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Adapting Research Guides and Library Instruction to Provide Educational Support for Distance and In-person Learners

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ABSTRACT
Advancements in technology have impacted how people gather and obtain new information. This phenomenon is especially apparent among younger generations where there has been an increase in the number of students who are visual learners. To continue to best serve these students, librarians need to begin to adapt library instructional material, such as research guides, to also present information using visual multimedia resources. While adapting research guides to increasingly visual learners, the opportunity exists to ensure that research guides follow a user-centered design. In the process of updating these guides, librarians can also provide some assistance with web accessibility by meeting several criteria from the Web Content Accessibility Guidelines 2.1. This article highlights criteria from the Perceivable, Understandability, and Operable sections that can be met by non-web designers. The foundation of this process is the development of a content strategy that guides the planning and adapting of research guides. This article presents some of the best practices that can be used to guide librarians as they proactively adapt their research guides to current learners learning styles, while still meeting web accessibility expectations.

KEYWORDS
Library Instruction, Research Guides, User-Centered Design, Web Accessibility, Content Strategy

INTRODUCTION

This article presents a deep dive into the research literature and what it suggests for redesigning research guides to create a stronger educational and web-accessible resource for today's students. This research has shown that younger generations, beginning with Millennials (born between 1981 and 1996), better comprehend information presented through visual multimedia resources such as infographics and videos (Baker, 2014). While creating and referring to multimedia resources within a research guide, librarians can also present organized step-by-step (scaffolded) instruction within that same guide (Bergstrom-Lynch, 2019). Another important consideration during this process is the user, or a student's experience when accessing the presented information. User-centered literature explores different methods on how to create an effective, user-friendly, and a web-accessible instructional resource for all students (Billingham, 2014). A topic that needs additional discussion is how liaison librarians can assist web designers by including web-accessible features when they create their instructional material (Solovieva & Bock, 2014). As research guides are a common resource for liaison librarians, this article will discuss which web accessibility features can be added to a research guide. In this article, research guides are referred to as LibGuides, however, the information and web accessibility steps can be applied to all educational resources.

DISCUSSION OF BEST PRACTICES FOR LIBGUIDE DESIGN

To meet current and distance education students learning styles, it is suggested that a first adjustment to our LibGuides would be to transition away from the once text-heavy pathfinder design to a design that is more user-centered (Sonsteby & DeJonghe, 2013). The reasoning behind this move away from the text-heavy design is found in a usability study from Bucknell University Library. That study re-

ported that one student made the comment, "there might be a little too much text on the pages - which makes it a little tedious to read through to get to what you're looking for." Another student commented, "all sections are quite helpful. Just linking to specific information within some things might help." A third comment was, "more explanation on what each link does" (O'Neill, 2020, pp. 2-4). One possible reason why current students find it difficult to locate information is Millennials and the following younger generations are different from previous generations, they are more "plugged-in" to technology, expect to quickly find answers to their questions, and do not want to waste time reading detailed paragraphs (Baker, 2014, p. 111). Current students have transitioned to skimming paragraphs, using multimedia, and wanting an organized, easy-to-navigate resource (Pickens, 2017). As librarians create these resource guides, they need to present material that addresses what students need, not what resources librarians believe should be present (Bergstrom-Lynch, 2019; Sonsteby & Dejonghe, 2013). Gonzalez and Westbrock (2010) wrote, "most students do not have general research questions, rather they have specific needs" (p. 640). A text-heavy resource covering a topic will need to be redesigned into a user-centered, scaffolded instructional resource to continue being an educational resource.

Number of Tabs and In What Order

Similar to blueprints for buildings, subject guides connected to courses should follow a content strategy, which is a "practice of planning for the creation, delivery, and governance of useful, usable content" (Halvorson, 2009, p. 32). When a library unit follows an established, organized, navigational framework or content strategy, this strategy acts as a guide to fixing content issues and provides general updates for all guides. Below are several recommendations that research literature has shown to assist with improving user-centered navigation and organization that also supports the web accessibility of the guide (Pickens, 2017; Pionke & Manson, 2018; Thorngate & Hoden, 2017). To easily navigate to certain resources in all course-connected guides one step is to set a default tab order (Bergstrom-Lynch, 2019; Pickens, 2017).

Although the decision to set a default tab order may seem easy, guide creators need to consider which tabs students will need most and the length of time they may be willing to spend on a guide (Castro-Gessner et al., 2013). Griffin and Taylor (2018) have noted participants in their study generally favor visiting the left or top tabs or immediately going to a certain tab that has the content they need. Griffin and Taylor's LibGuide analytics study showed students who entered the guide from their LMS, "typically remain on the guide embedded in their course for an average of 39 seconds, and they only viewed 1.29 pages" (p. 153). The data was then compared to students who have "a bookmarked link or manually entering the web address… spend almost four minutes on a guide" (Griffin & Taylor, 2018 p. 153). Leading one to conclude that students spent more time on a tab that provided them with information that assisted their research.

This data combined with the knowledge regarding which tabs students typically visit leads to the general conclusion that tab order should begin with the tabs that present the most important content. To reduce the possibility of students feeling overwhelmed when they visit the guide there should be an attempt to limit the number of tabs on a guide to only those necessary to present the needed content (Sonsteby & DeJonghe, 2013).

Guidelines for Content Box Locations

As the tab order is being created, the next objective is to set general guidelines for content box locations (Pickens, 2017). An example based on the above resources leads to consistent placement of Boolean Operators, which can help searches in the databases and the library's catalog. The above guidelines suggest that an establishment of Boolean Operators' information should be placed on the Find Articles or Find Books tab. The impact would result in students knowing general information, such as Boolean Operators will always be on a certain tab on any guide. With the use of organized tabs and content boxes, the navigation of a guide should allow a history undergraduate to effectively navigate through different tabs on a psychology guide.

Improved Navigation

An additional method to provide students with easy navigation and help reduce "the frustration associated with searching multiple sources with limited success," is the wording used within guides (Van Kampen-Breit & Gould, 2018, p. 747). Several usability studies have focused on improving a guide's wording and have determined a guide should be jargon-free and use a more friendly conversational tone (Barker & Hoffman, 2021; Chan et al., 2019). Guides should list the title of the resource followed by the words database, journal, or article. For example, in a database list instead of ERIC the guide should list ERIC Database. By providing the resource in the title, it can help avoid confusion and improve the user-centered experience by providing a better connection to the type of resource they are using (Sonsteby & DeJonghe, 2013; Blakiston, 2013). One of the last steps to support a user-centered guide is to include descriptions of the resources and link destinations that highlight the key features (Blakiston, 2013; Ng, 2017). A condensed description directly states what the resource provides, allowing the student to determine if a certain resource can help complete an assignment or answer their research question.

Summary of Best Practices

A content strategy that establishes the basic blueprint design plan, organization, and wording of each guide that also supports the instructional approach of cognitive learning style is supported by research as best practice. Using a consistent content strategy sets a clear, step-by-step scaffolded instructional foundation for educational resources.

COGNITIVE LOAD THEORY

However, even with a content strategy, Cognitive Load Theory needs to be considered when designing a tutorial or guide (Baker & Hoffman, 2021; Bergstrom-Lynch, 2019; Pickens, 2017; Templeman-Kluit, 2006). In instruction, Cognitive Load Theory reflects on an individual's cognitive ability to process and store presented information (Al-Samarraie et al., 2019; Little, 2010; Pickens, 2017). Ideally, an instructional design needs to provide scaffolded information that the working memory can comprehend and then store in long-term memory (Baker, 2014; Pickens, 2017; Yilmaz, 2011). The design also needs to reduce the possibility of overloading the working memory, which would cause the working memory to fail at processing the presented information. "The general principle using cognitive load theory is to reduce extraneous cognitive load, manage intrinsic cognitive load, and promote germane load" (Khalil & Elkhider, 2016, p. 149). One method to reduce an extraneous cognitive load is the use of a balance of multimedia and text in the LibGuide (Pickens, 2017). The use of multimedia, text blocks and Cognitive Load Theory also assist in presenting information to the four different learning styles; reading, visual, auditory, and kinesthetic (Bergstrom-Lynch, 2019; Blummer & Kritskaya, 2009; Khalil & Elkhider, 2016).

Delivery Methods (Visual and/or Text)

User-centered research contains usability studies that were conducted to better understand which delivery methods assisted with the cognitive load for younger generations (Baker & Hoffman, 2021; Bergstrom-Lynch, 2019; Pickens, 2017). For visual learners, text paraphrasing should be written with an active voice, using short sentences that present information in a clear and detailed way. Usability studies indicate that students have an improved response to text using a conversational tone (Barker & Hoffman, 2021; Chan et al., 2019; Pickens, 2017; Sonsteby & DeJonghe, 2013). The use of shorter, friendlier text would reduce the possibility of students feeling overwhelmed in comparison to a resource that has textbook paragraphs. For visual and auditory learners, Pickens (2017) stated that video tutorials also follow the same idea as text paragraphs. The video needs to present the information without dividing the student's attention and should use signaling to highlight the important sections. A more scaffolded tutorial video helps students' working memory comprehend and store the important details while dismissing the non-important content. With an increase in the numbers of visual learners, using images can play an important role in presenting the information (Rapchak, 2017). In some cases, an image can replace a large text block, which can assist the working memory in processing information and can reduce

the possibility of cognitive overload (Little, 2010; Pickens, 2017). At times, images can also be used to increase engagement, however, any nonessential images can have a negative impact on comprehending essential information (Rapchak, 2017). By removing nonessential images, the working memory would only then need to process information that is essential to understanding the learning objective (Pickens 2017). With all delivery methods combined, creators can provide students with working examples that should be able to promote a more in-depth understanding of the instructional content. While having an instructional design that incorporates Cognitive Load Theory is an important element, the other important element is how the instruction is displayed on the tutorial or guide.

Number of Columns

One issue that highly impacts the design of LibGuides is the number of columns a creator uses in each tab and how it impacts a student's cognitive load (Al-Samarraie et al., 2019; Barker & Hoffman, 2021; Thorngate & Hoden, 2017). The use of multimedia can impact some column decisions to ensure the material can be read. The number of columns is also connected to the student's working cognitive load level. A 2019 study by Al-Samarriaie et al. investigated the topic to help determine the cognitive load of a guide with one, two, and three columns. From the EEG results of 27 students, the analyzed data showed, "it can be concluded that reading text from two-column had significantly lowered the cognitive load level among students. On the other hand, reading text in single-column resulted in a higher cognitive load level" (Al-Samarraie et al., 2019, p. 602). To build upon these results, usability study articles also stated that students commented that they preferred a tab with two columns instead of a three-column design (Thorngate & Hoden, 2017). When using an infographic or multimedia within a tab, it becomes more favorable to use a three-column design (Thorngate & Hoden, 2017). In this case, using a three-column design provides space to explain or expand on the information the multimedia is presenting to the student. An important consideration the creator needs to keep in mind is the size of an infographic and if it contains text. It may be necessary to use two columns to keep the infographic text large and clear enough to read. With the creation of a LibGuide that follows a content strategy and has a design that is more user-centered, another consideration would be current web accessibility standards that require library resources include several web accessibility features.

WEB ACCESSIBILITY FEATURES

Research on user-centered experience combined with web accessibility informs us that to have a library unit apply web accessibility features, two elements are necessary. The two elements needed are an organized content strategy and collaboration with the library's web developers (McDonald & Burkhardt, 2019). These two elements, when put into practice, provide an organized approach that has been designed to ensure that LibGuides contain scaffolded instructional resources that can meet the current web accessibility guidelines (Friedman & Bryen, 2007). When creating LibGuides, librarians should first have a general plan on what content is needed for a guide, which is why a content strategy is important because it is this strategy that will set a library-wide approach to creating guides (Logan & Spence, 2021).

Web Content Accessibility Guides (WCAG)

To help prepare for tomorrow's library, one important aspect that needs to be built into the content strategy's early development is the integration of web accessibility features. (Blakiston, 2013; Friedman & Bryen, 2007). As part of the preparation, librarians should begin the process by planning to meet the current Web Content Accessibility Guidelines (WCAG) 2.1 or the drafted 2.2 guidelines. These guidelines were approved in 2018 and governed by the World Wide Web Consortium to establish a set of international accessibility standards for the Internet (W3C Mission, n.d.). As librarians, we mainly need to know that these guidelines cover five sections: Perceivable, Operable, Understandable, Robust, and Conformance. The guidelines also contain three different compliance levels. These compliance levels are as follows: Level A, minimal compliance; Level AA, acceptable compliance; and Level AAA optimal compliance. As guides or tutorial creators, librarians can easily assist with the Perceivable, Operable, and Un-

derstandable sections and meet compliance Level A or AA (Facts About W3C, n.d.; Greene, 2020). When considering adding web accessibility to a content strategy, collaboration with the library's web designer can provide a better document. The collaboration between librarians and web designers can lead to instructional library resources that are also web-accessible (Blakiston, 2013).

Perceivable Section

Using the WCAG the Perceivable section's overall goal is to make sure all content is presented in a way that students both with and without accessibility issues can access. The first criterion is adding text alternatives (alt text) to the non-text content. Depending on the guide and the use of images, a librarian needs to evaluate the type of images included. Types of images found in LibGuides may be determined to be either complex, an image that provides new information, or decorative, an image meant for visual appeal. (Chee & Weaver, 2021; Ng, 2017). Complex images are instructional images when they provide visual information necessary to present the learning objective. An example would be a screenshot image in a guide or tutorial on how to set up a citation paper. The librarian using this image to display how certain parts of a paper should appear is using it as a complex image because it presents content on a citation paper. If the librarian decides to continue to use this complex image, they will need to write alt text that clearly describes the entire image, not just the discussion elements (Ng, 2017). If an image that is being used does not have information, the image could be considered decorative and not need any alt text. Adding alt text in guides and tutorials does add additional time to a project, which means librarians must balance personal preference regarding the number of images with the time necessary to add alt text under the restraint of deadlines. The use of images also connects to the next criterion within the WCAG guidelines of the Perceivable section which is Contrast (Enhanced). This criterion focuses on any images or informational graphics that a librarian would create themselves. To follow the WCAG Contrast (Enhanced) compliance Level AA, visual presentations of text or images containing text below size 14 need to have a contrast ratio of at least 4.5:1. Larger text, above font size 14 would need a ratio of at least 3:1. By collaborating with the library's web designers, helpful tools or contrast checking web sites can be added to a content strategy to ensure images that meet compliance Level AA (Golden, 2007; Chee & Weaver, 2021; Ng, 2017; Solovieva & Bock, 2014). The last Perceivable criterion is Time-based Media, which focuses on including captions for audio descriptions or media. Clossen and Proces (2017) highlight that when adding captions, creators do need to be careful to ensure that captions are correctly synchronized with the audio and not use captions to make auxiliary points. Thankfully, using voice-to-text technology in programs assists in meeting the compliance Level AA (Ng, 2017).

Operable Section

The WCAG's Operable section is meant to help improve a website's navigation and organization design to allow all students the ability to navigate to different sections of the website. As mentioned in the content strategy section, providing students with a consistent tab order and consistent box locations are critical to the user experience. These features are also listed as Navigable web accessibility features (Sonsteby & DeJonghe, 2013). Using clear, jargon-free wording and condensed descriptions of resources avoids confusion on what type of resource a student would want to use if they are relying on a screen reader's description (Mulliken, 2019). Depending on which software is being used, some provide the creators with a gallery and the ability to control the speed of the rotation. According to the WCAG guidelines, creators should set the rotation speed so it can last no more than 5 seconds; or provide the student with the option to pause the rotation. This amount of time provides the student with enough time to view and understand (Solovieva & Bock, 2014). With embedded videos, after confirming that the video provides closed captions, creators also need to confirm that the videos do not display more than three flashes per second. This criterion is set to help prevent a web page from causing a student to have a seizure or generally discourage a student from using the page or returning to it (Golden, 2007; Solovieva & Bock, 2014). In web pages, headers function to separate information into different sections. For example, in LibGuides each tab is automatically assigned as header 1 and the content box titles are assigned as header 2. This design provides the screen reader the ability to skip to different content boxes (Brown et al.,

2018; Hopper, 2021). Depending on the amount of text that a creator adds to each content box, the creator may consider adding a header and title to separate the text into smaller sections (Brown et al., 2018; Ng, 2017). If these sections should continue to be separated, the creator would use the next header level. The benefit of adding headers allows "screen-reader users to quickly jump from one result to the next intuitively… without having to listen to the description under each result" (Mulliken, 2019, p. 162). The use of headers provides students the ability to skip ahead to the content they have not yet heard. Headers also improve the user 's experience since it does reduce the amount of time a student needs to revisit the same content each time they visit the guide (Mulliken, 2019).

Understandable Section

The Understandable section of the WCAG could be the easiest to incorporate because librarians are already creating material that their audience should understand. The Web Content Accessibility Guidelines highlight two criterion points that should be in the discussion of the creation of a content strategy; these are how a library uses abbreviations and professional jargon (Barker & Hoffman, 2021). To assist with this discussion, it would be helpful to use a screen reader to listen to the guide. Some questions that can impact a guide are: Can undergraduates understand the abbreviation ILL or should Interlibrary Loan be used? Or does a screen reader correctly read the guide's use of a college or school abbreviation? These questions are essential when creating the content strategy because it sets consistency in all guides and presents a more user-centered resource to all students (Augustine & Greene, 2002; Pickens, 2017).

CONTENT STRATEGY

With the addition of a user-centered design and web-accessible features in a library's LibGuides, it becomes apparent that a content strategy will also be needed to govern consistency in both past and future guides. As Halvorson (2009) wrote, "content strategy is the practice of planning for the creation, delivery, and governance of useful, usable content" (p. 32). As a governing document, the content strategy should be written so all librarians clearly understand what is required to be in a LibGuide and their responsibilities as the creator. Because a content strategy can be customized to a library's needs, the content strategy could also include supporting guidelines that can assist with the creation of a LibGuide. A research study conducted by Logan and Spence (2021), showed that almost half of 120 higher education institutions published LibGuides, "without a user-centered document that explicitly describes what content should be included in LibGuides, institutions are likely to have as many different visions… potentially contributing to some of the content problems" (p. 4). Logan and Spence's findings highlighted that a content strategy also needs to be reviewed and updated periodically to maintain its focus on best user-centered practices ensuring that the library is presenting the best content to the students while maintaining past guides.

COLLABORATION

When establishing or updating a library's content strategy, there may be some limitations on the amount of content creativity LibGuide creators can include. LibGuide creators and web designers are encouraged to work together to create engaging and accessible features that benefit all guide users. This collaboration offers the creators the opportunity to mention any preferred instructional content that also may need to be evaluated to meet the web accessibility guidelines (Billingham, 2014; Chee & Weaver, 2021; Friedman & Bryen, 2007). Through collaboration with librarians, web designers and liaison instructors, all are provided the opportunity to establish and adjust the content strategy so it best fits both a library's mission statement and a librarian's liaison objectives. While exploring how to redesign guides to include the ACRL Framework, Duffy et al. (2021) highlight the benefit of how liaison librarians are able use guides as a collaborative resource with fellow librarians and instructors. "We built holistically and collaboratively, they [the guides] become all the more robust because we were able to discuss what concepts students were having a hard time grasping…then built those Framework concepts into the guides" (Duffy et al., 2021, p. 29). Through this type of collaboration, it can allow librarians to build a

relationship with the instructors while at the same time creating a valuable library resource for the students.

CONCLUSION

As we continue to educate younger generations, the need to evaluate and adapt our virtual resources becomes more critical. With a growing number of visual learners (Baker & Hoffman, 2021; Mestre, 2006; Neuhauser, 2002), there is a recognition of using multimedia in our current resources. In today's online educational landscape, library's resources are significant and necessary for remote students and can provide a richer and more beneficial user-centered experience. Current research shows that establishing a content strategy for research guides can help maintain a consistent resource design (Logan & Spence, 2021). Usability studies have shown that consistent navigation along with a course-connected step-by-step scaffolded instructional design (Bergstrom-Lynch, 2019; Pickens, 2017), can better assist students in locating the resources they need for an assignment. Providing a guide in a conversational tone that can easily be skimmed, also encourages repeated usage. As a library's content strategy is being formed, with the collaboration of web designers, librarians can easily include certain web accessibility features (Blakiston, 2013). The web accessibility features librarians could help with are those found in the Perceivable, Operable, and Understandable sections of the WCAG 2.1 guidelines. These web accessibility features can be included in a content strategy, which is "a massive undertaking, but it cannot be overlooked. It is absolutely essential for the future success of library websites if our content is to remain useful, usable, and findable" (Blakiston, 2013, p. 191). A library that includes these web accessibility features and user-centered features in its virtual resources reflects a library that is taking a proactive approach to ensure that all its students can access, use, and understand the content.

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