Applying Universal Design for Learning in Online Courses: Pedagogical and Practical Considerations

Cindy Ann Dell, Montana State University, Billings, Montana

Thomas F. Dell, Montana State University, Billings, Montana

Terry L. Blackwell, Montana State University, Billings, Montana

Abstract

Inclusion of the universal design for learning (UDL) model as a guiding set of principles for online curriculum development in higher education is discussed. Fundamentally, UDL provides the student with multiple means of accessing the course based on three overarching principles: presentation; action and expression; and engagement and interaction. Guidelines are also provided for incorporating UDL into an online curriculum for teaching both general and diverse populations including students with disabilities.

Keywords: Universal design for learning, online instruction, accessibility, disabilities

INTRODUCTION

The growth of online learning in higher education has opened up exciting possibilities for students by providing access to courses without the constraints of a traditional brick and mortar classroom. However, even with the increase of online access to higher education, barriers continue especially for students with disabilities. A recent approach to assisting students with disabilities to be more successful with online classes is Universal Design for Learning (UDL). Ideally, UDL allows students with disabilities to access courses without adaptation, and also allows the coursework to be available in a variety of formats for the non-disabled, making it easier for everyone to access.

To that end, the purpose of this paper is to present guidelines and recommendations for designing online courses using UDL. In higher education UDL is based on the principle of inclusion of diverse populations which is consistent with society's evolving attempts to provide equal access for all. The goal for using UDL in online course design is to reduce the barriers for students with disabilities, but to also maximize the learning for the non-disabled.

Therefore, the theoretical framework for this paper includes the work of Rose and Mayer (2008) and their three overarching principles of effective UDL course design: Principle 1, presentation, involves providing learners with various ways of acquiring information and knowledge. Principle 2, action and expression, provides students with various routes for demonstrating what they know. Principle 3, engagement and interaction, enables an instructor to tap into students' interests, challenge them appropriately, and motivate them to learn (ACCESS Project, 2010; Center for Applied Special Technology [CAST], 2008; He, 2014; Rose & Mayer, 2008).

Educators have also integrated the UD philosophy of providing these three principles which increased access for all students. Hitchcock, Meyer, Rose and Jackson (2002) applied UDL to learning by devising an approach for curriculum reform that incorporates new media and technologies to achieve the three principles. For students with disabilities in higher education, UDL can also be applied in online courses, which has presented a unique set of opportunities and challenges for teaching and learning.

LITERATURE REVIEW

In 2008 there were 10.8% of students with disabilities in higher education (National Center for Education Statistics [NCES], 2013). Despite attending higher education in increasing numbers, many students with disabilities are mainstreamed without being fully assimilated into college life, and are also not visible in the classroom or online (Higbee, Katz, & Schultz, 2010). Furthermore, many instructors have students in their online classes who have disabilities but don't realize it.

> In most situations, a learning disability is not readily observable. Because there are no outward signs of a disability such as a white cane or wheelchair, students with learning disabilities are often overlooked or misunderstood. Some instructors and administrators suspect that students who claim to have learning disabilities are faking it, are playing the system, or lack the intelligence needed to succeed in college. Understanding the implications of learning disabilities, preparing to teach students with diverse characteristics, and learning to accommodate students with learning disabilities are essential for faculty and staff to provide academic and career opportunities for these students that are equivalent to those provided to their nondisabled peers (DO-IT, 2012, para 2).

The increase of students with disabilities in college and universities is consistent with an overall increase among the general U.S. population, which has quadrupled in number in the last twenty-five years (Olney, Kennedy, Brokelman, & Newson, 2004). There is also a corresponding increase in the variety of types of disabilities among college students as federal definitions broaden, and now include hearing, speech, orthopedic, learning, health-related, visual impairments, and other disability-related conditions (NCES, 2010). Table 1 shows the percentages of students who self-identified as having a disability.

Table 1

Percentages of Students with Specific Disabilities

Disability	Identifying Percentage
Learning disabilities	28%
Mobility or orthopedic impairments	15.4%
Health Impairments	5.8%
Mental illness or emotional disabilities	24.1%
Hearing impairments	6.0%
Blindness and visual impairments	2.7%
Speech or language impairments	0.7%
Other impairments	17.3%

(NCES, 2010)

Even though enrollments of students with disabilities are increasing, there are growing numbers who fail to graduate, which makes support services and accommodations in higher education institutions necessary for retention (Barnard-Brak, 2010; Higbee, et. al, 2010; Paul, 2000; Quick, Lehmann, & Deniston, 2003). One specific suggestion is that administrators and

faculty be knowledgeable about the types of and specific characteristics of disabilities students may have so that support services can accurately match their needs to a variety of physical and academic accommodations (National Council on Disability [NCD], 2003).

Because of the increase in enrollment of students with disabilities, there is a corresponding need to identify types of disabilities and provide appropriate support services and accommodations in the classroom. Traditionally assistance has included note-taking, recording lectures, determining accessible classroom location, assistive computer technology, document conversion (Braille, large print, tape) and/or alternative testing taking. More recently, with the advent of online courses, students with disabilities will often rely on technology such as voice recognition, on-screen keyboards, screen magnification software, screen readers and audio transcriptions and video captioning (Coombs, 2010).

Universal Design

The concept of Universal Design (UD) originated with state and federal legislation which mandated that architectural designs for public buildings include access for individuals with disabilities. As a result, architects incorporated UD principles into public building plans and it is now commonplace to see wheelchair ramp access into public buildings. The UD approach to engineering in curb cuts is an example of a design that works for everyone including elderly and parents with strollers (Mace, 1997). UD also makes the building more functional for all who enter, saves costs, and is much more efficient with a greater numbers of users over time

Rose and Mayer (2008) applied UD principles in education and subsequently published *A practical reader in universal design for learning*. They set forth a summary of the key points of UDL and applied them to students. The goal was to make a curriculum more readily available to students with a wide range of skills and abilities through multiple forms of learning and

engagement (Lancaster, 2011). The approach to utilizing UDL is consistent with increasing the positive learning outcomes for all students, and also corresponds with student development theories that recognize the value of supporting each individual, including those with disabilities (Evans, 2008). Rose and Mayer (2008) provide a theoretical framework to explain how learning occurs through UDL principles. They refer to the overarching principles as "recognition networks, which are specialized to receive and analyze information (the 'what' of learning); strategic networks…specialized to plan and execute actions (the 'how' of learning) [and] affective networks…specialized to evaluate and set priorities (the 'why' of learning, (p. viii). According to Rose and Mayer (2008) these three networks are important to the learning process, and coupled with the "corresponding principles UDL aim to minimize barriers and maximize learning by flexibly accommodating individual differences in recognition, strategy or affect" (p. viii). They maintain that course designers seek to support learner differences by providing multiple and flexible modes of presentation; expression and engagement.

UDL principles include an educational framework allowing for learning differences but also be based on cognitive learning science. Ohio State University completed a study on UDL and concluded that:

> Universal design is an approach to designing course instruction, materials, and content to benefit people of all learning styles without adaptation or retrofitting. Universal design provides equal access to learning, not simply equal access to information. Universal Design allows the student to control the method of accessing information while the teacher monitors the learning process and initiates any beneficial methods (The Ohio State University Partnership Grant, 2012, para. 1 and 2).

Universal Design for Teaching Online Courses

Currently, many students with disabilities utilize technology such as screen readers, close-captioned videos, seating arrangements and a test environment that minimizes distractions that contribute to their success in higher education (Higbee, et. al, 2010). Additionally Totty and Kalivoda, (2008) identify additional ways the Web, computer hardware and software and other technologies can help students and promote equal access. However, Coombs (2010) notes that for online courses there should also be an accessibility to the learning infrastructure, and accessibility to the actual course content and the student needs to be well-versed in the assistive technology that is provided by the institution.

UDL is not limited to assistive technology; it also enhances pedagogy and instructional practices used for students with and without disabilities (King-Sears, 2009). Instructors using UDL principles plan course instruction, materials, and content to benefit people of all learning modalities without adaptation or retrofitting, including students with disabilities and non-traditional groups such as international students who may speak English as a second language. However, UDL is not meant to diminish the challenges associated with scholarship in higher education, rather it focuses on equal access to information, as well as learning. "Simply stated, Universal Design is just good teaching" (The Ohio State University Partnership Grant, 2013, p. 1). With this as a primary focus, courses using UDL should insure that the learning goals of the course provide an appropriate academic challenge for the college student and that the assessment is flexible enough to provide accurate, continuous information that helps instructors revise instruction to maximize learning for diverse learners (Fox, Hatfield, & Collins. 2003). In addition, Hodge and Preston-Sabin (1997) surmise that accommodations for students with

disabilities may simply result from good instruction. Additionally, UDL mirrors best practices for pedagogy that follow many of Chickering and Gamson's (1987) principles such as multiple teaching methods that allow for student's preferred learning styles (Higbee, et. al, 2010; Rao & Tanners, 2011). In other words, the course learning goals should be challenging to the students while the instructor incorporates ways to limit or remove barriers to access and participation (Hitchcock, et al. 2002). At their best, UDL practices include ongoing evaluation of student learning through assessing specific outcomes set forth in rubrics that include study guides (Bernacchio & Mullen, 2007; He, 2014).

ADA and the Process of Obtaining Accommodations

The Americans with Disabilities Act of 1990 requires that reasonable classroom accommodations be provided for an individual with a disability. This condition can be physical (e.g. hearing impairment) or psychological (e.g. depression), but also include learning impairments that limits one or more life activities. In order for a student to qualify for accommodations, a determination of eligibility for services must be made. The student is responsible for obtaining the documentation from a medical or psychological specialist that verifies that this individual in fact has a disability that meets the ADA criteria (ADA, 1990). However, the instructor should also include a policy on accommodations for disabilities in their syllabus to encourage self-identification by students requesting this assistance. This next section will discuss what this policy might include, as well as discuss options for simple online support accommodations the instructor can make for the student, such as visual impairments. However, it is the responsibility of the campus Disability Support Services Office (DSS), not the instructor, to provide specialized assistive technology equipment to the student.

To that end, the student is responsible for providing any relevant documentation to the DSS office on campus which then provides a Letter of Accommodation (LOA). The LOA typically outlines the limitations of the disability and often provides specific requests to the instructor in order to assist them in providing accommodation to help the student meet the educational goals of the class as outlined in the syllabus (Union College, 2011).

Practical Steps to Implement UDL

The University of Arkansas at Little Rock (n.d.) provides a comprehensive guide to implementing UDL in online classes. Their *Ten Simple Steps toward Universal Design of Online Classes*[1] include a guide for the creation and design of an online class using UDL These include: (1) create content first-then design; (2) provide simple and consistent navigation; (3) include an accommodation statement; (4) choose content management system (CMS) tools carefully; (5) model and teach good discussion board etiquette; (6) use color with care; (7) provide accessible document formats; 8) choose fonts carefully; (9) convert PowerPoint to HTML; and (10) if the content is auditory make it visual, and if it is visual make it auditory.

These 10 steps are consistent with the three basic principles of UDL, presentation, which include providing the students with multiple opportunities to learn with various ways for them to acquire knowledge (presentation), demonstrating what they know (action and expression) and encouraging students' interest while challenging them (engagement and interaction), as well as increasing motivation and self-regulation (ACCESS Project, 2010; CAST, 2008; Rose & Mayer, 2008). The three principles and 10 steps should be considered when developing a class and formulate a syllabus for the course. Table 2 shows how the ten steps are aligned with the three UDL principles. Since the Ten Simple Steps were developed primarily for online class

[1] From "Ten Simple Steps toward Universal Design of Online Classes" (n.d.). Retrieved from University of Arkansas at Little Rock. http://ualr.edu/pace/tenstepsud/ Used and adapted with permission.

instructors and developers, the first principle, presentation, is most prevalent in the table, and included in the practical implementations of UDL.

Table 2

Practical Implementation of UDL course design aligned with UDL Principles.

UDL Principle	Practical Steps for Implementation
Presentation	• Create content first-then design • Provide simple and consistent navigation • Include an accommodation statement • Use color with care • Choose fonts carefully
Action and Expression	• Model and teach good discussion board etiquette
Engagement and Interaction	• Choose content management system (CMS) tools carefully • Provide accessible document formats • Convert PowerPoint to HTML • If the content is auditory make it visual • If the content is visual make it auditory

Create Content First, then Design the Course

Coombs (2010) maintains that online instructors should be learner-centered when designing a class. Because online classes and technology can level the power relationships in a class, students often take over their own learning. The teacher and the learners become partners in the process, and learners become more self-regulated. Backwards design (Wiggins & McTighe, 2005) is an effective method to design lessons, curriculum and online classes. Begin

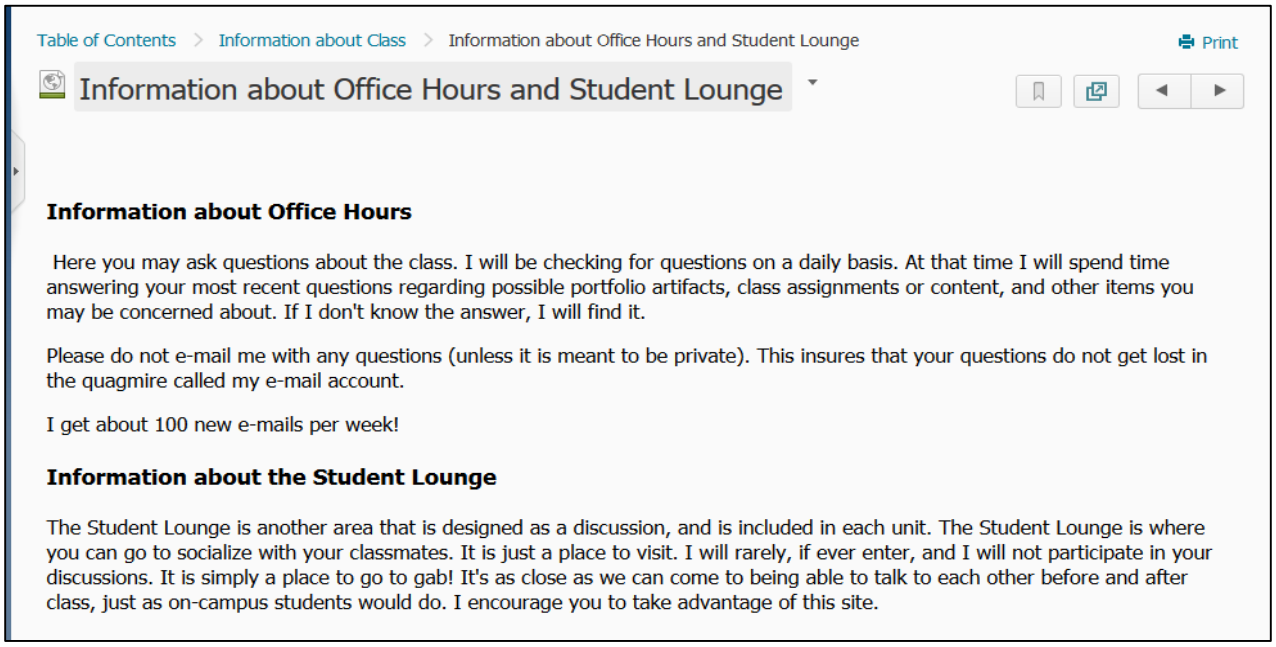
with the end in mind. Think first about the objectives for the class. What is it that students should learn in each unit or module? How will the class be organized? Will the course be divided into units according to a text book, by another organizational structure? Whatever that structure, an outline can be created to guide the course construction and design. When a class is planned ahead in such a way, an instructor can incorporate UDL principles and anticipate student needs, and not just react to them (DO-IT, 2012). For example, a backward design approach (Wiggins & McTighe, 2005) can reflect best practices for pedagogy by incorporating multiple teaching methods that allow for multiple means of assessment. The key is to know first of all, what the objectives (what students should know by the end of the class) are, and determine possible alternative methods of assessing them. For example, an essay test rather than multiple choice questions could be given to assess the learning outcomes based on a rubric of education goals included in the syllabus. Some students would benefit from a meeting with the instructor and be assessed through an oral examination to assess understanding (Bernacchio & Mullen, 2007; Chickering & Gamson, 1987; iCITA, 2013.; Higbee, et. al, 2010; Hitchcock, et.al, 2002; Rao & Tanners, 2011).

Provide Simple and Consistent Navigation

When designing content in an online class, the instructor should consider how a screen reader for the visually impaired will provide the content to the learner. A screen reader cannot read graphics, so if a graphic such as a picture is used, it should be described with text. Learning Management Systems (such as Desire2Learn and Blackboard) provide the ability to add text to the graphic. This also makes it easier to search items from the class later on, if there is a text component to the graphics (DO-IT, 2010).

Additionally, insure that the student can navigate the screen and move from page to page without the requirement of a mouse. The elements used set up the online class should be accessible for navigation through the keyboard only, since some learners may not be able to physically operate a mouse. The pages should be clean, uncluttered, consistent, simple and well organized. There should be headings and subheadings that do not rely on color (since some learners cannot distinguish colors well). Figure 1 is an example of an effective use of headings and easy to navigate text.

Figure 1. An Example of Navigation Headings



Include an Accommodation Statement

Federal law requires that accommodations for people with disabilities be provided to make sure there are no unnecessary barriers to learning. "Section 504 of the Rehabilitation Act of 1973 opened college campuses for many individuals with disabilities, and passage of the American with Disabilities Act (ADA) of 1990 further guaranteed the rights of these students" (Collins & Mowbray, 2005, p. 306). As a result of this civil rights legislation, most universities

have an office for Disability Support Services. DSS is a student support services provider that will often provide a list of accommodations for the student.

Accommodations do not mean lowering academic standards, but providing reasonable means to accomplish the learning goals. For example, a student may need more time to take a test, or a note taker. Perhaps an interpreter may be required for a student with a hearing impairment, or a screen reader for electronic document for the visually impaired. In many cases, instructors will not be involved in providing accommodations, and the institution's disability support office will be providing what is needed by the student. Additionally, many universities have accommodations statements that faculty are asked to include in their syllabi. Statements should reflect an openness to make appropriate accommodations related to a student's needs, where to go for accommodations services and to encourage the student to speak to the instructor about any necessary accommodations since they need to be the source of this information. A message about the instructor's use of UDL principles may also be included in the statement. It is the responsibility of the student to disclose their disabilities and to provide the LOA and request appropriate accommodations. It is the responsibility of the instructor to encourage them to do so.

Choose Learning Management System Tools Carefully

Most commercial learning management system tools such as Blackboard, Desire2Learn, Moodle, and SAKAI are accessible to learners with various types of disabilities (iCITA, 2013). When choosing a learning management system, look for accessibility statements from the company, and check for ease of use in several areas. These include ease of personalization; ease of navigation; help with the system and tutorials for students and instructors; common tools such as announcements, discussions, e-mail, chat functions, content functions, assignment functions, and ease of grade book use; testing features; and the ability of instructors to author course

content. For more in-depth information and to see a comparison of four commercial learning management system programs, review the report from iCITA at https://dl.dropboxusercontent.com/u/3486333/csun2013/lms_compared_paper_2013.html

iCITA (2013) provides specific guidelines to look for when deciding on a system. For example, are their options that allow students to customize the layout to increase their usability and accessibility? Specifically, does the system allow for styling font size and session time out? Additionally does the system allow them to navigate effectively and efficiently to obtain the essential content of the class?

Model and Teach Good Discussion Board Etiquette

There are many ways in which people with disabilities access online class content, and interact with classmates in online discussions. Students with visual impairments use screen readers and screen magnification, or use a Braille display keyboard that will enable a student to print documents in Braille. Speech to text software is also very useful for many students with various disabilities to write papers. Students with hearing impairments need audio turned to text, such as closed captioning in video, and other multimedia that require audio. Video relay systems can also be utilized, so that conversation can take place through typed text. Students with learning disabilities use spell check and grammar check options to assist them with writing. A text reader is also helpful so that the student can hear and/or see what is being required.

Many online instructors use discussions as an important teaching and learning tool (Stavredes, 2011). As such, it is important for instructors to teach and model discussion board etiquette. Organizing discussions topics in advance so that students can keep track of topics is important. A few suggestions from The University of Arkansas Little Rock (n.d.) to help

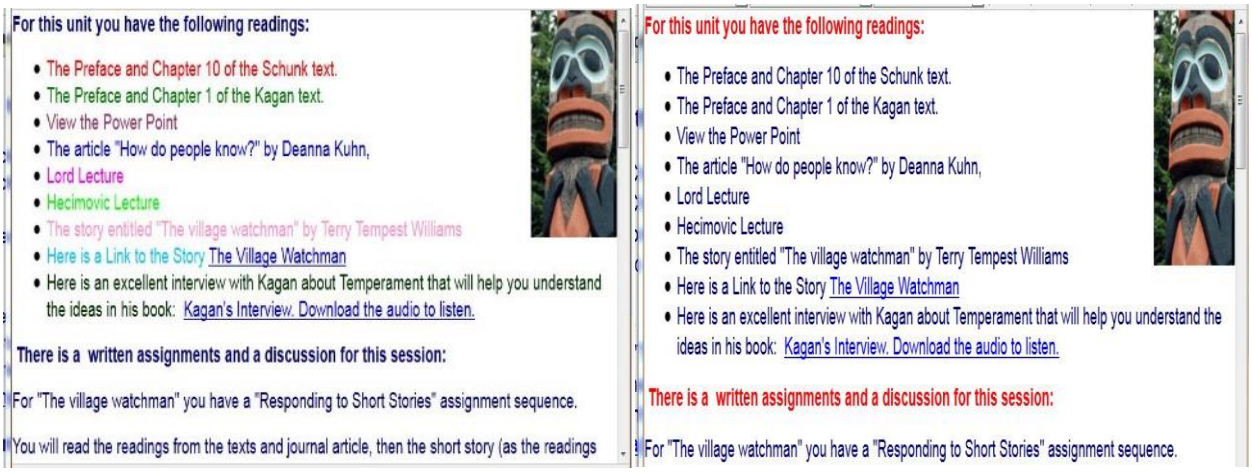
provide well organized and easily accessed discussion boards for students with or without disabilities.

Instruct students to avoid creating a new thread unless they are indeed introducing a new idea. Students should add to the thread they are responding to. If a person has a new idea, a new discussion thread may be opened. If a student with a screen reader sees a new idea in a discussion it can become quite confusing. Instructors should train students to keep the discussion threads consistent, and explain why it is important to do so.

Use Color and Fonts with Care

Designers of online classes should consider all the potential learners and their ability to access the Internet and specific websites or designed course pages. In most cases fancy and elaborate websites are the most inaccessible and actually may not be necessary for learning to take place. Consider a person who cannot distinguish color, or one with various learning disabilities. Including many colors and fonts for headings or key points on the page would not be noticeable to those students, and may also be confusing for anyone else reading the text online. Figure 2 provides examples of appropriate and inappropriate use of color. Notice the multiple colors in the first example. No one looking at the first example would know the importance of any of the items listed. In the second example, although red is used, it does not detract, and even if the color is not distinguishable, it stands alone as a heading since it is in bold text.

Figure 2. Inappropriate and Appropriate use of Color



Appropriate use of fonts is similar to color choices. Make sure the font is easily read, and can be resized without trouble. Figure 3 shows the differences in fonts.

Figure 3. Inappropriate and Appropriate use of Fonts

Provide Accessible Document Formats

Coombs (2010) offers advice on making documents accessible and easier to view for all learners to use. One important guideline is to be consistent with the design throughout the course. Overall, he gives practical tips including how to position headings properly, use fewer frames, utilize accessible and applicable graphics, and provide text equivalents for non-text

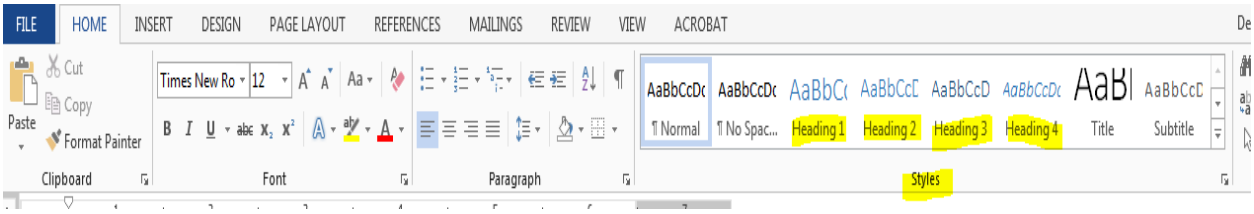
elements. He explains that charts, diagrams, and photos are important for the entire class, and can serve as learning scaffolds for everyone if used correctly.

Documents online should include several design features, including straight forward and simply structured sentences, lists, short paragraphs, well-organized content and, hierarchical headings (Coombs, 2010). Hierarchical headings are very helpful for all learners, as they provide a cognitive map in a pre-organized structure, making it easier for all learners (Mayer, 2008). Creating an outline prior to design helps maintain organization.

Using preformatted functions in documents.

Word has pre-formatted "styles" that help develop the structure of a document, using a set of commands that format the appearance of the text. The formatting stays with the document if it is ever saved in PDF, RTF or HTML in an online class (Coombs, 2010). Using these pre-formatted headings are excellent for UDL, since they provide a clear hierarchical for all learners, as well as make it easier for screen readers to navigate and read. Figure 4 shows the menu to format headings in Word.

Figure 4. Creating Headings in Word



You can chose the heading style to the type of heading you want to use by clicking on the heading level you want to create. An example of formatted headings follows.

This is a Level 1 Heading

Here you can provide text related to the remainder of the document

This is a Level 2 Heading

Here you can provide text related to a topic.

This is a Level 3 Heading

Here you can provide detailed information about a second sub-topic.

Using tables online. As with formatting a Word document, you can also format tables automatically. Click on the *Insert* tab at the top of the menu ribbon and click *Insert Table*. There will be several options, one of which is the *Quick Tables*. This option will provide ready-made tables that you can edit. Here you will find formatted headings all ready to go. Figure 5 shows an example of a table formatted using Quick Tables.

Figure 5. Using a Formatted Table in Word

ITEM	NEEDED
Books	1
Magazines	3
Notebooks	1
Paper pads	1
Pens	3
Pencils	2
Highlighter	2 colors
Scissors	1 pair

Using images in online text. It is very important to include a text explanation of any graphic you use, and according to Coombs (2010), a screen reader will be able to tell the visually impaired learner what the graphic is about or why it is used. You want to use simple text to describe the image.

Here are the steps involved:

1. In Word or PowerPoint, you can insert a picture using the menu at the top of the page. Click on Insert and then Pictures to begin inserting a graphic or picture.
2. Then right click on the picture to bring up a "format picture" menu.

Figure 6. Inserting Pictures in Word

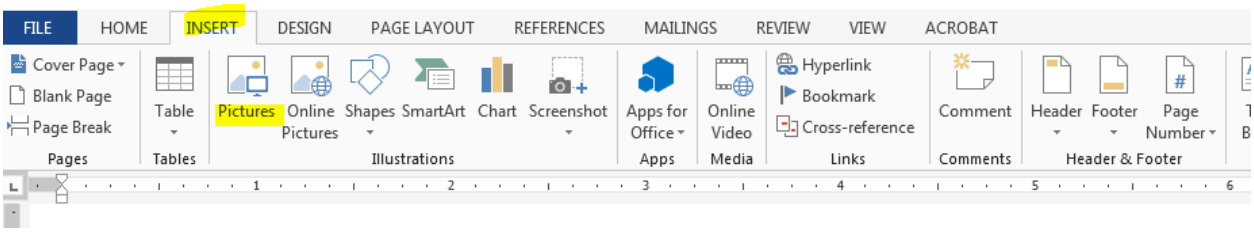
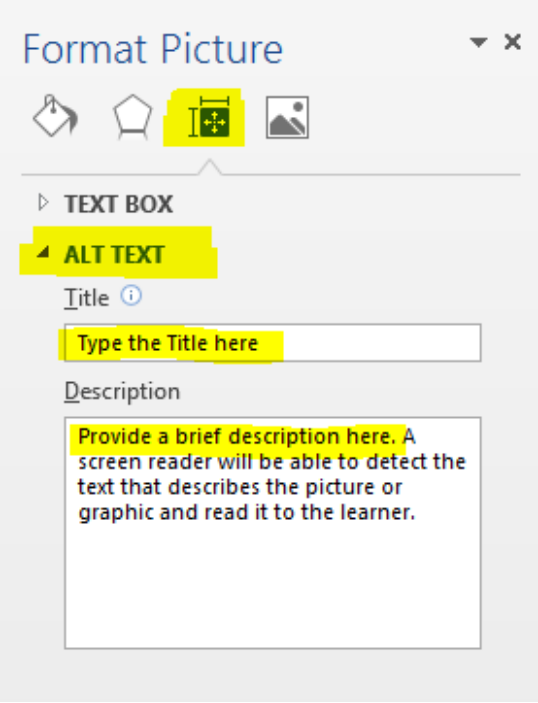


Figure 7. Providing Brief Descriptions of Pictures in Word



If a model or flow chart is used, be sure to provide a text explanation in the narrative body of the page. Coombs (2010) explains that the narrative explanation works best if it comes prior to the image.

Using the Most Accessible Documents and Online Functions

Some documents are easier to use than others. Microsoft products are very easy to use, are accessible for most learners and are widely available. If a document is set up in Word, the formatting is maintained if it is transferred to a PDF, RTF or HTML for an online class, as discussed earlier. However, PDF documents are not as accessible to some learners, and there are other online functions that don't work as well. Table 3 shows some of the most common document types and their ease of access.

Table 3

Common Document Types and their Ease of Access

Document or Web Function	Easy to Access	Hard to Access	Alternative
Word	X		
PowerPoint	X		
Excel	X		
PDF		Somewhat	Convert to Word or use with care
Live Chat		X	Don't require
Webinar		X	Don't require

Making Auditory Content Visual

The use of multimedia content online is an effective and efficient way to provide information to students online. There are thousands of educational video clips available that can

be linked or embedded into an online class for students to view. However, when considering UDL principles, some are better than others. Closed captioned videos (making the auditory content visual) are essential to providing all learners with the best quality video and content. One of the most popular sites to find educational videos is YouTube, but the ability to access closed captioning is quite unreliable; some are well captioned, some are poorly captioned, and some are not captioned at all. There are many sites that provide closed captioned videos or closed captioning services that are easy to find and use (C. Copeland, personal communication, September 18, 2014). An Australian company called "cap that! Captioned for learning" encourages educators to provide closed captioning for all videos used. cap that! provides the URLs for websites and companies that provide close captioned video of all kinds. The link may be viewed at http://www.capthat.com.au/resources/find-captioned-videos . The list of various company sites is annotated and includes information about the quality of captioning and the grade level for which the videos are appropriate. These include major media companies like the BBC, ABC, PBS, NBC and Kahn Academy and others.

"Amara" is a site that provides a tutorial and captioning service so that personal videos may be easily closed captioned for free. http://www.amara.org/en/ . cap that! also provides links to subscription-based educational videos with captioning. They also provide a tutorial on how to caption your own videos within YouTube at http://www.capthat.com.au/how-caption-youtube-video .

Other sites that provide their captioning with their videos include TED Talks at https://www.ted.com/ , National Science Teachers Association at http://www.nsta.org/college/connections.aspx , and Deaf MD at http://www.deafmd.org/ (C. Copeland, personal communication, September 18, 2014).

CONCLUSIONS

The concept of universal design is as longstanding as cuts in sidewalks, which were originally mandated to allow access for wheelchairs, but which ultimately ended up with the unintended consequence of benefiting babies in strollers, people on bicycles, and children on skates. The philosophy and principles of a UDL framework are similar to UD and are meant to provide pedagogical strategies for instructors to maximize learning opportunities for diverse groups of students including those with physical and/or learning disabilities (Bernacchio & Mullen, 2007; Rose & Mayer, 2008). As a result of a flexible course design that incorporates all three of the UDL principles including presentation; action and expression; and engagement and interaction. All students can benefit from this approach. Furthermore, while UDL can provide the greatest degree of support for the student, it also can continue to provide challenges to maximize online teaching and learning (Coombs, 2010; He, 2014; Lancaster, 2011). Finally, it is never too late to make an existing class more accessible. Using the three principles of UDL and the Ten Simple Steps (University of Arkansas at Little Rock, n.d.) is an easy way to check the accessibility of your online classes. Not only will students with disabilities have an easier time navigating the class, but so will all students in the class.

Author Note: Correspondence concerning this article should be addressed to Cindy A. Dell, Department of Educational Theory and Practice, Montana State University Billings, Montana 59101. Phone 406 657-1614. E-mail: cdell@msubillings.edu

References

ACCESS to postsecondary education through Universal Design for Learning (2010), ACCESS Project, Department of Occupational Therapy, Colorado State University. Retrieved from http://accessproject.colostate.edu/udl/documents/what_is_udl.pdf

Amara (n.d.). Retrieved at http://www.amara.org/en/

Americans with Disabilities Act of 1990, 42 U.S.C. Section 12102 et seq. (1998); Title II, Section 12131 et seq. (1998); 28 C.F.R. Sections 35.101-35.191 (1998); Title III, Section 1218s1 et seq. (1998); 28 C.F.R. Sections 36.101-36.608 (1998); Appendix A to Part 36 (Standards for Accessible Design; 1998); Appendix B (Preamble to Regulation on Nondiscrimination on the Basis of Disability by Public Accommodations and in Commercial Facilities; 1998).

Barnard-Brak, L. (2010). Accommodation strategies of college students with disabilities. *The Qualitative Report, 15*(2) 411-429.

Bernacchio, C. & Mullen, M. (2007). Universal design for learning. *Psychiatric Rehabilitation Journal 31*(2), 167-169.

Burgstahler, S. (2006). The development of accessibility indicators for distance learning programs. *ALT-J Research in Learning Technology*, *14*(1), 79, 102.doi:10.1080/09687760500479753.

cap that! Captioned for Learning (n.d.). *Find captioned videos: Websites with free educational videos with captions*. Retrieved at http://www.capthat.com.au/resources/find-captioned-videos

CAST (2008). Universal design for learning guidelines version 1.0. Wakefield, MA. Retrieved from http://www.udlcenter.org/aboutudl/udlguidelines/udlguidelines_graphicorganizer

Chickering, A. W., & Gamson, Z. F. (1987). Seven principles for good practice in undergraduate education. *AAHE Bulletin, 39*(7), 3-7.

Collins, M.E. & Mowbray, C.T. (2005). Higher education and psychiatric disabilities: National survey of campus disability services. *American Journal of Orthopsychiatry, 75*(2), 304-315.

Coombs, N. (2010). *Making online teaching accessible: Inclusive course design for students with disabilities.* San Francisco, CA: Jossey Bass.

DO-IT University of Washington (2010). *Working together: People with disabilities and computer technology.* Retrieved from http://www.washington.edu/doit/Video/index.php?vid=33

DO-IT University of Washington (2012). *Academic accommodations for students with learning disabilities.* Retrieved from http://www.washington.edu/doit/Brochures/Academics/accomm_ld.html

Evans, N. (2008). Theoretical foundations of universal instructional design. In J. L. Higbee and Emily Goff (eds.), *Pedagogy and student services for institutions transformation: Implementing universal design in higher education* (pp. 11-24). Minneapolis: University of Minnesota, General College, Center for Research on Developmental Education and Urban Literacy. Retrieved from http://www.cehd.umn.edu/passit/docs/PASS-IT-Book.pdf

Fox, J. A., Hatfield, J. P., & Collins, T. C. (2003). Developing the curriculum transformation and disability (CTAD) workshop model. In J. L. Higbee (Ed.), *Curriculum transformation*

and disability: Implementing Universal Design in higher education (Chapter 2, pp. 23-39). Minneapolis: University of Minnesota, General College, Center for Research on Developmental Education and Urban Literacy. Retrieved from http://cehd.umn.edu/CRDEUL/books-ctad.html

He, Y. (2014). Universal design for learning in on online teacher educational course: Enhancing learners' confidence to teach online. *MERLOT Journal of Online Learning and Teaching, 10*(2), 283-298.

Higbee, J. L., Katz, R. E. & Schultz, J. L. (2010). Disability in higher education: Redefining Mainstreaming. *Journal of Diversity Management, 5*(2), 7-16.

Hitchcock, C., Meyer, A., Rose, D., & Jackson, R. (2002). Providing new access to the general curriculum: Universal design for learning. *Council for Exceptional Children 35*(2), 8-17.

Hodge, B. M., & Preston-Sabin, J. (1997). *Accommodations—Or just good teaching? Strategies for teaching college students with disabilities.* Westport, CT: Praeger.

Illinois Center for Information Technology and Web Accessibility [iCITA] (2013). *A comparison of learning management system accessibility*. Retrieved from https://dl.dropboxusercontent.com/u/3486333/csun2013/lms_compared_paper_2013.html

King-Sears, M. (2009). Universal design for learning: Technology and pedagogy. *Learning Disability Quarterly 35*(2), 8-17.

Lancaster, Paula (2008). Universal design for learning. *Colleagues 3*(1). Retrieved from http://scholarworks.gvsu.edu/colleagues/vol3/iss1/5

Mace, R. (1997). Principles of universal design. North Carolina State University. Retrieved from http://faculty.wiu.edu/P-Schlag/articles/Universal%20Design%203.pdf

Mayer, R. E. (2008). *Learning and instruction* (2nd Ed.). Upper Saddle River, NJ: Pearson Merrill Prentice Hall Sciences.

National Council on Disability (2003). *People with disabilities in postsecondary education: A position paper*. Retrieved from http://www.ncd.gov/publications/2003/Sept152003s

National Center for Education Statistics (2010). *Profile of Undergraduate Students: 2007-08.* Retrieved from http://nces.ed.gov/pubs2010/2010205.pdf#page=150

National Center for Education Statistics (2013). *Fast Facts of Undergraduate Students: 2007-08.* Retrieved from http://nces.ed.gov/fastfacts/display.asp?id=60

Olney, M. F., Kennedy, J., Brokelman, K., & Newson, M.A., (2004) Do you have a disability? A population-based test of acceptance, denial, and adjustment among adults with disability in the U.S. *Journal of Rehabilitation, 70,* 4-9.

Paul, S. (2000). Students with disabilities in higher education: A review of the literature. *College Student Journal, 34*(2), 200-210.

Quick, D., Lehmann, J., & Deniston, T. (2003). Opening doors for students with disabilities on community college campuses: What have we learned? What do we still need to know? *Community College Journal of Research & Practice, 27,* 815-827.

Rao, K. & Tanners, A. (2011). Curb cuts in cyberspace: Universal instructional design for online courses. *Journal of Postsecondary Education and Disability, 24*(3), 211-229.

Rose, D., & Meyer, A. (2008). *A practical reader in universal design for learning*. Cambridge, MA: Harvard Press.

Stavredes, T. (2011). *Effective online teaching: Foundations and strategies for student success.* San Francisco, CA: Jossey-Bass.

Ten simple steps toward universal design of online courses (n.d.). Retrieved from University of Arkansas at Little Rock. http://ualr.edu/pace/tenstepsud/

The Ohio State University Partnership Grant (2013). *Fast facts for faculty: Universal design for learning*. Retrieved from http://ada.osu.edu/resources/fastfacts/Universal_Design.htm

Totty, M.C. & Kalivoda, K. S. (2008). Assistive technology. In J. L. Higbee and Emily Goff (eds.), *Pedagogy and student services for institutions transformation: Implementing universal design in higher education*. (pp. 473-480). Retrieved from http://www.cehd.umn.edu/passit/docs/PASS-IT-Book.pdf

Union College (2011). *Policy on letters of accommodation for students with a disability*. Retrieved from http://www.uu.edu/studentservices/disabilityservices/LOApolicy.cfm

Wiggins, G. & McTighe, J. (2005). *Understanding by design.* Alexandria, VA: ASCD.