Visualizing Science Exhibit Usability Study
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In the fall of 2016, the J. Murrey Atkins Library’s Usability Lab conducted a usability study of the Visualizing Science: Microscopic Images from UNC Charlotte webpage. “The J. Murrey Atkins Library's exhibit and competition, Visualizing Science: Microscopic Images from UNC Charlotte, highlighted the important role of the University of North Carolina at Charlotte in scientific advancement. The physical exhibit was converted to an online exhibit and formatted for screen readers, which may be used by the visually impaired.” The study recruited participants that use assistive technologies to test the efficiency, effectiveness, ease to learn, engagement, and error tolerance of the digital exhibit. The Usability Coordinator collaborated with the Office of Disability Services and the library’s Science Librarian and Software Developer to complete the study.

Tasks-based usability analysis was the methodology used in this study. This methodology is a reliable way of gauging usability at any stage of development. The two participants completed the tasks with little difficulty. This is particularly noteworthy considering that neither of the participants had any exposure to the webpage prior to testing. This report contains a list of recommendations to address these issues.

Data was collected via task-based testing. The objectives of the usability study are as follows:

- Identify the effectiveness of the exhibit, is it useful to users and help them achieve their goals accurately.
- Identify the efficiency of the exhibit, can users complete a task quickly and accurately.
- Identify how engaging the exhibit is to users using assistive technologies, is it pleasant and satisfying to use.
- Identify how error tolerant the exhibit is, does it prevent errors, or help a user recover from errors that occur.
- Identify the ease to learning of the exhibit, does it support the ease of completing a task through initial orientation and continued learning.

Study Design

The tasks-based analysis helps researchers uncover usability issues as users interact with an interface via predefined tasks. Participants in this study attempted six predefined tasks on the Visualizing Science: Microscopic Images from UNC Charlotte webpage (Shown Below). In addition, the participants’ completed a pretest survey (Shown Below) and a posttest survey (Shown Below). The pretest survey captured demographic information, including year in school, major/field of study, frequency of catalog use, and an explanation of use. The posttest survey captured participants’ thoughts about the exhibit. The Usability Coordinator collaborated library’s Science Librarian and Software Developer to develop a set of functions to be tested. After the set of functions were
determined, the Usability Coordinator developed the six tasks and subtasks. The Director of Disability Services before finalization evaluated the task list, pretest survey, and posttest survey.

**Pretest questions**

1. What year are you in school?
   a. Freshmen
   b. Sophomore
   c. Junior
   d. Senior
   e. Graduate Student

2. What is your field of study?

3. How often do you use the library’s services (physical/digital)?
   a. Never
   b. A few times a semester (2 or more)
   c. A few times a month (2 or more)
   d. A few times a week (2 or more)
   e. Daily

4. What do you use the current library for (physical/digital)?

5. Have you had any issues with library services? If so, what have they included?

6. What assistive software do you use?

7. What browser do you utilize?

**Tasks**

1. Navigation to Atkins’ Visualizing Science Exhibit, [https://library.uncc.edu/VisualizingScience/](https://library.uncc.edu/VisualizingScience/)

2. When was the exhibit displayed on the first floor of the Atkins Library?

3. Who submitted the “Electron Paths” image?

4. Access alt text description for the “A little forest?” image.

5. Can you locate the third image in the exhibit?
   a. If yes, what is its title?

6. Locate the “Awareness” image.
   a. What type of microscope was used?
   b. What magnification was used to capture the image?

**Posttest questions**

1. Which feature do you find the most useful? Why?

2. Are there any features that are difficult to navigate or find?

3. Are there any features missing from the website?

Participants’ performances as they attempt to complete the tasks expose usability issues and inform recommendations. During the test session, participants were encouraged to articulate their thoughts and actions aloud as they worked through the tasks. The think aloud protocol allows researchers to understand the context for user actions and decisions while completing a specific task, thus making it easier for the researchers to determine the underlying causes of usability issues.
The test sessions were conducted on a Dell desktop computer in the library’s assistive technology room. The sessions were recorded with a Canon Vixia HF M52 Camcorder. The camcorder recorded the desktop screen and the audio of the test session.

The test sessions involved the test facilitator and the participant. The Usability Coordinator acted as the facilitator. The facilitator greeted participants upon arrival, guided participants through the informed consent, presented the participants with the tasks, answered participants’ questions, and prompted the participants for responses. In addition, the Usability Coordinator took notes during the sessions and analyzed the data produced.

**Recruitment**

Student participants were recruited through an email blast sent by the Director of Disability Services (*Shown Below*). The email included the purpose of the testing, the testing timeframe, the participation incentives, and contact information. The email blast was sent to 17 potential participants that are registered with the Office of Disability Services. Two participants took part in the study. The two participants read and signed an informed consent form to participate in the test session. The consent form is approved by the university’s Institutional Review Board. Participants were incentivized with a $5 Target gift card for his/her participation. Participants received the incentive regardless of whether they completed the test session.

**Recruitment Email**

Subject: Atkins Library Usability Study Seeking Volunteers!

Hello --

Atkins Library plans to conduct a website usability study and wants to include individuals who use assistive technology. The Usability Coordinator, Rachel Winterling, has contacted Disability Services for help in recruiting student volunteers. Participation is completely voluntary, and Disability Services has not shared your names or emails with the Library Staff. If you are interested, you should contact the Usability Coordinator directly. Details about the usability study and the contact information for the Usability Coordinator are below --

Thank you for taking the time to consider participating in this important study on usability!

Sincerely,
Gena Smith

Begin Text for Usability Study:

J. Murrey Atkins Library is seeking volunteers that use assistive technology to participate in a website usability study. Volunteers will receive a $5 Target gift card for their participation. The session will take 15-30 minutes in the library. Participants can bring
their personal computer or use a library computer that includes JAWS, Read&Write Gold, and voiceover (MAC). If you would like to participate, contact Rachael Winterling at rwinterl@uncc.edu.

**Participant Demographics**
The participants consisted of two graduate students. None of the participants had prior knowledge of the digital exhibit before their participation in the study. One participant is pursuing a PhD in Urban Education and the other participant in pursuing a Masters in Linguistics. The pretest findings are listed below:

<table>
<thead>
<tr>
<th>Question</th>
<th>Participant 1</th>
<th>Participant 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>What year are you in school?</td>
<td>Graduate Student</td>
<td>Graduate Student</td>
</tr>
<tr>
<td>What is your field of Study?</td>
<td>MA in Linguistics</td>
<td>PhD in Urban Education</td>
</tr>
<tr>
<td>How often do you use the library’s services (physical/digital)?</td>
<td>A few times a week</td>
<td>A few times a week</td>
</tr>
</tbody>
</table>
| What do you use the current library for (physical/digital)? | • Website  
• Research (Articles)  
• Hang out between classes | • Research (EBSCO) |
| Have you had any issues with library services? If so, what have they included? | • Assistive technology room (101C) is uncomfortable due to hot temperature  
• Public Desktops automatically muted  
• Finding specific databases | • Research material formats are usually not readable instantly with assistive technology software |
| What assistive software do you use? | • JAWS | • Text-to-Speech  
• Dragon Natural Speaking |
| What browser do you utilize? | Internet Explorer | Internet Explorer |

**Recommendations**
The following recommendations were developed based on analysis of the qualitative data gathered from the two testing sessions. The study revealed several modifications that should be addressed to enhance the engagement, effectiveness, efficiency, error tolerance, and ease to learn of the exhibit. The participants consisted of two graduate students. Please note that neither of the participants had used the digital exhibit before the test session.
Content should be layman’s terms; uncommon abbreviations and equations should be spelled-out/explained.

Uncommon abbreviations and equations should be spelled out for all types of users to improve the readability, efficiency, ease to learn, and effectiveness of the digital exhibit. Specifically for visually impaired users, it is common for uncommon abbreviations or equations read incorrectly on different assistive technology software. For example, one display states, “SkMFT are found in a continuum as follows: type I → IIA → IIX → IIB, with type I being the smallest and lowest force producing fiber and type IIB being the largest and highest force producing fiber;” “SkMFT” in an earlier sentence is identified as skeletal muscle fiber but the parenthetical abbreviation is not placed directly by the spelled-out word. Screen readers do not read abbreviations properly to users, thus abbreviations should always be spelled-out or placed next to the spelled-out phrase. In addition, assistive technology software allows users to easily skip to sections within a webpage or display, thus a user with a visual impairment might miss the meaning of abbreviation and are unable to access the spelled-out abbreviation easily. In addition, equations or symbols do not read correctly through assistive technology software, meaning it can provide inaccurate information to a user; to improve the effectiveness of equations or symbols they should be explained in text.

Add jump-to navigation and organize the displays by program.

To increase the efficiency, effectiveness, and ease to learn of the digital exhibit, jump-to navigation should be included as well as organizing the displays by program/department. Currently, a user must scroll through the list of displays in the exhibit that are listed in alphabetical order; there is no form of navigation for any type of user to easily access a display’s information without scrolling. Adding a jump-to navigation to jump to the displays/departments displays were submitted from would allow users to navigate the exhibit easier than scrolling through each item. Currently, if a user knows the name of a display they can use the keyboard shortcut, “ctrl+f” or a heading search if using JAWS; most users will not know the name of a display, thus organizing them by department/program will increase the efficiency, effectiveness, and ease to learn. The department/programs represented are: Department of Mechanical Engineering, Engineering Science, Nanoscale Science Ph.D. Program, Department of Kinesiology, Department of Biological Sciences, Department of Physics and Optical Sciences, Department of Bioinformatics and Genomics, and the Department of Electrical and Computer Engineering.

Update introduction to reflect jump-to navigation and organization.

After the jump-to navigation and displays have been organized by program/department, the introduction should be added to the introduction to reflect the changes. Including this information in the introduction will increase the efficiency, effectiveness, and ease to learn of the exhibit.

Evaluate the images’ brief description.

Each image has a brief description that can be accessed by moving the cursor over the image. Currently the introduction states, “A brief description of each image appears when the cursor is moved over the image and is readable by a screen reader for the visually-
impaired.” The image description is also entered as alternative text for JAWS to read. In the test sessions, it was observed that other assistive technology software such as Dragon Natural Speaking does not read alternative text or pick up text accessed by cursor movement; most assistive technology software used the keyboard and not the mouse. Placing the image description below the display overview will ensure it will be seen by all users and read by the majority of assistive technology software, the image description should be a subheading to ensure readability. In addition, the brief description could be a collapsible section titled “click to read image description.” The introduction should be upgraded after the image description has been moved to reflect the changes.