



# Accessible Learning Management Systems: Bridging the Gap between Vendor and User Knowledge

Presented by: The D2L Accessibility Interest Group, with primary contributions by Sandra Earl, Mark Felix, Christie Gilson, and Ken Petri

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## Abstract

Accessible learning management systems (LMS) improve learning opportunities for users with disabilities by offering flexible learning paths and innovative ways of accessing information. However, most LMS are not fully accessible. This paper discusses the efforts of one LMS to improve the accessibility of its products by working with an Accessibility Interest Group consisting of information technology specialists, disability services representatives, and end users at client organizations.

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## Accessibility challenges facing learning management systems

Learning management systems (LMS) have the potential to improve learning and usability for students with disabilities by offering flexible learning paths and innovative ways of accessing information. Students are able to complete assignments at their own pace, from the comfort of their own home, using specifically configured computers and assistive technologies. Course materials can be offered in multiple formats that cater to different learning styles and can be interpreted by assistive technologies more readily than hard-copy materials. However, the extent to which this potential is realized depends greatly on the design of the LMS itself and how it supports the creation of accessible content. Unfortunately, several barriers exist to good design:

- International accessibility standards are a work in progress and tend to focus on static pages.
- Knowledgeable developers and support staff are difficult to find.
- Infrequent collaboration between vendors and users makes it difficult to verify and improve accessibility solutions.

Consortiums involving LMS vendors, disability and assistive technology specialists at client organizations, and end users offer the possibility for collaborative solutions to these difficulties. For example, representatives from information technology departments can point vendors to resources and technically review solutions, while representatives from disability service groups and assistive technology users offer insights on users' major pain points and the usability of new designs.

The Desire2Learn Accessibility Interest Group (D2L AIG) for the Desire2Learn eLearning Enterprise Suite has used such collaboration to initiate major design changes over a two year period, resulting in an industry leading learning management system.

## Accessible web design standards are a work in progress

Although countries throughout the world have legislated that websites and web applications must be accessible to users with diverse use needs, clarity on what constitutes accessible design is lacking and enforcement is negligible. The Voluntary Product Accessibility Template (VPAT), which was developed to help web designers meet compliance under Section 508 of the United State's Rehabilitation Act, is arguably the most influential government provided resource for meeting accessibility legislation, yet it is mute on how to implement the requirements. In response to the need for international standards, the World Wide Web Consortium (W3C) released the Web Content Accessibility Guidelines (WCAG), but they received similar criticism. WCAG 2.0, in "release candidate" status nearing final recommendation, is currently seen as the leading standard to test against by most developers; although, there is concern that it does not ensure that web applications also facilitate accessible user-created content. A complimentary set of W3C standards known as Authoring Tool Accessibility Guidelines (ATAG) is being developed to ensure that web applications also consider the accessibility of user-created content. Finally, as browser support for dynamic techniques improves, LMS are becoming Rich Internet Applications (RIA), with functionality that was previously only available in desktop applications. Guideline for developing dynamic web content using JavaScript and Ajax, such as the W3C's Accessible Rich Internet Applications (ARIA), are emerging, but are not yet supported across all browsers or assistive technologies. ARIA is primarily a resource for developers and does not provide standards or compliance measures.

The ambiguity around accessible web content standards makes it easy for corporations to pay lip-service to accessibility without making significant changes to their designs or accurately reporting their performance. Few companies publish accessibility reports, such as a VPAT or WCAG checklist, and most that do publish their compliance only provide general comments that are hard to verify.

Through the D2L AIG, Desire2Learn has developed a clearer understanding of the importance that educational institutions place on compliance documentation and has made a commitment to report its compliance fairly and completely. As representatives of their respective institutions, D2L AIG members have a vested interest in reviewing the documents and investigating their accuracy. The D2L AIG worked together over numerous teleconferences to ensure each criterion in the VPAT was accurately documented. Instead of recording a simple yes or no response, we have documented what was done to meet compliance and any exceptions that are still outstanding. Both current and potential clients benefit from this transparent approach. As Ken Petri, Director of the Ohio State University Web Accessibility Center, points out, "The VPAT is a living document, one that is viewed as a place to report the real state of the product concisely, but with a level of detail and honesty that is truly useful to the customer." Mark Felix an Instructional Applications Support Specialist at The University of Arizona suggests,

Many companies attempt to gloss over problems that are difficult to resolve. Most likely due to a fear that admitting problems exist will be seen as a weakness rather than having an open and honest communication practice with customers being seen as a strength, when in reality this type of communication is what all customers hope for and value. In the last few years D2L has made this value change and become a stronger product for it.

The VPAT/WCAG experience is a prime example of this communication practice that D2L's clients greatly value.

Desire2Learn's VPAT and WCAG Checklist for both the Learning Environment and ePortfolio are available to all clients through the Desire2Learn Community. The D2L AIG also maintains a more detailed, internal list of outstanding issues that helps Desire2Learn set priorities and objectives. This document is updated as new issues and needs are discussed.

## **Expertise in accessible design is difficult for developers and designers to acquire**

For many companies, understanding and acknowledging the need for accessible design is a relatively recent advancement. The full breadth of what accessible design means and best practices for implementing solutions are still emerging, and, as a result, few corporations, regardless of their size, have developers experienced in this area. While corporations come to terms with expectations from governments, clients, and the broader community, web developers must familiarize themselves with legislation, literature, and best practices on accessible design. This is a steep learning curve, especially for companies that develop authoring tools and rich internet applications.

The D2L AIG was initiated in response to client requests for greater development effort and transparency in relation to accessibility and because there was strong commitment from clients to help Desire2Learn understand and meet accessibility standards. Thus the D2L AIG became an invaluable resource that allows client expertise and insight to have a direct impact on the design and development cycle of Desire2Learn products. Development cycles are more efficient and the products are more stable as a result. The D2L AIG supports Desire2Learn by pointing staff to open source and international standards, literature on advanced techniques, and tools to help facilitate evaluation. A few examples include: WCAG, ARIA, WebAIM and their WAVE Toolbar, and the University of Illinois Urbana-Champaign's (UIUC) HTML Best Practices, Firefox Accessibility Extension and Functional Accessibility Evaluator.

As developer and designer knowledge improves at Desire2Learn, so does the depth of conversation between clients and the vendor. The consortium does not view accessible design as a series of checkpoints, but as a process that is continually refined and developed. The choice of WYSIWYG editor by Desire2Learn is a great example of the kind of conversations that have occurred. For its Learning Environment 8.3 release Desire2Learn introduced a new WYSIWYG editor that, amongst other benefits, was carefully selected for its level of accessibility. The choice of editor involved regular teleconferences and offline discussions with the consortium, as well as multiple evaluations of NDA-covered pre-production implementations. The D2L AIG was confident in Desire2Learn's choice of editor and the company made a large investment in customizing the editor for their product. Feedback from keyboard users has been positive, but some screen reader users have suggested they would prefer the ability to turn off the editor and use a plain text field. The consortium has discussed the advantages and disadvantages of this option and a feature request has been reported. This type of continuing discussion and learning is one of the key advantages to regular meetings between Desire2Learn staff and clients.

## A vendor's effort is seldom tied to real use cases

While many vendors conduct regular usability sessions, accessibility testing is more challenging because users with different needs are more difficult to locate and organize. A vendor's largest clients may only be aware of seven or eight blind students actively using the product and these students change on a regular basis. As a result, participant feedback concerning accessibility issues is often collected post-release and has to filter through a series of contacts at both the learning institution and the LMS. This means accessibility issues are fixed with bugs in subsequent releases rather than being considered with initial design and development.

As Christie Gilson, a Fulbright Scholar who completed her doctorate in Special Education at the University of Illinois, points out there are a number of failures with this system,

What is frustrating as a student who uses a screen reader is that, in order to improve anything we have to search out the appropriate people at the LMS, which is not an easy task, and then donate our time explaining the problem. If their sites were designed accessibly from the beginning we would not have to do this. Students with disabilities tend to be busier than students without disabilities. The amount of energy this takes and the potential for miscommunication when we bring concerns to the attention of those who can address them, often results in us not following through and living with an inefficient or ineffective system.

Christie advocates that vendors "should deliberately seek out users of assistive technology. Rarely can non-disabled IT folks think like or use assistive technology like those the assistive technology is intended for."

Desire2Learn has made a strong effort to act on this advice. The LMS has worked closely with the D2L AIG to encourage assistive technology users to participate in the consortium and review pre-release designs; it has participated in client led accessibility sessions with blind and low vision students, and students with learning disabilities; and has a native JAWS user work with their quality assurance team to test major releases pre-release. Dave Lockhart, a Senior Developer at Desire2Learn, commented that "working directly with a native JAWS user was an invaluable learning experience and had a direct affect on 8.2 designs. Instead of focusing on whether our designs were compatible, I got to see how she used JAWS and think about design changes that could improve her experience. "

Desire2Learn is attempting to seek more regular input earlier in the design process. They are currently redesigning their navigation bars (an outstanding issue), and shared early design ideas with consortium members, including screen reader users. By reviewing the designs early, Desire2Learn employees involved in the consortium are better equipped to ensure accessible design decisions are considered in the design and development process.

Although forward-thinking design is encouraged, the consortium is also a pathway for end-user feedback. Because many of the consortium's members work directly with users with different needs or use assistive technologies themselves, we often have a good idea of what users' frustrations and concerns are. We can relay these concerns to employees at Desire2Learn who are directly involved in the design and development cycle and who are motivated to see change.

## Accessible web testing is complex and labour intensive

Just as developers must build sound practices from ambiguous advice and standards, software testers must develop test cases from these same resources. And while a multitude of software is available to test performance issues, there are very few options for accurately testing accessibility compliance and they are labor intensive. Thus a software tester who focuses on accessibility must be familiar with the different standards, and also have the ability to test how the implementation of these standards meets the needs of users who are deaf, hard of hearing, blind, visually impaired, mobility impaired, or who have learning disabilities. Due to the diverse needs of these users, testers almost always build their test cases around a broad, generalized classification of user, such as someone who is deaf, visually impaired, or keyboard dependent. Testing is done using the most common assistive technologies such as JAWS for Windows, ZoomText, and Dragon Naturally Speaking. Moreover, testers are not experts in every assistive technology and tend to only have the time and resources to test a single or a few versions of each tool.

The D2L AIG helps Desire2Learn overcome these barriers by performing complimentary testing and sharing its results. Through the D2L AIG, Desire2Learn gains access to both user-focused and technically-focused evaluations. A good example of a user-focused evaluation is the usability study for Learning Environment 8.2 that Joe Wheaton, an Associate Professor of Special Education at Ohio State University, led with a group of low-vision, keyboard dependent, and alternative learning needs students. The students were asked to complete a series of common tasks and were encouraged to vocalize their thought process and difficulties as they worked. They then rated the difficulty of each task. Individuals from both Ohio State University and Desire2Learn observed the participants and made qualitative observations. At the end of the study Janna Cameron, Desire2Learn's Usability Specialist, compiled a list of bugs and usability issues. Many of the suggestions were incorporated in Learning Environment 8.2.1. Joe Wheaton documented his observations on the evaluation process so that a similar model can be used for future testing with other accessibility interest groups.

One of the D2L AIG's earliest projects was to evaluate the accessibility of Learning Environment 8.x series compared to the 7.4 series. For this evaluation the consortium used the accessibility checklist developed by the Center for Information Technology Accessibility at the University of Illinois' Urbana-Champaign campus. This checklist uses a matrix of questions that cover a broad range of disabilities to comprehensively evaluate the accessibility of web interfaces. The checklist is based on a broader set of HTML best practices that focus on navigation, text equivalents, scripting, and HTML standards. Matrices of this depth are uncommon, and the University of Illinois' Urbana-Champaign campus has been testing and refining their work through a number of AIG consortiums. The D2L AIG's review of Learning Environment 8.1, which took several months and involved a number of consortium members, produced detailed commentary on the majority of interfaces in the Learning Environment. The results of the review were compared and discussed between the consortium and usability specialists at Desire2Learn.

The project was an invaluable learning experience for Desire2Learn staff and was a catalyst for many process changes, including: new documentation, new design standards, automated

accessibility checks in the development framework, and new testing practices. It also resulted in significant design changes, including: subject-specific alternative text for icons, headings on widgets, skip links, form field labels, and logical tab ordering and highlighting. These design changes and many others are verified by Desire2Learn's quality assurance team and the company records accessibility issues using its bug tracking system.

Desire2Learn also provides members of the consortium with access to new products prior to their release to help proactively identify potential issues. The trust and openness required for this kind of collaboration has been built over many years. As Mark Felix points out, this type of relationship "requires that both sides come to the table with the appropriate expectations of what is possible given time and financial constraints." By involving the D2L AIG in design decisions and review at every stage, Desire2Learn has the opportunity to clarify design decisions, participate in user studies, and help prioritize concerns. Experts from different client groups also benefit because they have opportunities to share resources, network, and learn from each other.

## **Conclusions**

Collaboration through an Accessibility Interest Group benefits everyone. Vendors acquire the necessary skills to compete in a changing market; client participants have the opportunity to share knowledge and network, as well as draw attention to departments and working groups that are not always at the forefront of their institutions; disabled users can see real improvements and new learning opportunities; and all users benefit from clearer interfaces and simpler designs. The Desire2Learn Accessibility Interest Group is particularly successful because there is a genuine effort to meet regularly and discuss concerns openly and honestly. Although each meeting has an agenda and action items, we've learned that the best collaboration comes from ad-hoc discussions, sharing successes, and a willingness to review designs and suggest improvements outside of scheduled meetings.