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Mixed Methods Not Mixed Messages: Improving LibGuides with Student Usability Data

Nora Almeida et Junior Tidal

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Résumé de l'article

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Methods – User-centred design demands that stakeholders participate in each stage of an application's development and that assumptions about user design preferences are validated through testing. Methods used for this usability study include: a task analysis on paper prototypes with a think aloud protocol (TAP), an advanced scribbling technique modeled on the work of Linek and Tochtermann (2015), and semi-structured interviews. The authors introduce specifics of each protocol in addition to data collection and analysis methods.

Results – The authors present quantitative and qualitative student feedback on navigation layouts, terminology, and design elements and discuss concrete institutional and technical measures they will take to implement best practices. Additionally, the authors discuss students' impressions of multimedia, text-based, and interactive instructional content in relation to specific research scenarios defined during the usability test.

Conclusion – The authors translate study findings into best practices that can be incorporated into custom user-centric LibGuide templates and assets. The authors also discuss relevant correlations between students' learning modality preferences and design feedback, and identify several areas that warrant further research. The authors believe this study will spark a larger discussion about relationships between instructional design, learning modalities, and research guide use contexts.

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Research Article

Mixed Methods Not Mixed Messages: Improving LibGuides with Student Usability Data

Nora Almeida
Instruction Librarian, Assistant Professor
Ursula Schwerin Library
New York City College of Technology, City University of New York
Brooklyn, New York, United States of America
Email: nalmeida@citytech.cuny.edu

Junior Tidal
Web Services Librarian, Associate Professor
Ursula Schwerin Library
New York City College of Technology, City University of New York
Brooklyn, New York, United States of America
Email: jtidal@citytech.cuny.edu

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Abstract

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Introduction

Subject and course specific research guides created on the popular Springshare platform, LibGuides, have become ubiquitous in academic library environments. In spite of this, there has been little published research on the pedagogical efficacy, use contexts, and design of research guides. The LibGuides platform, which purports to be the "easiest to use web publishing and content creation platform for libraries," allows librarians to remix and reuse content across guides and institutions, and caters to libraries who want a flexible tool for curating library content that can accommodate librarians with little technological literacy or experience with digital instructional design (Springshare, 2017). However, just because librarians have subject expertise and knowledge of specialized research practices does not necessarily mean they can create digital resources that will be easy for students to use or that will address the information needs students have in different contexts. As academic libraries increasingly rely on digital platforms like LibGuides to reach students conducting research off campus and to supplement or replace face-to-face instruction, they should consider whether the subject and course specific research guides they create reflect user preferences and research behaviours. Librarians must also consider the various use contexts for online research guides when making decisions about language, layout, navigation, and interactivity.

This article describes a mixed methods usability study the authors conducted in 2016 to learn more about student design preferences and learning styles, and to improve subject specific research guides at the New York City College of Technology's Ursula Schwerin Library. The goal of the study was to translate user design and learning modality preferences into executable design principles. After introducing the project methodology and presenting study findings, the authors will discuss discrepancies and study limitations, and will outline several areas for future research. While focused on a specific institutional context, the methodology and results of this study will be of interest to librarians at other institutions who want to ensure that research guides and other educational technology platforms deploy user-centric design principles.

Institution and Platform Context

The New York City College of Technology, colloquially known as City Tech, is one of the City University of New York (CUNY) system's 24 colleges. The campus is located in downtown Brooklyn and is a commuter school primarily serving residents of New York City's five boroughs. Offering 2-year associate and 4-year

baccalaureate programs, City Tech is known for technical and professional programs such as nursing, hospitality management, and vision care technology. The institution is demographically diverse and enrolls over 17,000 students. While the City Tech population is unique, enrollment trends and student demographics reflect patterns at colleges and universities across the United States (U.S. Department of Education, 2014).

LibGuides is one of a number of educational platforms used by City Tech librarians for information literacy instruction and outreach. LibGuides 2.0 was acquired through a consortial CUNY-wide license and rolled out at the City Tech campus in Fall 2015. The platform replaced previous research guides housed on MediaWiki, the same open-source software that powers Wikipedia. Prior to the 2015 roll-out, a majority of faculty librarians at City Tech had no experience creating guides on either the LibGuides 2.0 or 1.0 platforms. A project to migrate existing MediaWiki guides to LibGuides 2.0 revealed that the guides lacked consistency in terms of overall design, navigation, extent of content, and interactivity. While the library employs user testing to inform the design of the library website, subject expert librarians had autonomously developed subject specific research guides without soliciting user feedback. The authors realized that usability testing might provide insight into student preferences and help improve the design of LibGuides while still giving subject expert librarians the autonomy to curate disciplinary content.

Literature Review

In spite of its ubiquity, the LibGuides platform is currently underexplored in LIS literature and some librarians have expressed concern that "there is sparse research on how university students use LibGuides and what benefits it affords them" (Bowen, 2014, p.152; Hicks, 2015; Thorngate & Hoden, 2017). Recently, the LibGuides platform has received some critical attention from user experience librarians but published case studies infrequently address connections with regards to pedagogy, student learning modality preferences, social dimensions of library technology, or sociocultural contexts of research (Brumfield, 2010, p.64; Hicks, 2015). An exception to this is a forthcoming study by Thorngate and Hoden (2017), who discuss the importance of "the connection between research guide usability and student learning" and explicitly connect design features with cognitive practices. The few existing case studies that discuss LibGuides, user experience, and pedagogy point to the necessity of qualitative and task based user testing approaches in order to understand student learning styles, research behaviors, and design preferences (Thorngate & Hoden, 2017; Bowen, 2014).

User Testing Protocols

Literature on user testing protocols reveals that qualitative methods like interviews and TAP can be combined with more traditional user experience protocols to generate substantive, qualitative feedback. A mixed methods approach allows experimenters to gain pointed feedback about specific design elements that can then be analyzed alongside subjective learning modality preferences and user behaviors (Linek & Tochtermann, 2015). The testing protocol initially considered for the City Tech study included an A/B test combined with semi-structured interviews in order to compare design variants and capture user preferences for different layouts, page elements, and navigation schemas (Young, 2014; Martin & Hanington, 2012). However, since A/B tests are most effective with fully executed designs and a large number of study participants, the authors concluded that paper prototyping was the most appropriate method for testing interface variations using low-fidelity mock-ups (Nielsen, 2005). Paper prototyping allows for an analysis of "realistic tasks" as study participants "interac[t] with a paper version of the interface" (Snyder, 2003). This protocol is flexible enough to be used with more than one interface variation and, unlike A/B testing, only requires 5

participants to identify most usability issues (Snyder, 2003; Nielsen, 2012). While some literature indicates that users prefer computer prototypes in task based protocols, the quantity and quality of feedback generated by paper versus computer prototype testing is comparable (Sefelin, Tscheligi, & Giller, 2003; Tohidi, Buxton, Baecker, & Sellen, 2006). Task analyses on paper prototypes are frequently combined with TAP to capture subjective feedback and to identify "concrete obstacles" participants encounter (Linek & Tochtermann, 2015). The TAP protocol has been used for numerous usability studies involving LibGuides (Thorngate & Hoden, 2017; Yoon, Dols, Hulscher, & Newberry, T., 2016; Sonsteby, A., & DeJonghe, 2013).

Numerous usability studies have pointed to the "reluctance of people to express critique and to verbalize negative thoughts during user testing" (Linek & Tochtermann, 2015; Sonsteby & DeJonghe, 2013; Tohidi et al., 2006). To invite more critical responses from study participants and to "receive more informal, creative feedback," experimenters can combine alternative methods with traditional protocols and present "multiple alternative designs" to participants (Linek & Tochtermann, 2015; Tohidi et al., 2006). One such alternative protocol is the advanced scribbling technique, which can be combined with traditional paper prototype task analyses and interviews. During advanced scribbling, participants annotate paper prototypes with colored highlighters in order to identify important, confusing, and unnecessary design elements (Linek & Tochtermann, 2015). Linek and Tochtermann (2015) describe this protocol as a "systematic way of receiving feedback and avoiding ambiguity" and also note this method may reduce barriers to critique because it "enables the evaluation of single design elements without pressuring the participant to express explicitly negative comments."

LibGuide Templates and Design Elements

Libraries cite user studies, case studies, or best practices documentation on the Springshare LibGuides website as the basis for local design decisions (Bowen, 2014; DeSimio & Chrisagis, 2014; Dumuhosky, Rath, & Wierzbowski, 2015; Duncan, Lucky, & McClean, 2015; Thorngate & Hoden, 2017). However, it is important to note that many institutions use LibGuides without conducting any user testing or surveying published case studies to inform design. As a result, many LibGuides are problematically "library-centric" in terms of how information is presented and organized (Hicks, 2015). Hicks (2015) argues that such unreflective design practices can undercut critical pedagogical models and "marginalize the student voice from the very academic conversations" that most concern them. Consequently, user testing is not only important in terms of defining design decisions but may also be a critical imperative if such interactions yield important insights into how students learn.

LibGuides are most successful if they focus on student information needs and reflect student research behaviors. Researchers have found that students will abandon guides if they are confusing, cluttered, or if the purpose of the guide is not immediate apparent (Gimenez, Grimm, & Parker, 2015). Some institutions have opted to replace librarian-centric terms such as "articles and journals" with natural language terms such as "magazines" or "news" after conducting user testing (Sonsteby & DeJonghe, 2013). Additionally, several studies specifically looked at how students respond to the use of columns on LibGuides and introduced strategies to reduce "noise" and clutter (Gimenez et al., 2015; Thorngate & Hoden, 2017).

Many libraries make use of LibGuides templates to hard code design elements and ensure design consistency across research guides (Duncan, Lucky, & McClean, 2015). Templates not only make guides more useful to students but also allow subject selectors to focus on content

instead of technical aspects of the LibGuides platform (Duncan et al., 2015). While specific template recommendations are helpful in that they identify concrete design elements on the LibGuides platform, it is essential that libraries consider specific user populations, institutional cultures, and use contexts when designing LibGuide templates.

Aims

The primary objective of this mixed methods user study was to understand City Tech students' design and learning modality preferences and to improve subject specific research guides. The study was designed to capture students' impressions of multimedia content such as videos, images, embedded presentations, text-based content, and interactive instructional content like search boxes or quizzes. This was in the context of a specific research scenario and in relation to a specific platform interface. The authors used study findings to document best practices for design, and plan to translate this document into a new hard-coded LibGuides template that includes a standard navigational schema and layout. For optimal features that may not be relevant for every guide or subject area, the authors plan to create a series of custom LibGuides assets that librarians without technological expertise can easily pull into research guides.

Methodology

Before beginning user testing, the authors worked with an instructional design intern to conduct a brief content audit of the subject specific guides migrated from MediaWiki. This audit revealed that some guide content was out of date, content was duplicated, most guides were heavily text-based, the migrated guides used inconsistent database linking protocols, and most guides did not have embedded search opportunities or interactive features. In the Fall 2016 semester database assets were loaded into LibGuides in order to resolve linking issues. A handful of guides were revised to mitigate duplication and to remove some out of date content before user testing began.

After conducting a literature review, the authors determined that a mixed methods approach would yield the most robust data about student design and learning modality preferences. The methods ultimately used for the study included a combination of paper prototyping, advanced scribbling, task analysis, TAP, and semi-structured interviews. Below, each protocol is described along with how data was compiled and analyzed. After refining the project methodology, the authors worked with the instructional design intern to develop two paper prototypes: a control prototype that mirrored a typical subject guide, and a revised prototype that used a simplified navigation schema and included more multimedia elements. Ten student participants were recruited through flyers and email blasts, and were compensated $5.00 for 30 minute individual test sessions. The authors and the instructional design intern conducted testing in December 2016 with one experimenter serving as proctor, a second experimenter as note taker, and a third experimenter as a human "web server" who supplied access to interior pages of the prototype after study participants "clicked" on features or menu items during the task analysis phase. Results were analyzed and shared with the City Tech Library department in Spring 2017 and the authors plan to complete the template and library faculty training in Fall 2017.

Paper Prototyping

Student participants were given two paper prototypes emulating two variations of the landing page of an English research guide. The control prototype had a two-tiered primary navigation menu, a static welcome image, and contained few linked elements with the exception of a list of recommended databases. Alternatively, the revised prototype contained a minimal primary navigation menu with labels containing action verbs like "find" or "search",

introduced more opportunities for interaction with search boxes and collapsible info boxes, and contained multimedia features including a book gallery and video (see Appendix *B* and *C*). Participants were asked to annotate both prototypes following the advanced scribbling protocol guidelines (see below). Subsequently, participants selected their preferred layout, answered questions about their modality and design preferences in a semi-structured interview (see below), and completed a research task on the paper prototype that they selected (see below).

Advanced Scribbling

Participants were given green, yellow, and red highlighters and instructed to color code design elements on both the control and revised prototypes. Students marked elements they deemed important in green, confusing in yellow, and unnecessary in red and used a pen for substantive annotations. Data for advanced scribbling was collected by tabulating how users color coded each design element on each prototype. Since not all participants marked every element, percentages of elements coded as important, confusing, and unnecessary on the two prototypes were calculated by assessing the color coded elements in relation to the total number of participants who marked that element.

Interviews

Prior to scribbling, participants were asked contextual questions about their learning preferences and research experience (see Appendix *A*). After completing the advanced scribbling task on both prototypes, students were asked questions about the prototypes including which interface they preferred and why. Students were asked to expound upon their scribbles and to provide feedback on the navigation labels and the extent of content displayed on each guide. During these semi-structured interviews, a note taker recorded student feedback. Responses were tabulated for yes / no and either / or questions. During the data analysis phase, the authors identified keywords and mapped thematic patterns for qualitative feedback that could not be easily tabulated. For example, in response to the question "have you used the library to conduct research?" many students mentioned that they had borrowed books or used library databases or articles. The authors identified books, databases, and articles as keywords and were thus able to identify patterns about the types of research materials study participants had previously used.

Task Analysis and TAP

After the interviews, participants were given two hypothetical research scenarios (see Table 2 below) to test how well the prototype interfaces supported the completion of these tasks. During the task scenarios, participants were told to "think-aloud," verbally expressing their thought processes. Metrics were recorded for each task scenario, including fail/success rate and the number of "clicks" that users would need to complete the task. TAP response data was combined and analyzed with qualitative interview feedback using keyword analysis and thematic mapping.

Findings

Participant Profiles

Most student study participants indicated that they had some experience in academic research environments. Participants characterized themselves as either beginner or intermediate level researchers. The majority of participants (50%) indicated they regularly used a library other than the City Tech Library, 20% were not library users, and the remaining 30% of participants were City Tech Library users (see Figure 1). Only 4 out of 10 participants had ever attended a library instruction session. None of the participants in this study had previously used an online library research guide.

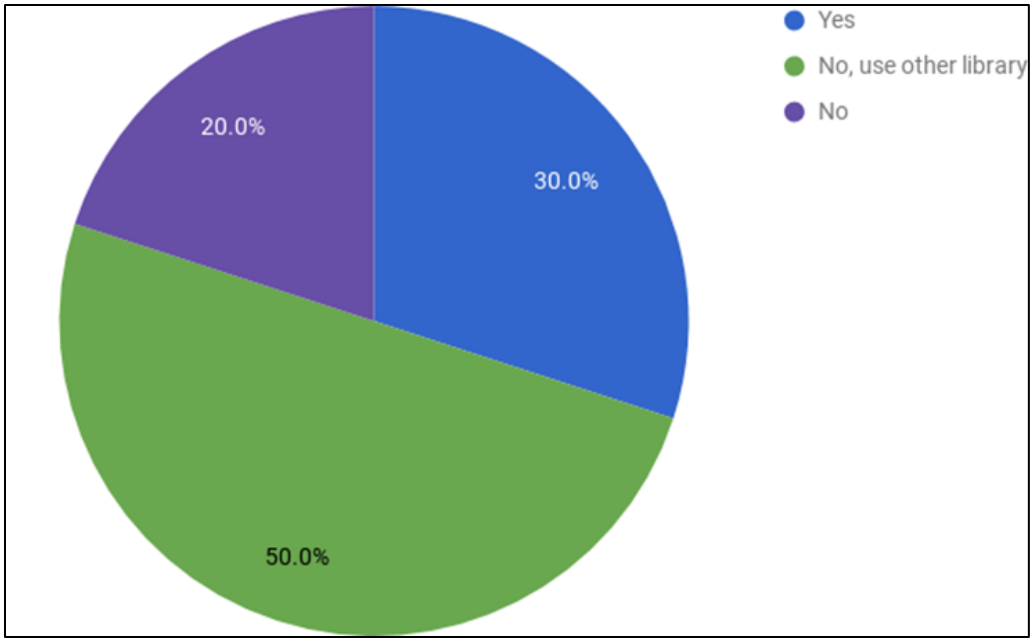


Figure 1
Participant interview responses about library usage.

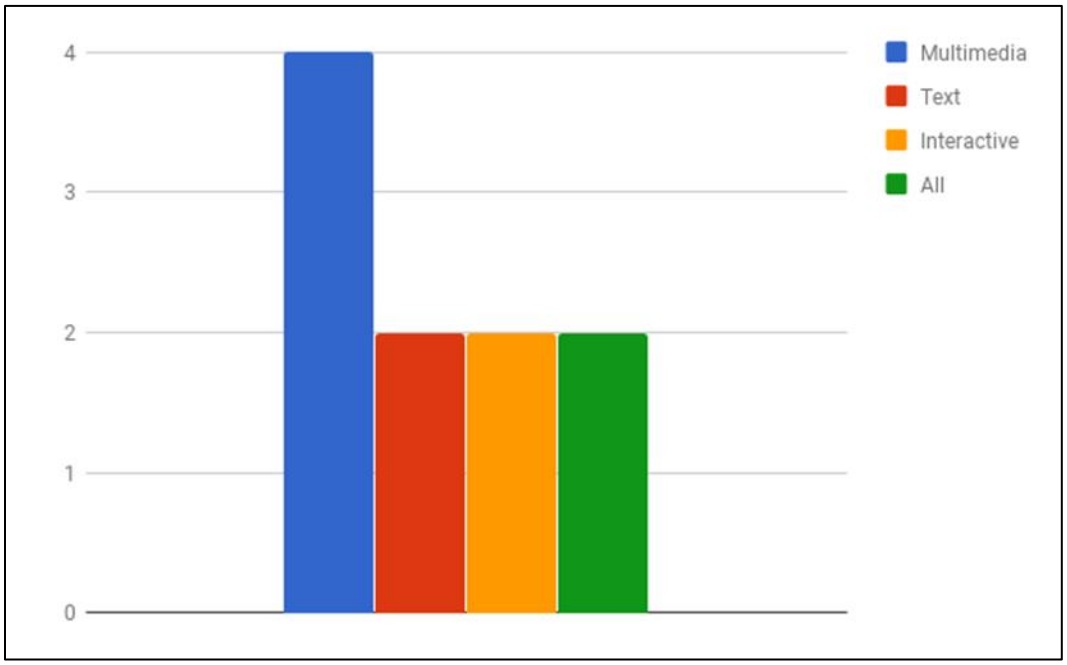


Figure 2
Participants' preferred types of content.

During interviews, student participants expressed a slight preference for multimedia over text-based content, interactive content, and the combination of all types of content (see Figure 2). Student media preferences were corroborated by analysis of advanced scribbling protocols and qualitative feedback compiled during user testing.

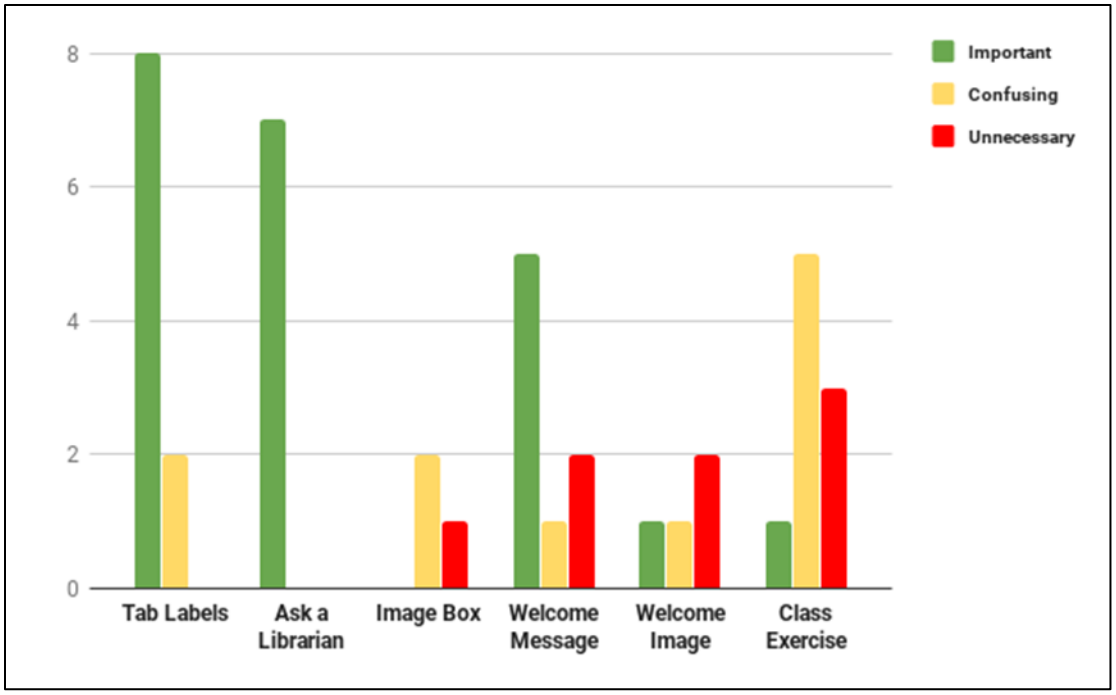


Figure 3
Participants' advanced scribbling data for paper Prototype A.

Design Elements

Fifty percent of study participants preferred the control prototype (Prototype A) and 50% of users preferred the revised prototype (Prototype B). Since no best overall design emerged from this study, the authors will highlight specific feedback on individual design elements across both prototypes in their analysis. The advanced scribbling protocol yielded some contradictory data with some students marking elements as important and others marking those same elements as either confusing or unnecessary. Some contradictory data is the result of variations in student design or modality preferences, and other disparities were clarified in semi-structured interviews.

The highest ranking elements (see Figure 3) of the control prototype (Prototype A) were the primary navigation menu, the "Ask a Librarian" box, and the welcome message providing context for the guide. A large majority of users marked the class exercise element as either unnecessary or confusing, and three users indicated that the welcome image was confusing or unnecessary.

There was less clear consensus about design elements on the revised prototype (Prototype B), although several elements received positive rankings from users (see Figure 4). High ranking elements included the primary navigation menu, although seven out of ten users found specific tab labels within the main menu confusing or unnecessary. While qualitative feedback suggested that language was important to users, none of the student participants provided feedback on the use of action verbs versus nouns in labels (e.g. "Find Articles" vs. "Articles"). Other high ranking elements on Prototype B were the book carousel, the search box, and the "Ask a Librarian" box. Several elements received mixed rankings including an instructional video which four users marked as important but three users found unnecessary, perhaps reflecting variations in modality preferences. The "Your Librarian" box

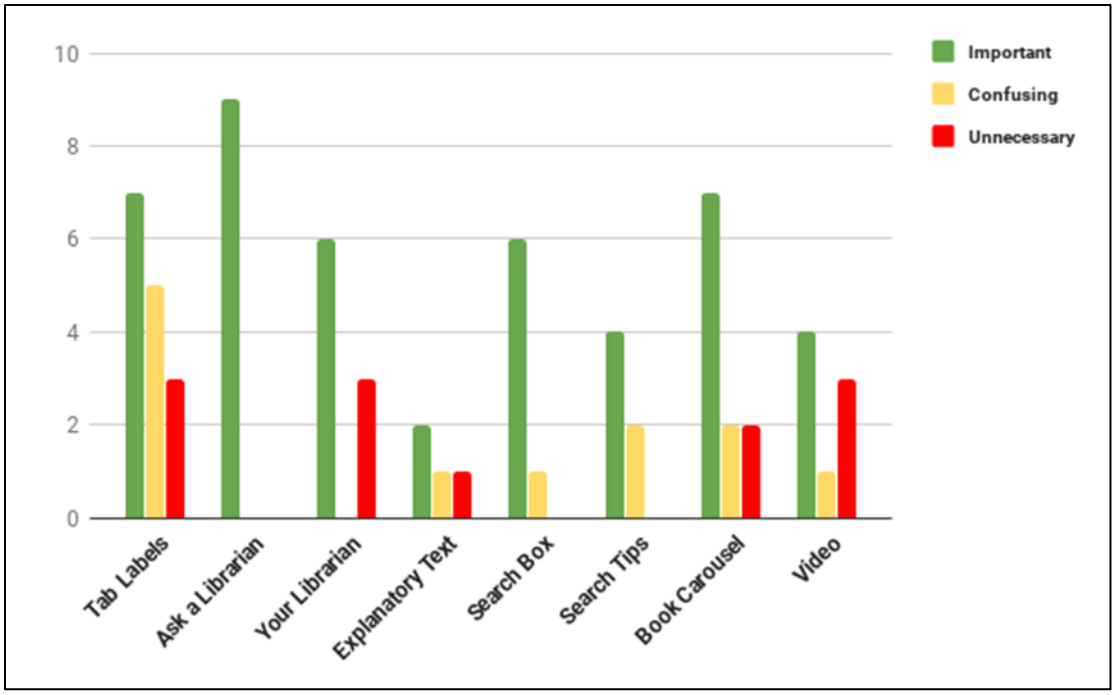


Figure 4
Participant advanced scribbling data for paper Prototype B.

Table 1
User Feedback About Template Elements

"Begin Search" should be "Home"
There are two "Search"
"should not be 2 search options"
Ask a librarian + contact [your librarian] are redundant
Combine "ask a librarian" and "your librarian" boxes

was ranked as important by six users, but three marked this feature as unnecessary, and qualitative feedback revealed that some students found this feature redundant.

Qualitative feedback

In interview questions and during the TAP, users offered some concrete suggestions for the guide layout and navigation labels that could be incorporated into the LibGuides template (see Table 1). Several users pointed out redundant features that should be consolidated, including the "Ask a Librarian" and "Your Librarian" boxes, and the search box widget and the "Begin Search" menu item on Prototype B. Participants also noted that the purpose of the guide should be explicit and they wanted to be able to conduct research without navigating away from the guide or being redirected to the library website.

Table 2
Tasks That Users Were Asked to Attempt on the Paper Prototypes

Task 1: Where would you go on this guide to find scholarly articles?
Task 2: Where would you go on this guide to search for books in the City Tech library's collection?

Task Analysis

Participants were given a hypothetical research scenario during which they were asked to conduct scholarly research for a paper on post-colonial Caribbean literature. Students were then given two tasks to complete on their preferred prototype in relation to the scenario (see Table 2).

Task completion success rates were high (above 80%) on both prototypes with a slightly higher failure rate for Prototype A. The lack of a search box on Prototype A accounted for most failures since users would have to navigate away from the guide to search the library's electronic and print holdings. Additionally, several participants had difficulty interpreting certain elements on the paper prototypes and in some cases assumed that certain features were hyperlinked. This resulted in a small percentage of false positives where users incorrectly believed they had successfully completed a task. This data was useful in that it revealed student expectations for linked and dynamic elements.

Navigation

The other metric recorded during the task analysis phase was the number of "clicks" needed to complete each task. A click was recorded whenever a participant indicated they would use the search box, follow a link, or go back a page. The click averages were low for both prototypes and tasks, with less than three clicks performed by all users per task. Click averages for task two were substantially lower for both prototypes. The authors speculate that this is a result of learnability as users became more comfortable with the prototype layouts after completing task one.

Discussion

Implications for Design

No "best" layout emerged as a result of the usability study and thus, the authors will focus on design elements ranked favorably across prototypes in developing a new user-centric template. Based on participant feedback, the authors plan to maintain the labels and navigation schema used in Prototype A but will incorporate more multimedia and interactive content to ensure LibGuides can accommodate different learning modality preferences. Study findings indicate that students should be able to complete basic research tasks from within research guides, and a search widget for the City Tech Library's discovery layer will be hardcoded into the final template. Based on user suggestions, the "Your Librarian" and "Ask a Librarian" boxes will be combined. Since there was some ambiguous feedback on multimedia features, the video and book carousel elements will be made available as optional assets that can be integrated into guides where appropriate.

In addition to producing a new template and multimedia assets, the authors plan to provide training for City Tech librarians and to discuss strategies to use LibGuides as part of the library's instruction program. While creating a standardized template and faculty librarian training can make research guides more intuitive and easy to use, guides must be analyzed in relation to one-shot instruction sessions and reference desk interactions to ensure they align with pedagogical models.

Defining concrete usage contexts for guides will help City Tech librarians tailor guides to meet student needs and help ensure that digital tools enhance information literacy outcomes.

Learning Modalities, Research Experience, and Design Correlation Analysis

This study revealed a positive correlation between learning modality and design preferences. Students who selected Prototype B were more likely to indicate that they favour multimedia as their preferred learning modality during the interview phase of the study, and were more likely to mark interactive and multimedia elements as "important" during the advanced scribbling protocol phase (see Figures 3 and 4, above). Students who selected Prototype A were more likely to indicate that they learn best by reading, and were more likely to mark text-based contextual elements as "important" during the advanced scribbling protocol.

The authors found no comparable correlation between participants' level of research experience and design preferences but believe a larger sample size and more diverse participant pool may be needed to measure whether research experience is predictive of design preference. If such a correlation were found, librarians could more effectively customize guides for different research levels.

Disparities and Study Limitations

While analyzing the study data, the authors identified some disparities and study protocol limitations. In some cases, student participants had difficulty reading design cues on the low-fidelity mock-ups, which is a known limitation of paper prototypes (Sefelin, et. al., 2003). In particular, users were confused about image placeholders and assumed that certain static elements were hyperlinked. These limitations did not significantly skew data because of the mixed methods approach but may have impacted overall preferences for one prototype over another. Disparities arose in instances where individual design elements were liked by some students but marked as confusing or unnecessary by others. These contradictory findings likely have more to do with personal design and learning modality preferences than a misreading of the prototypes, and illustrate that there is no single design approach that will please every user. Lastly, we found that some of the advanced scribbling data on navigation is misleading since qualitative feedback illustrates that the problem is the navigation labels not the menu design. This may be an inherent limitation of the advanced scribbling protocol that researchers can mitigate by encouraging marginal annotation in addition to color-coding, and by combining this protocol with semi-structured interviews.

Areas for Future Research

This mixed methods user study raised some questions and illuminated several areas that require additional research. The authors would like to further explore relationships between user research experience, learning modality preferences, and design, perhaps by diversifying the study sample to include more advanced level researchers and different kinds of learners. While beyond the scope of this study, the authors acknowledge that different use contexts such as use by librarians in instruction sessions versus independent use by student researchers for subject specific LibGuides may impact user design preferences and influence what features they deem important. The authors question whether guides should place emphasis on discovery, information literacy, or resource curation, and how these decisions relate to theoretical and political conversations about the purpose of online instructional tools. Are the guides intended to be used by students working independently on research assignments, as a supplement or replacement for face-to-face instruction? Is the intended audience for research guides students, classroom faculty, or librarians? Can a LibGuide serve all of these various purposes and audiences at the same

time? How do these shifting contexts resolve themselves in design? Do LibGuides and other digital instructional objects have a measurable effect on student research outcomes and achievement, and could they have more of an impact if they were deployed or designed differently?

The authors also hope to conduct more usability testing once the new LibGuides template is live since computer-based task analysis might present a clearer picture of how users interact with the LibGuides interface. Alternative protocols, such as mobile and remote usability testing, should also be deployed after template implementation to assess whether students have issues with access or navigation on different devices. Additionally, CUNY is in the process of acquiring a consortial license for the LibGuides CMS package, which includes an analytics package. Implementation of the CMS package will introduce more options for quantitative analysis of usage. Although LibGuides analytics cannot capture the kind of granular data a usability study can, analytical data can provide insight into what areas of a guide are used frequently.

Conclusion

This mixed methods user study yielded important insights into student design and modality preferences at City Tech. While there is no single design approach that can satisfy all users' preferences, there was consensus surrounding several concrete design features that can be hard-coded into a LibGuides template. The authors believe that the implementation of a new template and the creation of custom multimedia assets will make LibGuides more intuitive and accessible. Additionally, librarian training sessions and institutional efforts to align research guides with library instruction and reference services may ultimately enhance pedagogical outcomes and start an important dialogue about instructional design. While the concrete design outcomes generated from this study may not be translatable to other institutional contexts, academic librarians can adopt the methodology articulated here to create effective LibGuides templates at their own institutions. Additionally, the correlation between learner preferences and design principles identified here is applicable to other institutional and platform contexts, and should be studied further. Ultimately, the authors hope this study will encourage other libraries to focus on user-centric design and spark a larger discussion about relationships between instructional design, learning modalities, and research guide use contexts.

References

Bowen, A. (2014). LibGuides and web-based library guides in comparison: Is there a pedagogical advantage? *Journal of Web Librarianship*, *8*(2), 147-171. http://dx.doi.org/10.1080/19322909.2014.903709

Brumfield, E. J. (2010). Applying the critical theory of library technology to distance library services. *Journal of Library & Information Services in Distance Learning*, *4*(1-2), 63-71. http://dx.doi.org/10.1080/15332901003765795

City University of New York. (2017). *Online instruction at CUNY*. Retrieved from http://www2.CUNY.edu/academics/current-initiatives/academic-technology/online-instruction/

DeSimio, T., & Chrisagis, X. (2014). *Rethinking our LibGuides to engage our students: Easy DIY LibGuides usability testing and redesign that works* [PDF document]. Retrieved from http://corescholar.libraries.wright.edu/ul_pub/168

Dumuhosky, L., Rath, L. T., & Wierzbowski, K. R. (2015). *LibGuides guided: How research and collaboration leads to success* [PDF

document]. Retrieved from http://digitalcommons.brockport.edu/lib_presentations/2

Duncan, V., Lucky, S., & McLean, J. (2015). Implementing LibGuides 2: An academic case study. *Journal of Electronic Resources Librarianship*, *27*(4), 248-258. http://dx.doi.org/10.1080/1941126X.2015.1092351

Gimenez, P., Grimm, S., & Parker, K. (2015). *Testing and templates: Building effective research guides* [PDF document]. Paper presented at the Georgia International Conference on Information Literacy. Retrieved from http://digitalcommons.georgiasouthern.edu/gaintlit/2015/2015/37

Held, T., & Gil-Trejo, L. (2016). Students weigh in: Usability test of online library tutorials. *Internet Reference Services Quarterly*, *21*(1-2), 1-21. http://dx.doi.org/10.1080/10875301.2016.1164786

Hertzum, M., Borlund, P., & Kristoffersen, K. B. (2015). What do thinking-aloud participants say? A comparison of moderated and unmoderated usability sessions. *International Journal of Human-Computer Interaction*, *31*(9), 557-570. http://dx.doi.org/10.1080/10447318.2015.1065691

Hicks, A. (2015). Libguides: Pedagogy to oppress *Hybrid Pedagogy.* Retrieved from http://www.digitalpedagogylab.com/hybridped/libguides-pedagogy-to-oppress/

Linek, S. B., & Tochtermann, K. (2015). Paper prototyping: The surplus merit of a multi-method approach. *Forum: Qualitative Social Research*, *16*(3). Retrieved from http://www.qualitative-research.net/index.php/fqs/article/view/2236/3836

Martin, B., & Hanington, B. M. (2012). A/B Testing. In *Universal methods of design: 100 ways to research complex problems, develop innovative ideas, and design effective solutions.* (pp. 8-9). Beverly, MA: Rockport. Nielsen, J. (2005). Putting A/B testing in its place. In *Nielsen Norman Group.* Retrieved from https://www.nngroup.com/articles/putting-ab-testing-in-its-place/

Nielsen, J. (2012). How many test users in a usability study? In *Nielsen Norman Group.* Retrieved from https://www.nngroup.com/articles/how-many-test-users/

Sefelin, R., Tscheligi, M., & Giller, V. (2003, April). Paper prototyping - What is it good for? A comparison of paper-and computer-based low-fidelity prototyping. In *CHI '03 Extended Abstracts on Human Factors in Computing Systems.* (pp. 778-779). ACM. Retrieved from http://mcom.cit.ie/staff/Computing/prothwell/hci/papers/prototyping-sefelin.pdf

Snyder, C. (2003). *Paper prototyping: The fast and easy way to design and refine user interfaces*. San Francisco: Morgan Kaufmann.

Sonsteby, A., & DeJonghe, J. (2013). Usability testing, user-centered design, and LibGuides subject guides: A case study. *Journal of Web Librarianship*, *7*(1), 83-94. http://dx.doi.org/10.1080/19322909.2013.747366

Spingshare. (2017). LibGuides. Retrieved from https://www.springshare.com/libguides/

Thorngate, S., & Hoden, A. (2017). Exploratory usability testing of user interface options in LibGuides 2. *College & Research*

Libraries. Retrieved from http://crl.acrl.org/index.php/crl/article/view/16739

Tohidi, M., Buxton, W., Baecker, R., & Sellen, A. (2006). Getting the right design and the design right: Testing many is better than one. In *CH 2006 Proceedings, April 22-27, 2006, Montreal, Quebec, Canada.* (pp.1243-1252). Retrieved from https://www.billbuxton.com/rightDesign.pdf

U.S. Department of Education, National Center for Education Statistics, Higher Education General Information Survey (HEGIS) (2014). *Total undergraduate fall enrollment in degree-granting postsecondary institutions, by attendance status, sex of student, and control and level of institution: Selected years, 1970 through 2023* [Data File]. Retrieved from http://nces.ed.gov/programs/digest/d13/tables/dt13_303.70.asp

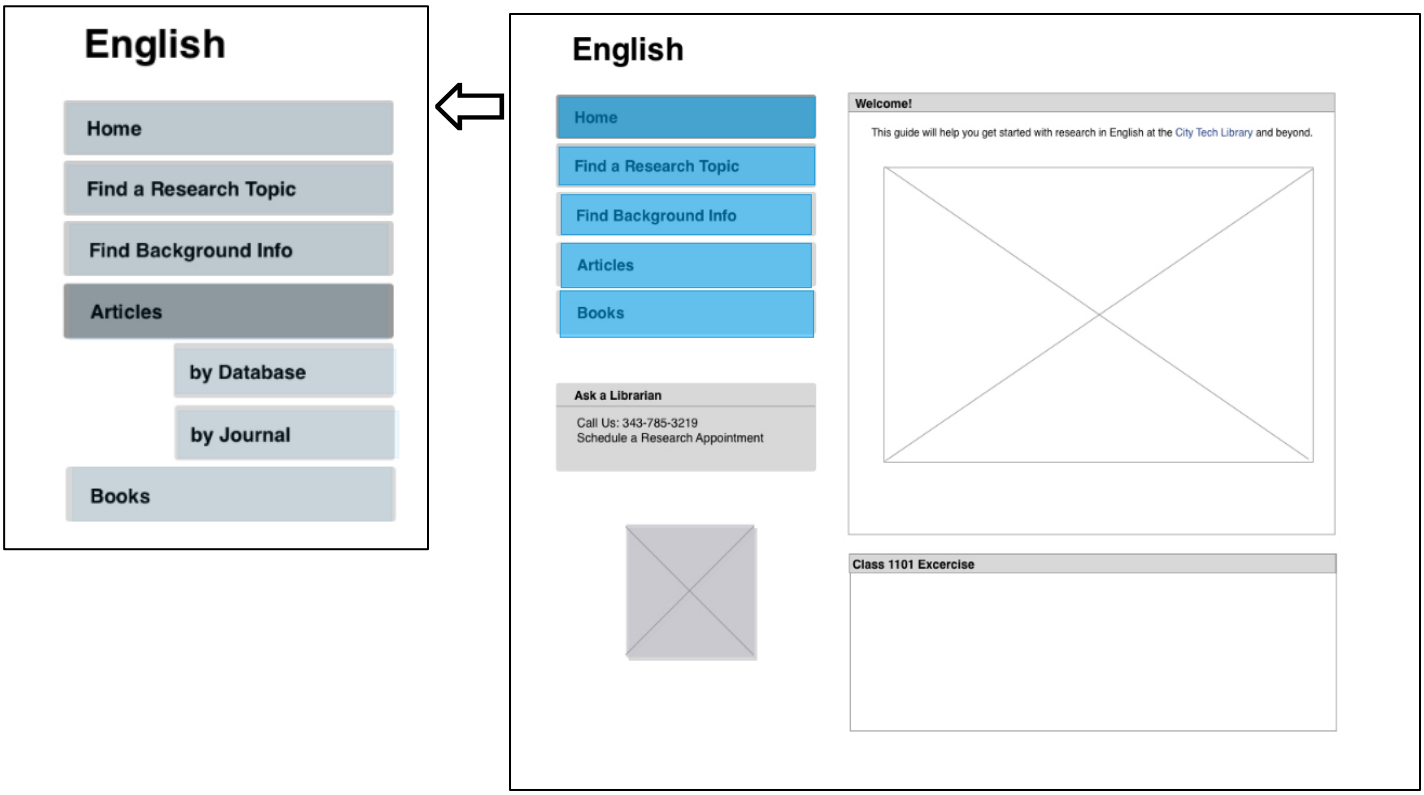
Yoon, K., Dols, R., Hulscher, L., & Newberry, T. (2016). An exploratory study of library website accessibility for visually impaired users. *Library & Information Science Research, 38*(3), 250-258.

Young, S. W. H. (2014). Improving library user experience with A/B testing: Principles and process. *Weave: Journal of Library User Experience*, *1*(1). http://dx.doi.org/10.3998/weave.12535642.0001.101

Appendix A
Interview Questions

1. Which research guide do you prefer?
2. What don't you like about the guide you didn't select?
3. Which features of the research guide made you select this guide?
4. How much content do you think should be included on a research guide?
5. What labels or features did you find confusing?
6. Do the menu labels on this guide make sense to you?

Appendix B
Prototype A



Appendix C
Prototype B