

Accessibility and Usability in e-Learning

The World Wide Web has been used by academia since its introduction in the early 1990s. As the World Wide Web grew and evolved, the popularity of learning on the Internet has steadily increased. More colleges and commercial entities have started offering degrees or training online via the Internet. A simple Internet search for online tutorials, training or degrees is all you need to confirm its popularity. However, this form of e-Learning, while popular, is not without its pitfalls. Some learning tools may have great content behind it, but lack an intuitive way of using it. Others may have an intuitive method of using it, but the content lacks accessibility for people with disabilities. Any combination of these issues can cause a learner to fail their online learning task. However, these issues can be resolved by applying principles of usability and accessibility in order to make the learning material usable and accessible to all learners.

Before applying these principles of usability and accessibility to an e-Learning environment, one must begin to understand what usability and accessibility are individually. In terms of web usability, usability is the science of measuring the quality of experience a user has when interacting with a user interface such as a web site (U.S. Department of Health and Human Services [HHS], n.d.). In terms of e-Learning, usability is about how easy it is for a learner to utilize a tool to achieve a learning objective. If a learner cannot find their assignment, then how are they supposed to complete it (Nielsen, 2003)? Both of these web sites provide a good definition of what is usability and the implications of an unusable e-Learning environment. Simply put, if a learner cannot use the e-Learning environment, then they cannot learn from it.

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However, what if a learner can find their assignment, but is unable to access the assignment due to it not being accessible? Web accessibility creates the means in which people with different disabilities are able to access and interact with web sites. These disabilities can range from visual, hearing, motor, or cognitive and can affect different aspects of how a person uses a web site (Henry, 2005). In order to make a web site accessible, it should be designed and developed with accessibility in mind. This means, technology wise, the designer needs to make sure non-text elements have proper alternate text, multimedia has synchronized alternate media, forms are properly labeled, and tables are utilized properly ("Introduction to web," 2011). These are just a few of the many technological elements an instructor would need to consider when developing e-Learning material in an accessible manner.

Before considering the technology, an instructor should consider some of the principles of instructional design and how they influence usability and accessibility. Clark and Mayer (2008) describe eight principles of e-Learning, which when used properly can help create effective multimedia learning material and user interface design for an e-Learning environment. These principles are the multimedia, contiguity, modality, redundancy, coherence, personalization, segmenting, and pretraining principles. Understanding and applying each of these principles is important to creating an effective e-Learning environment. However, Cheon and Grant (2009) believe that three of the principles, the contiguity, redundancy, and coherence principles, stand out as important to creating an e-Learning interface that is usable for all.

The contiguity principle informs the designer that words, whether spoken or written, should be aligned with their corresponding graphics (Clark & Mayer, 2008). This

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principle enhances the usability of the learning content by presenting the information with both graphics and words in close proximity to each other, thus reducing the cognitive load on the learner (Bower & Hedberg, 2010). This principle produces an effective method of presenting textual information with images. However, what if the e-Learning material also contains audio in addition to the graphics and text?

The redundancy principle simply states that learning material should not include visuals, audio and text in the same material (Clark & Mayer, 2008). Bower and Hedberg (2010) agree with this principle stating in their research that redundant information can put a burden on the learners working memory. However in a study by Bliton, Norwood, & Herlig (2010), the authors found 85% of instructional designers surveyed reported the use of visuals, audio, and text together was more effective to their learning in contrast to the redundancy principle. This presents a conflict for Clark and Mayer's (2008) redundancy principle where sometimes less is more when it comes to the limited capacity for learners to process information. However, there is the issue of what if the learning material contains visuals or audio when following the redundancy principle. In this case, Clark and Mayer (2008) defer to accessibility requirements and provide the designer with alternate methods of presenting the information without making an exception to the redundancy principle. For example, by turning off the audio and showing text instead, this can assist students with a hearing disability while retaining the exclusion of redundant information.

The coherence principle refers to the designer keeping extraneous information out of the learning material (Clark & Mayer, 2008). By excluding these materials, the designer can create a more efficient learning interface and increase its usability (Cheon &

Grant, 2009). Clutter on any web design can detract from the usability of the site, let alone a site used for e-Learning.

All three of these principles align with the usability concepts of learnability and efficiency (Nielsen, 2003). By reducing the cognitive load, the learner can more easily and quickly accomplish the learning objective. Redundant information can impede the learning process by over loading the learners working memory, as they would be focusing on too much information thus reducing their efficiency (Clark & Mayer, 2008). Extraneous information can clutter an e-Learning environment causing confusion in the interface for the learner reducing the coherence of the material. If understanding the principles of e-Learning is one of the keys to designing an effective learning environment, then other key is to know when to include accessibility and usability in the process.

Accessibility and usability should be considered as early as possible in order to provide proactive solutions to potential issues when designing learning material. It requires less effort on the part of the instructional designer, to include accessibility and usability throughout the entire design process than it would to try and retroactively include it at the end of the design period (Thatcher et al., 2006). Unfortunately this is typically the case where a designer leaves accessibility to the last moment when the legality of requirement becomes an issue (Mueller, 2003). This is a serious implication as reacting to an accessibility issue can be grounds for a lawsuit as further described by Thatcher et al. (2006) when he describes several accessibility lawsuits that actually occurred around the world. In order to prevent such lawsuits, a designer should reevaluate their approach to accessibility to decide if they being proactive or reacting.

Unfortunately when a designer is reacting to an accessibility or usability issue, it takes more time to resolve the issue than if it had originally been included at the beginning of the instructional design process. For example, the ADDIE, or analyze, design, develop, implement, and evaluate, is a model of instructional design that describes the important phases that can be used in any instructional design model (Brown & Green, 2006; Carlinger & Shank, 2008). Neither of these authors directly addressed accessibility or usability concepts in their descriptions of the ADDIE. However by looking at the design process of a general web site, Thatcher et al. (2006) suggests that web designers start considering accessibility at the beginning of a project. In the case of using the ADDIE model, instructional designers should consider accessibility and usability during the analyze phase. At this point, they should be considering not only who their learners might be and what they will be learning but also what if they had any disabilities or characteristics that might make accessibility and usability important (Carlinger & Shank, 2008). From that information, the designer can make a more informed decision on technologies selection during the design and development phases. There accessibility or usability issues can be turned into solutions in order to implement a more effective learning environment.

Unfortunately, the challenge with e-Learning and accessibility is that the instructor may only control the accessibility of the content while having little to no control over the accessibility of the learning environment (Poore-Pariseau, 2010). This issue is confirmed by a study made by Fichten et al. (2009) where they surveyed a group of students, disability providers, instructors, and e-Learning professionals. In that study, one of the common issues found among the different disability groups was the

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inaccessibility of the learning management system. The usability of the learning environment may also present itself as a challenge to the instructor. In researching e-Learning application usability, Zaharias and Poylymenakou (2009) found that poor usability of the learning management system itself contributed to a higher dropout rate in e-Learning courses. In this case, the instructor should also consider the accessibility or usability of the learning management system during the analysis phase of their instructional design, as alternate formats of the instructional material may need to be devised and utilized. Such alternate formats can increase the time needed for the design and development phases, however the implication of accessible and usable learning content with an inaccessible or unusable learning management system is that student learning and achievement may drop for the learners.

For students in a course, their goal should always be to learn the information being presented in a manner that is easy for them and makes it memorable. An inaccessible e-Learning environment presents a barrier to people with disabilities. Simply put, individuals with disabilities cannot learn what they cannot access. The same can be said for e-Learning material that is not usable; individuals cannot learn what they cannot use. By including accessibility and usability features to the course material, students become more motivated to learn. This in turn has an effect on the instructor, as motivated students are easier to teach (Poore-Pariseau, 2010). This concept was confirmed in a study by Fichten et al. (2009) where they found that the second highest benefit for student with disabilities was that an e-Learning environment provided them the ability to achieve academic success. Further benefits described in the study was that an accessible e-Learning environment allows the students to learn at their own pace and utilize assistive

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technology that enabled them to achieve the learning objectives. Poore-Pariseau (2010) believes that such benefits can facilitate the learning experience and provide positive effects for all students. This being the case, it can be argued that accessible and usable e-Learning material helps learners achieve their academic goals.

The utilization of accessibility and usability in an e-Learning environment can greatly improve student's ability to be successful learners. Through understanding the basic concepts of usability and accessibility, an instructor can take the principles of e-Learning and apply them to the instructional design process. This proactive approach can save an instructor from the time consuming process of hurriedly creating alternate formats as a reaction to a usability or accessibility issue. Usable and accessible e-Learning can help improve student achievement and bolster their learning. This means for the instructor they will have an easier time instructing the students and increase the effectiveness of the students learning outcomes. In the end, e-Learning is about the learner and creating an environment in which they can be successful.

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