Usability Study of Database Accessibility for Students Who Use Screen Readers

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Navigating the research process and accessing scholarly resources can be challenging for many students. Those who use screen readers to access information have an added layer of complexity to their information seeking. While librarians have developed services to support students with print disabilities, it is often not clear the exact nature of the research process these students experience and how that experience compares to students who do not use screen readers. In order to better understand the research experience of students with print disabilities and to develop better services to support these students, two librarians at Washington State University Vancouver embarked on a usability study of database accessibility. This paper will highlight some of the things we learned during this project.

Background

Two students who use screen readers contacted our library for assistance in using library resources to find scholarly articles. These students arranged individual times with reference librarians and brought their laptops with them so that they could use their screen readers while working. We helped these students find what they needed as best we could but noticed several important things.

First, the research process was incredibly time-consuming for the students and not the independent experience they wanted or deserved. Our library services are designed to support students through their research process, providing instruction as needed so that students can develop their critical thinking skills and become more confident and independent with their research skills. These two students were definitely not feeling confident or independent in their use of library resources.

Second, our reference librarians have no (or very limited) experience with screen readers. They struggled to understand what was happening with the research experience for these students and how best to help without doing their research for them. It was obvious there were problems and that students

were frustrated but it was not obvious what the problems were. The librarians could not tell whether the issues were related to students' competency with the screen reader software, related to conflicts between screen readers and database interfaces, or related to information literacy skills. The librarians were definitely not feeling confident in their abilities to help these students.

Finally, it was clear that this situation was not sustainable. The librarians had experienced the same issues and frustrations in the past while helping students with print disabilities, and, unless something changes, are likely to experience the same issues going forward. We want to make sure we are serving all of our students equitably and we want that experience to be positive, not the frustrating experience it was proving to be for students who use screen readers. And we want our librarians to feel confident in their ability to support all of our students. Something needed to change.

Information Gathering

Though we suspected that the major issues for students with print disabilities were related to the interaction between screen readers and database interfaces, it was important to gain a broader understanding of these students' research experiences. We started by gathering information in two ways: consulting experts in our community and consulting the library literature to see what other librarians were saying.

Consulting experts in our community was a good way to learn about the training and technologies our students encounter on their way to us. In particular, we wanted to understand what types of adaptive technologies are typically used and what types of training students receive. We began by talking with our campus Access Center to learn about the technology and services available to students on campus. Next, we visited the School for the Blind where we learned that the focus is on teaching students to live independently. Training related to

screen readers was fairly limited and not specific to information seeking skills. Then, we spoke with staff at the Disability Center at Clark College, our local community college, where we learned that Clark students were also struggling to use screen readers to search databases, and, though services were available to help, more accessible interfaces would make things easier. Finally, we also consulted the Department of Services for the Blind in Seattle, Washington, to get a tour of the many adaptive technologies they provide training on, and we consulted Dr. Richard Ladner at the University of Washington who has done extensive research with students who have print disabilities. All of this gave us a better idea of the types of technology, training, and services our students typically experience. It also reinforced for us that the types of issues we observed as our students struggled were not unique to our library.

Consulting the library and information science literature helped in understanding what librarians had already learned related to accessibility. Numerous articles offered suggestions for supporting students who use adaptive technologies. Because of our interest in databases, though, we looked closely at research related to database usability and accessibility. Heather Hill, whose content analysis of library and information science literature from 2000–2010 provides a good synopsis of the literature, found that most articles focus on technology.[1] Many authors look at accessibility by using a variety of methodologies to study compliance with web standards, such as Byerley and Chambers; Tatomir and Durrance; Stewart, et al.; and DeLancey.[2] Several conducted task-based usability evaluations; Stewart used six sighted participants and Byerley used two legally blind participants.[3] Dermondy and Majekodunmi evaluated database usability specifically focused on "the research process of a small sample of ten Canadian university students with print disabilities who use screen readers to access information online."[4] They used a task-based usability process with 10 participants with print disabilities and were looking specifically at the research process and experience of students who use screen readers.

Usability Testing

Usability focuses on the interaction between someone and an interface, looking specifically at how easy it is for someone to accomplish the tasks that interface was designed for. There are many attributes that contribute to usability (including efficiency and errors[5]) and numerous ways to assess usability (including first-click testing, eye tracking and task-based usability).[6] With the task-based methodology, participants work through a series of tasks with an interface while researchers observe. Oftentimes, participants are also asked to think aloud as they work so that researchers can gain more insight into their experience.

Based on everything we learned during our information gathering process and knowing that we needed to understand more about what our students were experiencing, we decided to conduct our own usability study modeled on the study by Dermondy and Majekodunmi. The task-based usability methodology was appealing because it provided an opportunity to observe participants as they interacted with scholarly databases. Additionally, we had conducted numerous usability studies in our library over the years so we were already familiar with various ways to evaluate the usability of websites and catalogs.

Our Project

Our usability study used a task-based process. We recruited 20 participants. Ten of these were students with print disabilities who use screen readers to access information. The 10 remaining participants were students who do not have print disabilities and do not use screen readers. We hoped that having two groups of participants would help us identify if problems were specific to screen readers or were broader in scope. Additionally, having two groups would help with understanding differences in information seeking strategies for those using screen readers as compared to those who do not.

Three different database interfaces were selected for the study. We chose to include different interfaces so that we could try to determine if issues were unique to a specific interface or if they were larger problems. In each database, participants were asked to complete one task: search for, and access, one full text journal article on a given topic. Finding journal articles is a common task for most students and is the reason libraries provide access to so many databases. So, it seemed an obvious task for our study.

The testing was done on laptops we provided; one was a Windows laptop and the other a Macintosh. Three different screen readers were available for participants to choose from: JAWS, NVDA, and

Voice Over. Participants had their choice of laptop, screen reader, and browser and could customize the software to their liking. Additionally, Camtasia was used to record the laptop screen and participant voices. Observers kept notes and prompted the participants to think aloud.

Some Observations

There is a lot of data to work through as we consider different database interfaces as well as comparisons between the two groups of participants. However, when considering the research experience of students with print disabilities who use screen readers, three observations stand out.

First, there were many problems related to PDF documents. Seven of the ten participants who use screen readers encountered problems with a PDF. Some of the PDFs were simply inaccessible and screen readers could not read them at all; some could be read one word at a time. Sometimes switching browsers helped; sometimes downloading and using alternate software to open the PDF worked. Overall, accessing PDFs was inconsistent and problematic. This is especially troublesome because PDFs are a common format within databases for providing full text content.

Second, participants using screen readers encountered far more usability issues than those not using screen readers. The screen reader group faced about thirteen unique usability issues, many of which were seen repeatedly. These issues had moderate to significant impact on the participants' ability to complete tasks. The group not using screen readers encountered five unique issues, some of which were seen repeatedly. The issues for this group had minor impact on their ability to complete tasks. Overall this means that database usability is substantially impacted for those who use screen readers.

Third, the amount of time to complete tasks was much longer for participants using screen readers. This group averaged about nine minutes to complete each task as compared to an average of four minutes for the group not using screen readers, a significant difference in efficiency. This was directly connected to the issues with PDFs and higher number of usability issues. Figuring out how to open PDFs, working through different usability issues, and simply having to listen to large chunks of content on each page all lengthened the amount of time it took for the screen reader group to complete tasks.

This group exhibited a great deal of patience and perseverance as they worked through each task.

Overall, students with print disabilities who use screen readers encountered more usability issues, were unable (or struggled) to open PDFs, and took longer to complete tasks. These issues directly impacted the usability of the database interfaces we evaluated and in particular influenced the usability attributes related to efficiency and errors. More significantly, these three observations highlight significant issues these students face with their research process, adding layers of frustration and complexity to information seeking activities.

Accessible Assessment

Because this study included participants with print disabilities, it was important to make sure the research process itself was accessible. Several things needed to be considered.

Recruitment materials needed to be in accessible formats. In the past, much of our advertising was in print format: flyers and posters placed around campus and advertisements in the student newspaper. However, this does not work for participants with print disabilities. Expanding our recruitment strategies to social media and connecting with community and student groups helped with recruitment efforts.

Every online and physical space that participants encounter during the study needed to be accessible. In our study, we initially used an online survey tool to collect demographic data but quickly learned that this tool was difficult to use with a screen reader and added more complexity to the study than we wanted. In this case, we eliminated the online survey tool so that participants only encountered the interfaces we were studying.

Libraries, including ours, are always embarking on assessment projects of various types. It is important to consider accessibility when designing, recruiting, and implementing assessment projects so that we are learning from all library patrons.

Going Forward

As a way to make things better, we are starting by sharing our observations with our own librarians and with the wider library profession. Understanding the bigger issues faced by those who use screen readers to access information can help us all develop better

services to support these students. Developing ways to make PDFs accessible, scheduling longer times for reference consultations, and expanding our knowledge of adaptive technologies will all help in supporting these students. However, more can be done.

More research should be done to build on what we already know. As more and more library resources go digital, research into how different users interact with these resources is essential. Also, we need to add accessibility into our purchasing decisions, if it is not already a consideration. Libraries spend a lot of money on these various online interfaces; we should insist that these are accessible for all our patrons.

Finally, it is important to share with the library community what we are learning and doing. We should talk about what our patrons are experiencing and how we are supporting them. Keeping accessibility and usability as part of our on-going conversations will keep us all moving forward.

Final Thoughts

This research project was born out of a desire to better serve all of our students, especially after seeing the frustration students with print disabilities had while conducting research and the frustration reference librarians had in not being able to better support these students. Through this project, we better understand the research experience of these students and that understanding helps us build better services to support them. We hope sharing this information will help others.

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Notes

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