ for users accessing the unit with assistive technologies, such as a screen reader. Madsen’s report articulated that such directions, while useful, highlighted the user’s disability and ran the risk of alienating the user and, in this respect, could be regarded as discriminatory.

The preliminary research and prototype were useful in producing an early draft of ‘best practice guidelines’ that presented practical strategies for implementing W3C Priority 1 Guidelines for instructional design and development of web learning content.

The ‘best practice guidelines’ provide a standard for working. It is very easy to become engrossed in the needs of particular groups and expend considerable resources finding solutions for their needs. However, not only are needs almost limitless, but the solutions can have other effects later on, such as when maintaining and customising the product. While the guidelines do not guarantee universal accessibility, they provide a list of requirements that appear to satisfy many of the needs of the disabled.

The ANTA toolboxes accessibility pilot

ANTA Toolboxes are “a collection of resources, suggested learning strategies and supporting material to support online delivery of qualifications from recognised Training Packages” (ANTA, 2001). Now in their fourth round of development, the toolboxes are nationally recognised as a rich collection of quality learning resources, that can be customised by individual trainers to meet specific training needs.

In 2000, ANTA took the initiative to include the option to develop online resources conforming to W3C Priority 1 Guidelines in its request for tender for Toolboxes. Two of the Toolboxes that WestOne is supporting, in conjunction with partner colleges, were selected to meet W3C Priority 1 Guidelines. These are the Certificate III in Customer Contact (Telecommunications/Call centre) and the Certificate I in Hospitality (Commercial Cookery).

It is most important that the accessibility pilots also meet the high quality standards of previous toolboxes, both in terms of learning and accessibility.

Good instructional design was a priority in designing both toolboxes, and this has in part achieved many of the W3C Priority 1 Guidelines. Both the Hospitality and Call Centre toolboxes have an attractive and simple-to-use interface, and use plain English supported by integrated glossaries. In conformance with WestOne Services design guidelines, all images use HTML ‘alt’ tags to provide a text description of the image, and all navigation icons have been increased in size to make them easier to use for people with poor motor control. Where audio has been used then a transcript is also provided.

For both Call Centre and Hospitality, the design teams decided early on that the overall design would not be compromised by accessibility requirements. The teams came up with two different solutions though - the Call Centre toolbox uses a parallel W3C Priority 1 compliant navigation structure, while the Hospitality toolbox uses an integrated navigation structure.

The parallel accessible navigation used in the Call Centre toolbox model involves creating two separate navigation systems for the toolbox:

- the standard toolbox navigation incorporating non W3C Priority 1 compliant elements (such as JavaScript™ and Flash)

- an alternative navigation using pure HTML formatted to be compliant.

The opening screen invites users to select their preferred navigation system – either ‘enhanced’ or ‘web-accessible’. Key screens contain links that allow users to swap between the two systems. This has proved to be a simple and highly effective way to provide an accessible means of entry to the product, but does mean maintaining two lots of navigation throughout development. Both navigation systems access the same content.

The integrated model used in the Hospitality toolbox combines an accessible alternative within the same space as the standard toolbox navigation. Users employing assistive technologies are therefore able to access the alternative navigation seamlessly. An additional benefit of this model is that all the navigational elements are kept in the one location, however this can make it more complex to maintain.

The Hospitality toolbox uses Macromedia Flash as its ‘standard’ interface. This interface, while attractive, may not be visible by people with ‘low end browsers’ and the Flash components are not recognised by screen readers such as Jaws. This was remedied by including a series of ‘hidden links’ beneath the flash components, which are recognised by screen readers, but are not visible as part of the standard toolbox interface. As an added advantage, these hidden links take over if the user’s browser does not support Flash.

Initial feedback from early trials with accessible online products indicated that disabled users did not want to be singled out for special treatment when it came to using online courses. For this reason it is important that any alternative navigation used be as seamless as possible to the user. In some instances this seamlessness has been achieved through the use of ‘sniffers’ to detect which version browser is being used and to load the appropriate navigation system.

Works in progress

While both Toolboxes are intended to meet the same Priority 1 guidelines, having two separate teams working on different Toolboxes has resulted in some interesting variations in the products (in addition to the navigation noted above).

For example, the Call Centre industry is an attractive area for the blind and vision-impaired to seek employment. While meeting W3C Priority 1 Guidelines, an emphasis was placed on making the content accessible to this particular group.

- Graphics are of limited importance in the Toolbox and alt tags have been adequate to describe them.
- The product uses an integrated database, the design of which was influenced by the need to make it accessible to screen readers. It is not fully functioning and any data entries are lost when the student exits the database. However, the costs involved in developing two parallel databases are prohibitive.
- Audios are a key element of the content and are accompanied by text alternatives.

In contrast, Hospitality is a popular course with students with a mild intellectual disability. Again, while meeting W3C Priority 1 Guidelines, this Toolbox has endeavoured to cater for these students. This toolbox has an emphasis on the use of:

- Graphics accompanied by extended descriptions.
- Activity Summary Sheets that allow students to revise the important points of each activity in their own words. Based on the principles of primacy and recency, these

activity sheets, along with tips and reminders, are designed to encourage memory retention.

This variation in our products leads on to one of the potential problems in designing accessible courseware - knowing when to stop. There is a risk that by designing a course to be accessible to one particular client group, you could alienate other potential client groups. Fortunately the project requirements are quite specific, in that the pilot toolboxes should meet W3C Priority 1 compliance, and it should be pointed out that this is not the same as making the toolbox accessible. While the pilot projects have been tested using assistive technologies, such as Jaws and ZoomText, this is not a requirement of W3C Priority 1 compliance.

The two teams have also shared ideas and collaborated in finding solutions to common problems. W3C Priority 1 Guidelines specify that web sites should function without the use of scripting languages, as these are not supported by some assistive technologies, and yet the standard toolbox navigation system relies heavily on JavaScript for much of its functionality. The inclusion of a JavaScript-driven navigation system also makes the toolbox easier to customise (also an ANTA requirement).

This problem was particularly interesting, as we had already done some testing of the JavaScript navigation system with screen readers, and they handled it quite well. The solution was to have the toolbox detect whether or not the user's web browser was JavaScript-enabled and to load the appropriate version of the navigation.

The use of hyperlinks can sometimes be confusing to blind users, particularly if a link opens a new window and/or is poorly described. The use of multiple windows in the toolbox has been kept to a maximum of three windows at any one time. When a link does open in a new window, this information is provided using the HTML 'title' tag.

Even now, as the toolboxes draw to a conclusion, we are still finding better ways to increase their accessibility. This indicates, that while we have achieved much with the pilot projects, there is always room to improve. And one of the things we have discovered is that there is more than one way to make online learning accessible, depending on your audience.

Implications

Despite the initial learning curve, making toolboxes W3C Priority 1 compliant does not require a significant departure from existing design and development practices at WestOne. It is more a matter of enhancing existing design features to make them more accessible. Many of the solutions are simple, such as making icons and text labels larger, labelling all page elements and links, supplying text descriptions of complex interactions or graphics and supplying transcripts of audio elements.

During the development process we discovered that the critical factor in making the pilot toolboxes W3C Priority 1 compliant was not in the content, but the navigation structures, and that the solution to this problem is mainly through design rather than programming.

Conformance with Priority One guidelines has also added value to the product in other ways. Text alternatives for media benefit mainstream learners by providing different ways of accessing information within the product, as well as providing a printable version of the information usually contained in unprintable interactions. Text alternatives also benefit

students who cannot otherwise access some material because of technical disadvantages such as low bandwidth or incompatible software.

Following these guidelines has had some minor negative impact as well. The nature of some of the solutions has increased the complexity of customisation by a small amount. Anyone seeking to alter the product will have to maintain the accessible alternatives as well. Also some of the solutions, whilst not complex to average developers, may be daunting for some to customise.

While designing and building products to meet W3C Priority 1 compliance has meant an increase in production time, this has not been as great as initially expected. Current figures show that product development time has increased by less than 10% on top of standard development. We anticipate that with future products this time will be further reduced.

The future

The pilot program has been a great learning exercise, and we hope that the information gathered as part of the pilot will be used in future WestOne products. Indeed, many of the techniques we discovered in developing the pilot are already being implemented in other WestOne Services products, and as result of work done so far WestOne Services will be developing an Accessibility Style-guide to be used with all online products.

One important conclusion though is that the Style-guide should be just that – a guide. Having two teams working separately has emphasised that there may not be one ‘correct’ solution to an accessibility issue. While the use of Alt tags or equivalents and providing descriptive titles for frames will be common to all accessible products, sometimes unique solutions may be required (as in the Call Centre database). It is vital that the design and development teams have the freedom to experiment (particularly in the early stages of a project) to find the ‘best’ solutions. We can all learn from each other.

Project completion is due in July 2002 and, at the time of writing this paper, is about 75% complete, but early feedback, from both able and disabled students has been encouraging. As to the future of accessibility in ANTA toolboxes, at the time of writing there was no formal decision made, but there is a recognised need to make online learning more accessible for all users, and it is likely that the future will see more and more toolboxes aiming for W3C Priority 1 compliance.

There is a growing imperative, as evidenced by changes in policy and legislation both in Australia and internationally, that recognises issues of social justice, access and equity in the development and deployment of web-based resources. The pilot projects demonstrate that it is possible to meet the needs of disabled users without compromising the quality and interactive nature of online learning.

Appendix A: Instructional design strategies for ABI

Practicalities which we can implement into instructional design include:

- ABI people often have had to change sides of dominance (ie right to left handed) due to loss of function on their dominant side. Therefore when designing courses for disability groups we could specify large icons so that it is easier to position the cursor.
- Mice with 3 buttons so user doesn't have to remember to 'double left mouse click', often an impossible concept after brain injury. Also recommend slowest mouse speed, trackballs, or wheel mice as less motor coordination is required.
- Often can't verbalise or even write down the answer to a question even though they know and understand. However, if given alternatives the ABI person can select the best alternative. Very real implications for online assessment or interactivity. (ie drop down answer or alternative boxes).
- Some brain injuries result in 'hemisphere neglect' where the injured person is completely unaware of one side of the body. The person will thus 'neglect' anything on the right side of the screen for example. May be able to address this for specific groups.
- People with ABI can often remember/perceive colours and shapes better than keyboard keys, menu commands ... We may be able to design for this in specific instances.
- Everyday familiar conventions may make better navigational/interface icons than more graphical icons (eg exit sign rather than 'quit this module'; traffic light colours etc.)
- Aids to organisation are vital. So step-by-step procedures, frequent reminders and continual reinforcement are essential. Facility to keep a diary of 'What I did/learned today' would be good revision and will help remind the user who may well have forgotten within the hour/day.
- Minimal distractions are important. So no flashing animated gifs, repeating animations etc. Not only do they distract the user from learning but may cause epileptic fits.
- Also with regard to distractions, any graphics must be fast-loading as the user's attention will be lost if they have to wait even a short while.
- Black text on white background is the best, no embossing or background patterns.
- Internet communication facilities may be a real bonus for ABI people as these will enable people with various disabilities to be regarded on a 'level playing field'. Therefore build in chat/bulletin board/email tools.

Appendix B: World Wide Web Consortium (W3C) Web Content Accessibility Priority 1 Guidelines

Guideline 1. Provide equivalent alternatives to auditory and visual content.

- Provide content that, when presented to the user, conveys essentially the same function or purpose as auditory or visual content.

Guideline 2. Don't rely on color alone.

- Ensure that text and graphics are understandable when viewed without colour.

Guideline 3. Use markup and style sheets and do so properly.

- Mark up documents with the proper structural elements. Control presentation with style sheets rather than with presentation elements and attributes.

Guideline 4. Clarify natural language usage

- Use markup that facilitates pronunciation or interpretation of abbreviated or foreign text.

Guideline 5. Create tables that transform gracefully.

- Ensure that tables have necessary markup to be transformed by accessible browsers and other user agents.

Guideline 6. Ensure that pages featuring new technologies transform gracefully.

- Ensure that pages are accessible even when newer technologies are not supported or are turned off.

Guideline 7. Ensure user control of time-sensitive content changes.

- Ensure that moving, blinking, scrolling, or auto-updating objects or pages may be paused or stopped.

Guideline 8. Ensure direct accessibility of embedded user interfaces.

- Ensure that the user interface follows principles of accessible design: device-independent access to functionality, keyboard operability, self-voicing, etc.

Guideline 9. Design for device-independence.

- Use features that enable activation of page elements via a variety of input devices.

Guideline 10. Use interim solutions.

- Use interim accessibility solutions so that assistive technologies and older browsers will operate correctly.

Guideline 11. Use W3C technologies and guidelines.

- Use W3C technologies (according to specification) and follow accessibility guidelines. Where it is not possible to use a W3C technology, or doing so results in material that does not transform gracefully, provide an alternative version of the content that is accessible.

Guideline 12. Provide context and orientation information.

- Provide context and orientation information to help users understand complex pages or elements.

Guideline 13. Provide clear navigation mechanisms.

- Provide clear and consistent navigation mechanisms -- orientation information, navigation bars, a site map, etc. -- to increase the likelihood that a person will find what they are looking for at a site.

Guideline 14. Ensure that documents are clear and simple.

- Ensure that documents are clear and simple so they may be more easily understood.

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