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Usability, Library Research Guides, and the Engineering Student

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Abstract

Engineering students must be able to locate relevant, credible, and high-quality information. However, many students motivated by familiarity, simplicity, and speed typically turn to Google for their research needs, leaving their library's webpages underused. Library-created resources offer a plethora of credible, current information but can be overwhelming, confusing, and difficult for students to navigate. To address this issue, librarians have turned to usability testing of research guides to make them more intuitive and usable. Usability testing involves gathering direct feedback from users as they complete tasks. Such audience feedback enables librarians to make cleaner, more user friendly library research guides.

The authors of this paper observed aerospace engineering students at California State Polytechnic University at San Luis Obsipo (Cal Poly) interacting with an online subject research guide as they performed research tasks during two rounds of usability testing. In the first round of tests, participants were encouraged to think aloud and share their experiences with the facilitator. Students unanimously found the navigation somewhat muddled. The authors surmised that the visual clutter on the guide contributed to an unsatisfying user experience. Although the guides were difficult to use, students persisted. Students were willing to make numerous clicks in an effort to discover library resources to complete the usability test. In spite of the guide's design issues, the results indicated that participants found value as they explored the research guide. The authors then modified certain elements of the research guide based on the test results and participants completed a second round of usability testing.

The authors recommend ongoing testing to improve the information architecture (i.e., labeling and organization of content) of research guides. In this article, they explore how to apply their usability findings to other research guides and library resources. Their insights into students' information-seeking behaviors and mental models may benefit other online and engineering educators.

Introduction

Google looms large in universities, high schools, middle schools, and libraries, [1, 2] and its search function ranks webpages and scholarly articles to present the most popular and relevant information. It continuously updates its search algorithm based on data, experiments, and reviewers[3] to deliver answers quickly. Cal Poly students especially appreciate its focus and intuitiveness. In fact, studies have shown the majority of college students start their research with Google[4].

Libraries offer similar information to what a Google search yields; however, library search tools sometimes lack Google's ability to organize information in a way that appeals to students. Many libraries attempt to convey to patrons the breadth of their available resources and services[5] in densely packed websites. These websites, while rich with information, may overwhelm users. Librarians, then, may turn to usability testing to design intuitive and usable research guides, a small subset of library website. Librarians and library staff create research guides that help users find information, locate databases and other information sources, and provide research assistance. This study focuses on student use of the Cal Poly library's aerospace engineering research guide.

Gathering data, feedback, and opinions from usability testing sheds light on how students seek and conceptualize information. Participant input often reveals design problems. Addressing any participant misconceptions and library missteps through incremental improvements is a best practice in maintaining online content and teaching information literacy. In essence, insight into students' mental models via usability testing of research guides benefits engineering educators in their own presentation of information, concepts, and knowledge.

The library aerospace engineering research guide is an extensive, resource-rich guide focused on connecting students to research information. The guide follows a common two-column layout (Figure 1).

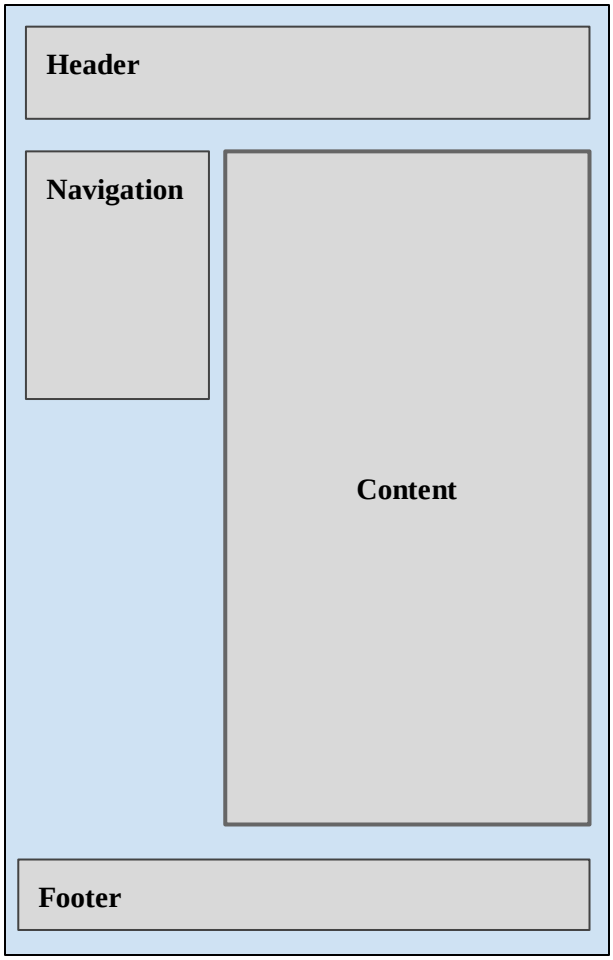


Figure 1: Research guide layout

The page begins with four sections featuring sixteen popular and scholarly databases in four different content boxes. The three-step "Find Books" tutorial includes a static overview image, and a related list of hyperlinks follows. The next section on company research points to industry profiles, market research reports, and company information. Cal Poly senior project information can be found at the bottom of the page. The navigation includes links to other sections anchored on the page and to the following pages: Standards and Patents, Writing AIAA / Citation Help, and Get Help from a Librarian.

Methods

Two researchers recruited six undergraduate aerospace students to participate in Krug's model of do-it-yourself usability tests, simple testing with minimal time, energy, and resources[6,7]. Because Krug's testing methods do not attempt to scientifically prove a generalizable hypothesis or create a comprehensive list of website usability problems, only three participants per round

are needed. For the first round of testing, one undergraduate humanities major who works in the library assisted with pre-testing the test.

One of the researchers also presented the study to two aerospace engineering classes and interested participants completed an availability questionnaire. The researcher scheduled all students who completed the form, but only three of five students performed the tests due to last-minute conflicts. The first-round participants consisted of one first-year, one sophomore, and one junior. The gender makeup consisted of one female and two male students.

Based on feedback during the first round of testing, the researchers made improvements and held a second round of testing. A few months later for round two, the authors recruited a convenience sample. The three participants were all aerospace engineering seniors: one female, and two male students.

Each round of usability testing ran between 36 and 45 minutes in length and was held in a library meeting room. The set-up included a Windows laptop, mouse, voice recorder, and Camtasia software from TechSmith to capture the audio and video for viewing later. One of the two researchers conducted the tests.

In the first round, the researcher began by reading a scripted explanation of tasks. Participants were invited to think aloud as they completed research tasks. According to Krug, "the combination of watching what the participants do and hearing what they're thinking while they do it is what enables observers to see the site through someone else's eyes and understand why some things that are obvious to them are confusing or frustrating to others."[7]

At the outset of the test, the participants listed three areas of interest in aerospace. They were given a few minutes to look around the webpage and share initial impressions. After familiarizing themselves with the site, they were presented with three compulsory tasks related to their area(s)[8] of interest:

- Find a research database
- Find an article
- Find a book

After the three above tasks were completed, optional tasks followed:

- Find information about senior projects guidelines
- Find industry-based standards that might be of use for a project or paper
- Find formatting guidelines for an American Institute of Aeronautics and Astronautics (AIAA) report

- Find where to get help if struggling to find information
- Make an appointment with the engineering librarian

The researcher asked participants to complete one or more of the optional tasks based on time constraints and student interests. During the conclusion of the session, the facilitator and the student engaged in a brief discussion and the student was invited to offer general feedback.

The researchers then evaluated the feedback and test results, exploring where the guide could be streamlined. The most serious problems were identified and small changes were made to address them. The second round of tests included the same three required tasks, but the main objective was to evaluate the effectiveness of the changes. During the second round, the researchers paid particular attention to participants' thinking aloud as they navigated the site and searched for a book.

First Round Results and Discussion

All three students found the information with little to no assistance for each required task. In other words, the guide was usable. The students navigated the guide tenuously yet persistently as they successfully completed each core task. All the students commented negatively on the navigation or the need for extensive scrolling down the long webpage. One student remarked on the time needed to scroll through the entire page. The two of the three students used the left sidebar navigation (Figure 2) to successfully complete their tasks. The third student did not see the left navigation initially. When the facilitator asked about it, the participant described it as "another thing thrown in." Based on observations, the left navigation bar seemed to be invisible or too similar to the other content boxes on the page.

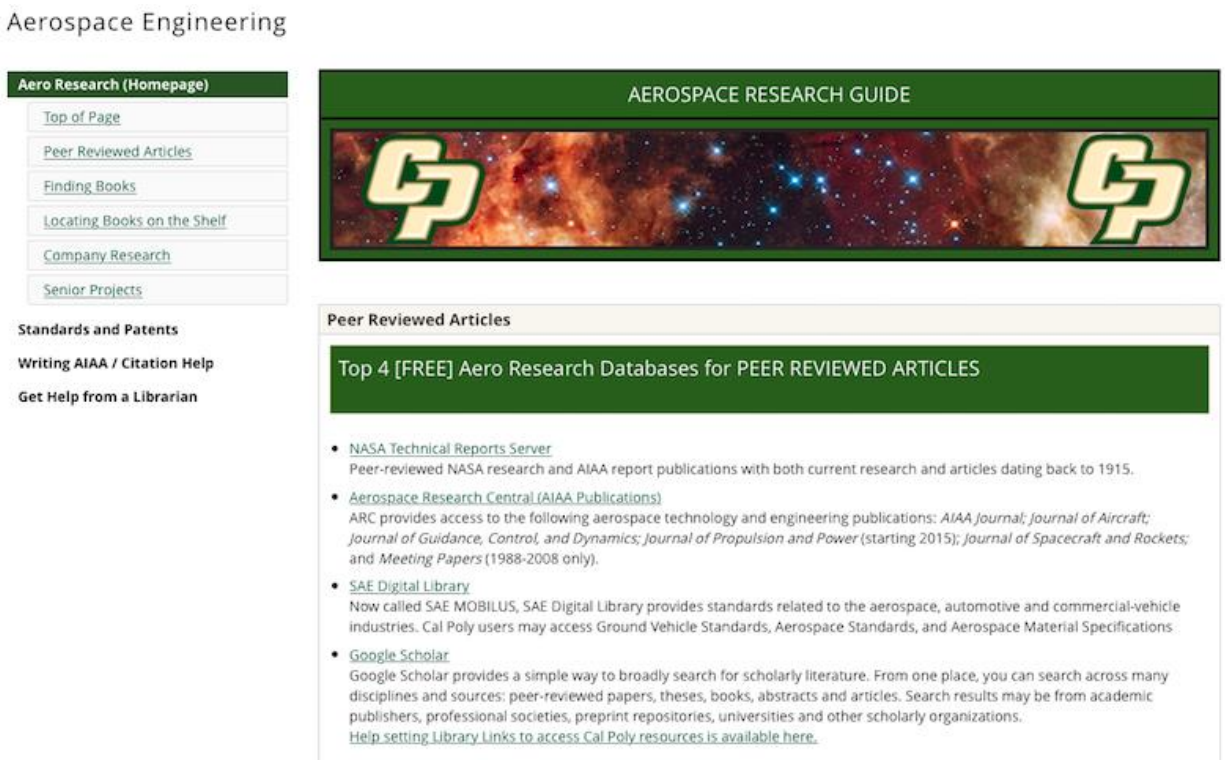


Figure 2: Round 1 Left navigation to assist with scrolling

In addition to navigation issues, each first-round student struggled with using the guide to locate a book. For example, one student completed the book task using links found in the header or top of the page menus without using the page or the left-side navigation. This student left the research guide. The remaining two students searched within the guide. They first clicked on a static image of a search bar (Figure 3) incorporated into the page to depict the most common book loan options. The two participants then recovered and located a book by clicking on active links. They found the book's call number on another library webpage and were directed back to the research guide for the final steps.

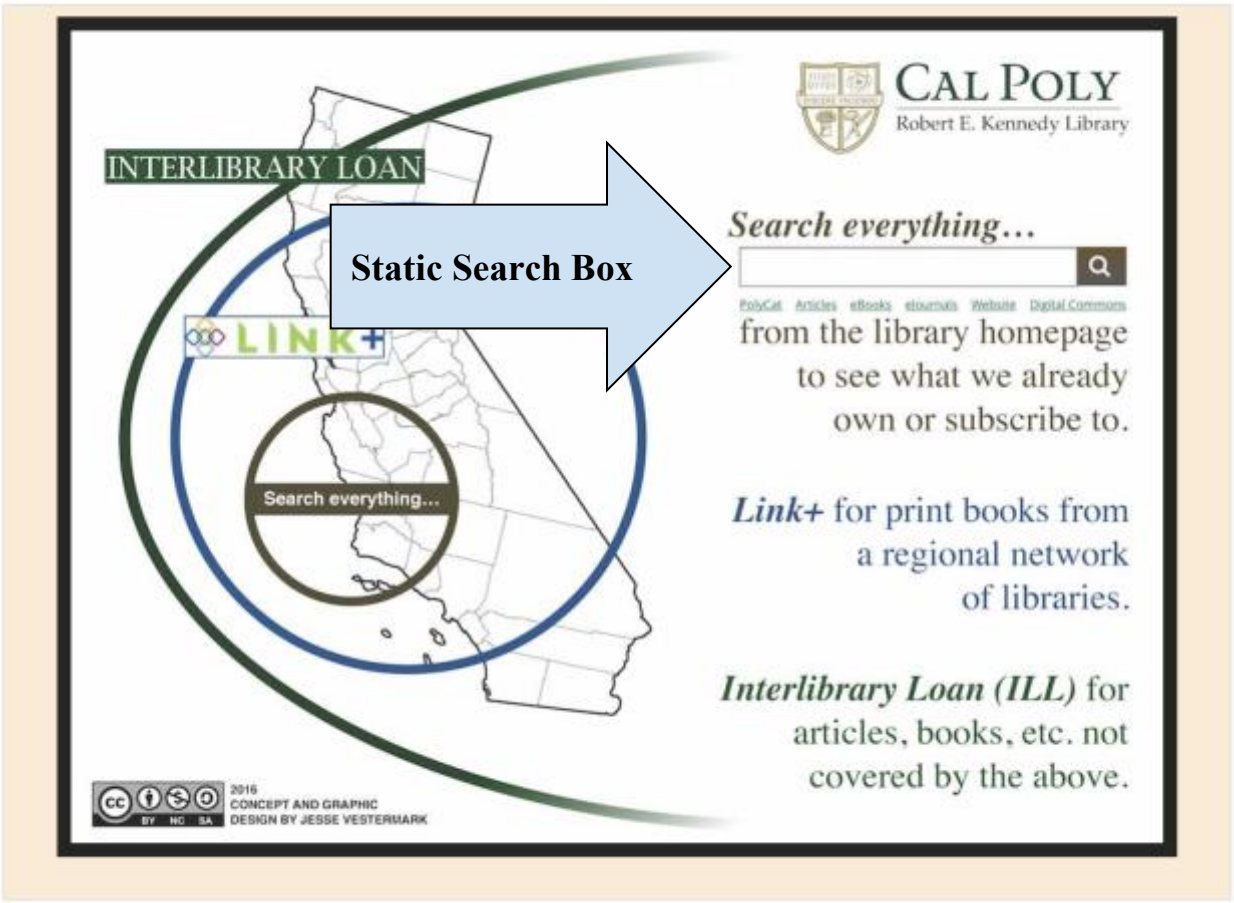


Figure 3: Round 1 Nonfunctional search box image

Then they reviewed the book location section of the guide where they quickly discovered the bolded and highlighted text indicating the floor and call number where most aerospace books are located (Figure 4).

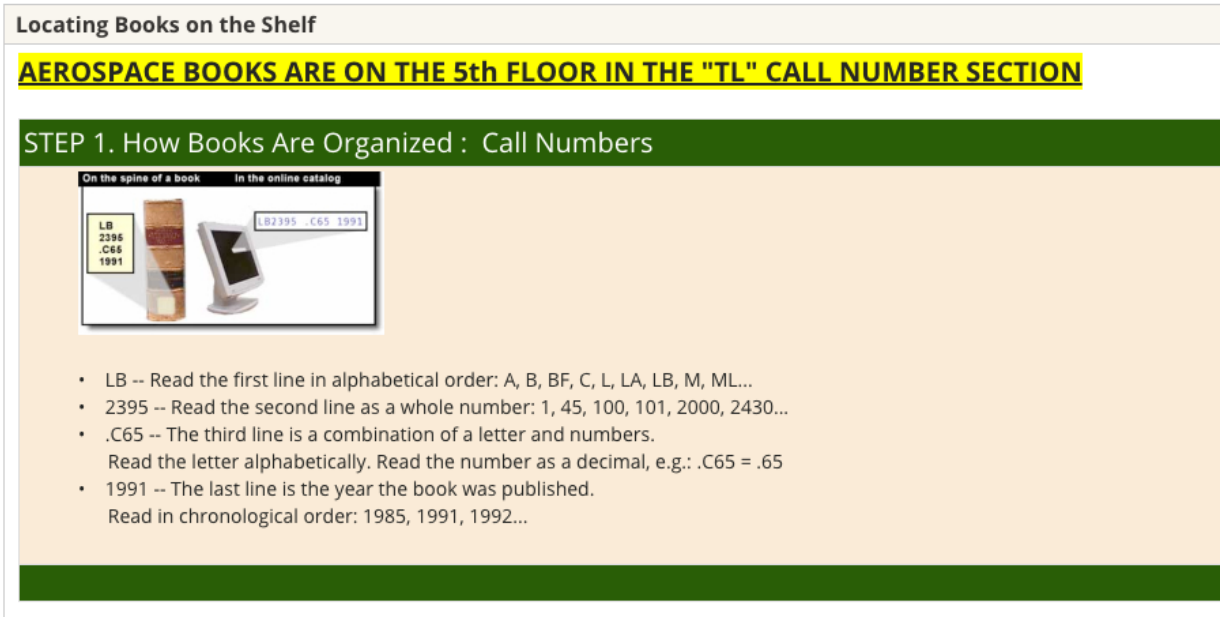


Figure 4: Round 1 Location of aerospace books

One of the two students who actively search the guide was by distracted a hyperlink "Engineering Call Numbers," which is actually a PDF that includes additional subclasses or specific call numbers for engineering resources. The student clicked on it and was led astray from finding the book (Figure 5).

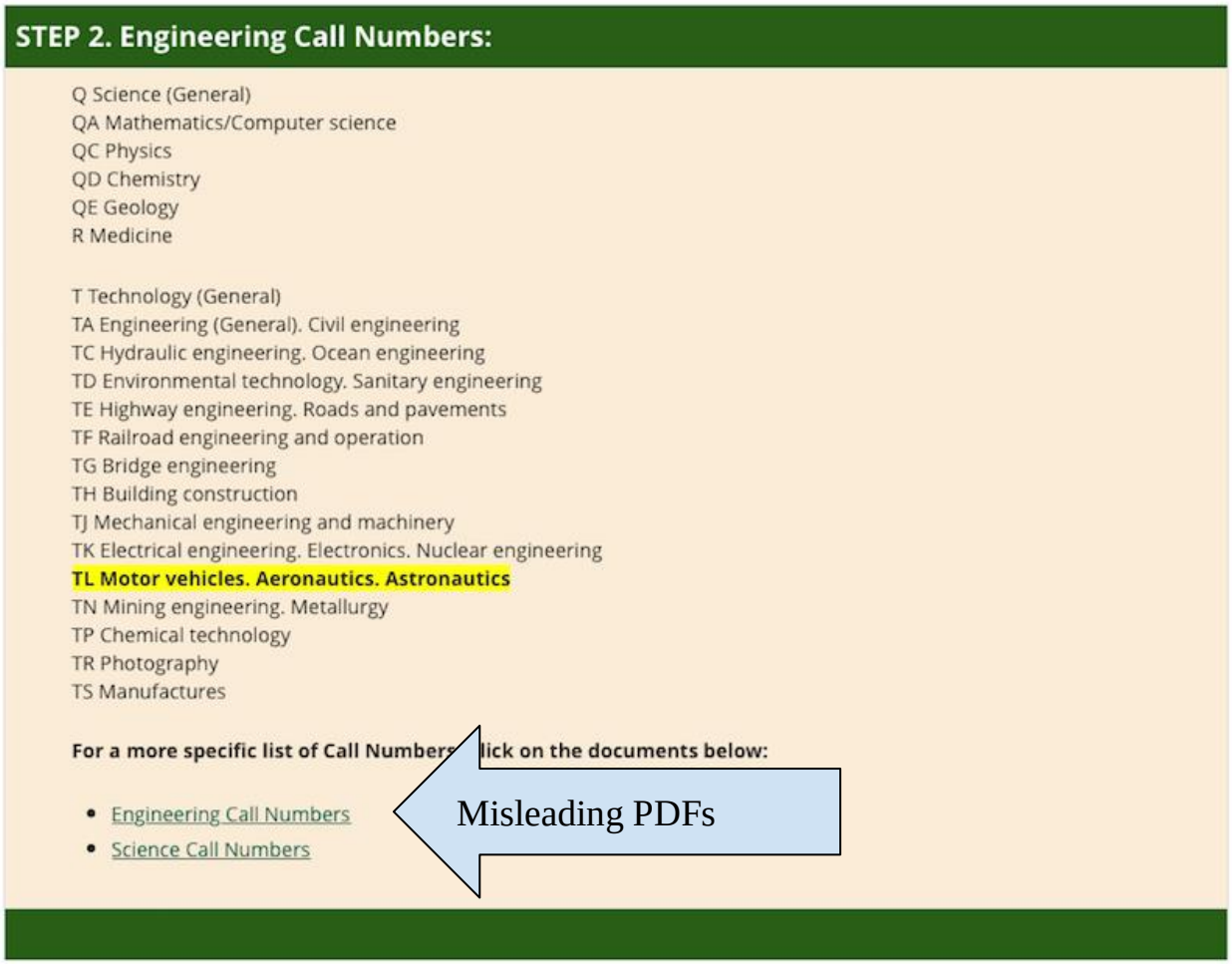


Figure 5: Round 1 Call number PDF

Those same two students found the book directory (Figure 6). They seemed nonplussed by their need for numerous clicks as they searched for their books. The participants persisted and found their books, but it became clear that sections of the guide could be eliminated.

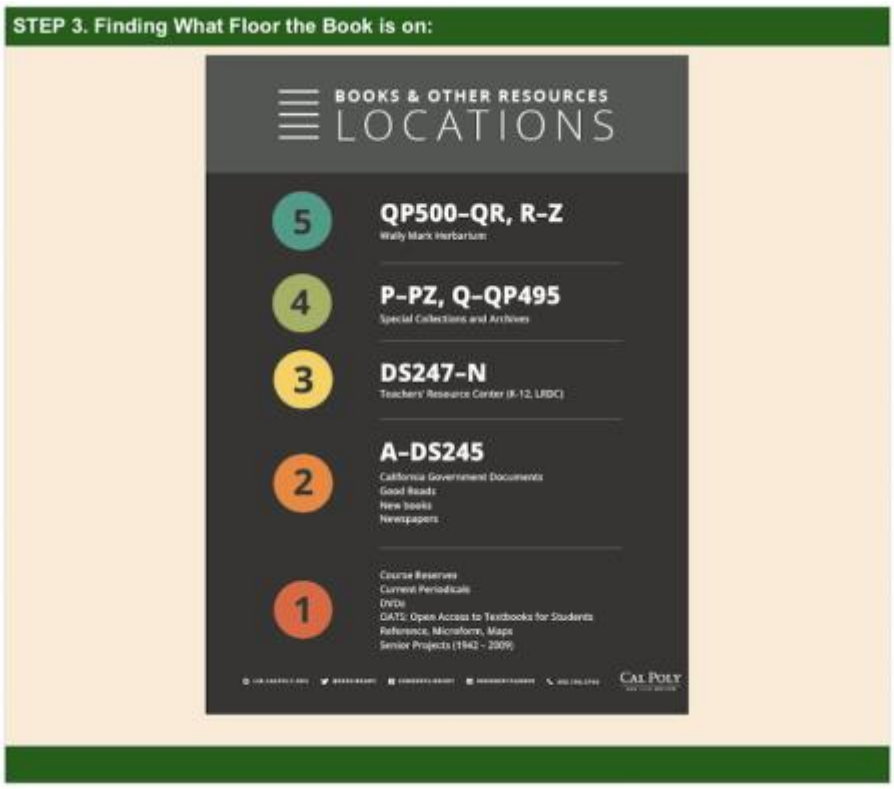


Figure 6: Round 1 Book directory

One of the optional tasks that all three students completed focused on senior projects. The students were given the task to investigate senior projects using the library's research guide. They were asked to find more information about how to get started on senior projects. Despite their lack of knowledge about senior projects, some participants clicked on the "Electronic Senior Project Information Packet" PDF, honing in on "Information Packet," expecting information on how to get started. They found submission guidelines instead. Others responded to the visual hierarchy by clicking on the most prominent link. The thinking aloud and discussions revealed that the students have limited knowledge of senior projects in large part because few students complete senior projects in aerospace.

In response to students' struggles, the following changes were made after the first round of testing:

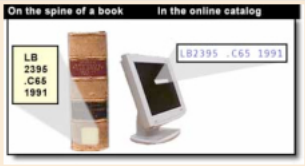
- Removing an optional section on business periodicals to shorten the page and reduce scrolling and visual distractions
- Removing the misleading nonfunctioning search bar image
- Removing superfluous instructions on how to read call numbers (Figure 7)
- Adding a library floor map of call numbers (Figure 8)
- Creating a brief introduction to senior projects
- Revising subheadings and file names to accurately describe content.

In particular, to address the students' comments about scrolling through excess information, the researchers combined Steps 1 and 2 on the finding books section. Notice the difference in Figure 7.

Locating Books on the Shelf

AEROSPACE BOOKS ARE ON THE 5th FLOOR IN THE "TL" CALL NUMBER SECTION

STEP 1. How Books Are Organized : Call Numbers



- LB -- Read the first line in alphabetical order: A, B, BF, C, L, LA, LB, M, ML...
- 2395 -- Read the second line as a whole number: 1, 45, 100, 101, 2000, 2430...
- .C65 -- The third line is a combination of a letter and numbers.
  Read the letter alphabetically. Read the number as a decimal, e.g.: .C65 = .65
- 1991 -- The last line is the year the book was published.
  Read in chronological order: 1985, 1991, 1992...

STEP 2. Engineering Call Numbers:

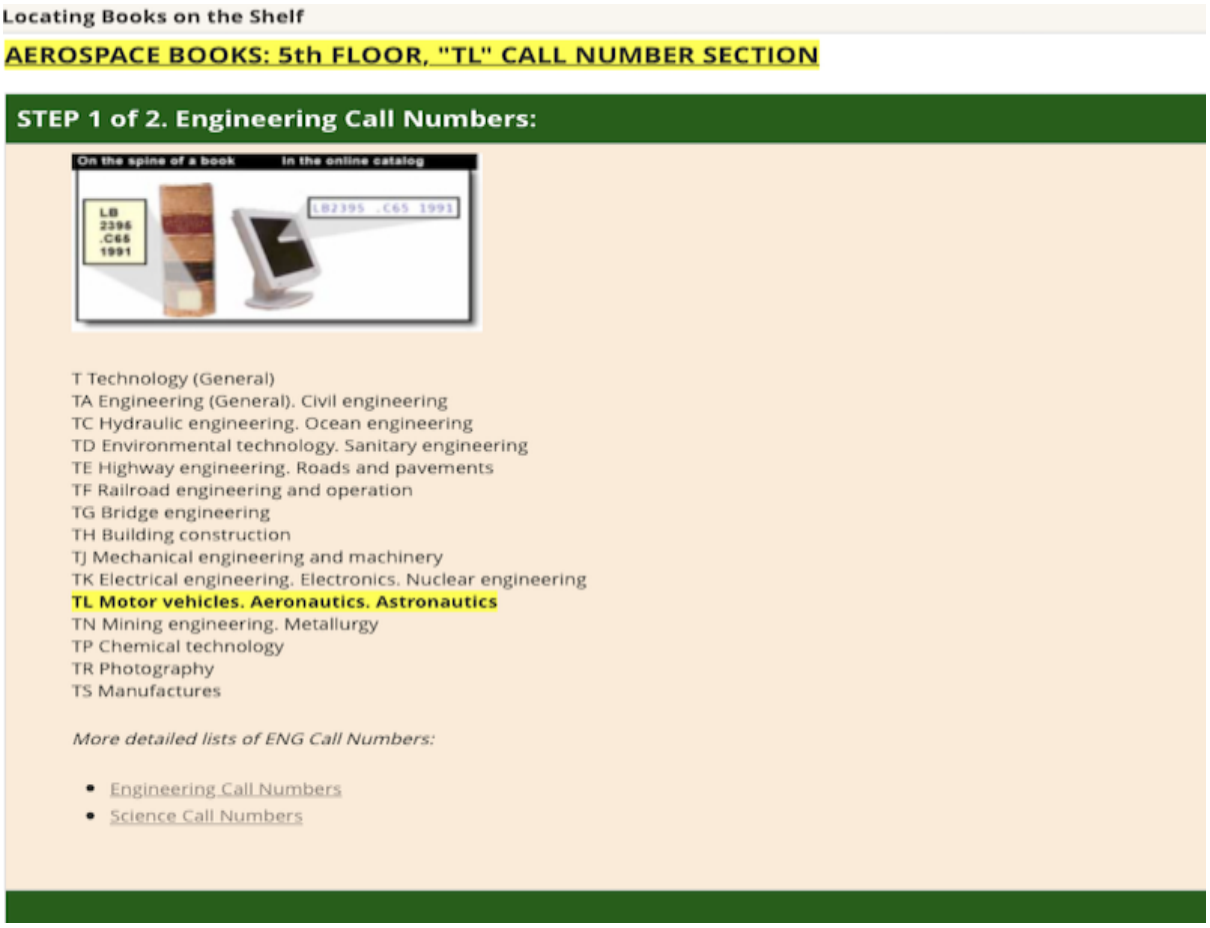
Q Science (General)
QA Mathematics/Computer science
QC Physics
QD Chemistry
QE Geology
R Medicine

T Technology (General)
TA Engineering (General). Civil engineering
TC Hydraulic engineering. Ocean engineering
TD Environmental technology. Sanitary engineering
TE Highway engineering. Roads and pavements
TF Railroad engineering and operation
TG Bridge engineering
TH Building construction
TJ Mechanical engineering and machinery
TK Electrical engineering. Electronics. Nuclear engineering
TL Motor vehicles. Aeronautics. Astronautics
TN Mining engineering. Metallurgy
TP Chemical technology
TR Photography
TS Manufactures

For a more specific list of Call Numbers, Click on the documents below:

- Engineering Call Numbers
- Science Call Numbers

Round 1 Steps 1 and 2 Locating books



Round 2 Step 1

Figure 7: Round 1 and 2 Beginning steps on how to read call numbers condensed

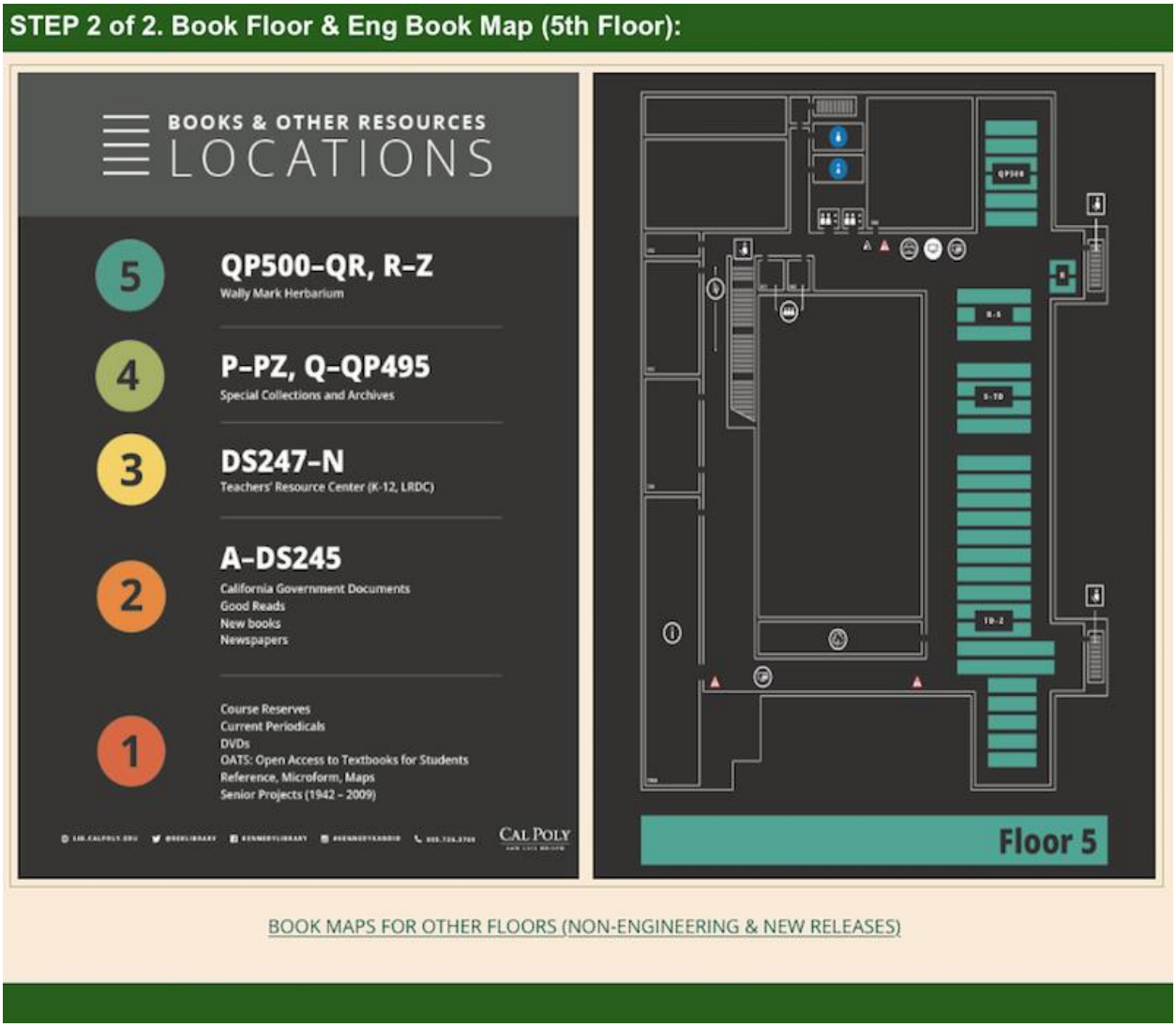


Figure 8: Round 2 Book map and floor directory improvement

Second Round Results and Discussion

Overall, the second-round participants were more aware of information resources at the outset. For example, participants mentioned using keywords and scholarly databases such as American Society for Testing and Materials (ASTM) and arXiv, an open access science repository, in their work and school environments. Though all three participants were seniors and seemed to be more seasoned researchers, their search process and commentary during in the navigation and senior project tasks resembled those of the first round students who varied in class level. The overall similarities in behavior support Krug's belief that any general tester, regardless of experience and not necessarily a representative participant, will improve a webpage by identifying its most serious problems. The tests focus on the guide usability and thought process, not research skills.

All second round students noticed the left sidebar navigation without any prompts from the facilitator. One participant was able to navigate the page and complete the required tasks without using the sidebar. Another student also used the main library page navigation to find books similar one student from the first round. Unlike the first round, only one participant mentioned a dislike of the scrolling or navigation.

The second group of students performed better overall on the book tasks. No one clicked on the extraneous PDFs. Instead, the first link they tried led them to an actual catalog of books and library materials. The participants moved quickly to find books. All participants noticed the highlighted information about books, which some participants overlooked in the first round. All second round students, undistracted by hyperlinks to PDFs or a static search bar image, completed the book search without hesitation or mistakes.

Despite creating a brief introduction to senior projects and revising subheadings and file names to accurately describe links, some confusion about the senior project remained. The introductory text was more scannable, yet students seemed to ignore it as they searched for how to get started on a senior project. Further, one second-round student honed in on the visual hierarchy of large font, repeating the behavior of first round students.

Conclusions: Lessons Learned

The researchers conducted the usability tests to gather feedback on ways to improve the library's research guides. The testing and conversations with participants confirmed that small changes in information architecture can improve the overall usability of a guide. In the first round, the webpage met the students' realistic expectations of library webpages, and they accepted the imperfect navigation of a library webpage. After the first round tests, editing and removing unneeded and deceptive content reduced scrolling and visual clutter. The revisions improved the navigation as second-round students completed the tasks with fewer prompts from the researcher. The side navigation was a standard, non-customizable template so the researchers simplified and shortened the guide to improve navigation. As a result, the second-round participants navigated the guide and found what they needed to complete the required tasks independently. The participants' think alouds articulated their mental models of information literacy and website usability. Practically, their expectations of functional and relevant images and scannable text influenced the research guide information architecture.

The struggles with the senior project guideline were twofold. Students needed basic background information on senior project guidelines presented in an appealing and intuitive manner. The researchers recommend ongoing testing to improve findability and to address additional concerns. The tests also revealed that there is more to be done if we are to provide access to

unfamiliar items such as senior projects. Educators have to provide engaging introductions, definitions, and context to encourage students to follow their scanning with learning and interacting with new content. The tests revealed that students would benefit more from knowing the range of information resources available to them as students and later as professionals. Although students will certainly continue to use Google and Google Scholar as methods that have worked in the past, will today's students seek out other trusted sites to recommend additional sources in the future if Google results are no longer valuable? How do students learn about a new topic? These questions will drive future research and the development of research guides. It is a delicate balance trying to discern how much or how little information student need; thus, ongoing usability testing is recommended for continued improvements.

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8. Depending on the participant's areas of interest, the researcher selected one or more interests that would lend itself to successful search results.