

Designing for Varied Spatial Abilities: A Rensselaer Campus Map Redesign

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ABSTRACT

This paper will describe a design concept for a searchable campus map that allows users to get navigational information in various formats, in an attempt to accommodate differing spatial abilities. A prototype application was created and tested among three users representing the target audience. The application was found to be generally useful and usable, with minor modifications. Additional research is still required, however, to answer the larger questions of what is the best way to present map information for maximum ease of navigation.

INTRODUCTION

Most people are familiar with the old joke about men who refuse to ask for directions or consult a map when they are lost, often to the frustration of their female partner. A cursory glance at the available research suggests that there are noticeable gender differences in spatial awareness that effect how people use maps. Perhaps men don't ask for directions because their internal sense of direction normally gets the job done. In addition, psychologist Howard Gardner pioneered research that suggests that spatial awareness is just one of seven different types of intelligences. One may be stronger in one category than another; even brilliant in one or more categories, but still suffer from poor spatial ability.

This paper is not meant to be an academic discussion of spatial awareness. A true summary of the research on the subject goes well beyond the scope of this project. The important thing to remember is that there are clear differences in how people process spatial information.

A new Rensselaer Campus Map application was developed on the premise that merely providing a map was insufficient for people who have difficulties with spatial awareness. Such a person may still have trouble orienting them self in relationship to a map or figuring out how best to get from point A to point B. Currently, the campus map provided on the Rensselaer website is pretty, but not highly usable. Informal surveys showed that students found it difficult to locate specific buildings and services and were confused by its non North – South orientation.

Visitors to campus may find use of web-based maps such as Google to be limiting because the map only directs to the visitors entrance on 15th Street without giving any information on how to get to a specific location.

The new map interface was designed to address these issues as well as to make it easier for people that have poor spatial ability. This map provides users with the option to get customized directions from any place on or off campus to a specific location on campus. The directions can be text only, or go even one step further by adding photos that detail the path visually.

TARGET AUDIENCE

As with the general population, maps are most used by people who are new to an environment. Once a person has visited a place a few times, maps are rarely needed. This scenario is no different for the Rensselaer Map. The primary audience consists of students and faculty who are new to Rensselaer, mainly incoming freshmen. Characteristics of this group include intelligence, technical literacy, and motivation to learn about their new environment. The majority of people in this group will not need to know how to get to campus from offsite, but rather how to get around once they are there. This group is also composed primarily of young people to whom a mobile phone is a major source of communication and information.

The secondary audience for the Rensselaer Map is people who need to visit the campus. This could include parents, community members attending lectures or events, vendors and more. Because this second group is so broad, no characteristics can be derived and technical literacy not assumed. This group will most likely be arriving from off campus.

DESIGN PROTOTYPE

A prototype application was coded in XHTML and CSS, and making use of some light Javascript and PHP.

In its finished form, this application would be database driven (recommend using PHP and MySQL). In addition, the application would need to

contain complex algorithms that would determine the shortest path between two points on the fly, create custom maps to depict this information visually, and create the text directions required. In addition, the entire campus would need to be split into a complex grid, with photos taken from all points on the grid.

Because of this, the prototype is setup to walk the user through only one possible scenario. Because of the application's complexity, it is important to have the design tested in its conceptual form and have all details worked out before any programming starts.

USER STUDY GOALS

This study was qualitative in nature. Users were asked to interact with the map application as much as possible given the constraints of the current prototype, and provide feedback to the evaluator via open ended questions.

STUDY PARTICIPANTS

Three users were recruited to reflect potential users from the primary audience; students who are unfamiliar with the Rensselaer campus. Study participants consisted of two females, age 19 and 21, and one male age 22. All three are college students, pursuing degrees in psychology, pre-med, and pharmacology. All users are computer literate, have used web-based map programs, and own and use a mobile phone for both voice and text messaging.

LOGISTICS

Because the prototype is web-based, only a laptop with internet connection was needed to complete the study. Users were asked to complete a brief demographic questionnaire, and then had the purpose of the study explained as well as the think out loud protocol.

STUDY TASKS

Participants were given the following task scenarios:

Imagine that you have decided to transfer to Rensselaer to complete your degree. You decide to explore the interactive map available on the school's website to get familiar with the campus. Without clicking on anything, tell me what you think each of the menu options or buttons will do.

Now, imagine that it is your first day at Rensselaer and you must attend an orientation in Sage Laboratory. Use this interactive map to find out where it is located on the campus. Is this what you expected?

On the left-hand side, there are some options. What kind of map do you think will be printed when you choose Print Map? What do you think will happen when you choose Send to Mobile? Are both of these what you would want to happen?

Imagine that your printer is out of order, so you decide to send the information to your mobile phone. Please complete this task. Is this what you expected?

After your orientation in Sage, you need to meet with your advisor, Professor Search. Use the interactive map to find out what building her office is in. Did this work as you expected?

After your meeting with Professor Search, your 1st class will be held in the Jonnson Engineering Building. Use the map application to find out how to walk from Professor Search's office to your class location.

The map you are presented is very different than what you've seen before. What do you think this map is showing you?

On the left side are three options. Please tell me what you think each option will do. Then explore each and tell me if the option matched your expectation.

RESULTS

First Impressions

All users understood that Building would bring up a list of buildings, and that Faculty/Staff would bring up a list of those people. Only one user guessed what was meant by Service. When the concept of Service was explained, one person suggested calling it Student Services and one suggested Departments. The person who got it correct thought that it should at least be plural.

All users understood the concept of getting Customized directions, but one person was unclear on whether the Starting Address could be an off-campus location. The GO button was universally understood to execute the search parameters.

All users understood the concept of Zooming In and Zooming Out on the Map. Two users went directly to the temporary symbols for navigating, and figured out that they could move the map around by just clicking and holding their cursor. One user was confused by the Zoom In and Zoom Out buttons not being active, because this is how she expected to navigate.

All users expected that clicking the Print Map button would print a full-size map, not one at the size shown.

Finding a Building

All users chose the drop-down option for Building to find Sage. All users seemed surprised that a confirmation screen first came up. Two clicked “Yes, Continue” without too much thought, but one user was unsure how to proceed. Because the “No, See Other Results” option was not active, users were asked what they thought it would do. One person understood that the application had returned only the most relevant match to the search query, and that this option would bring up the rest. Other users didn’t understand.

All users noticed the yellow bubble on the returned map, and correctly assumed that their chosen building was highlighted. Two people said that the returned map should be zoomed in more, because it took them a minute to realize that this map was different than the one on the home page.

All users assumed that the Print Map prints whatever map is showing on that page.

Send to Mobile

Two people thought that the Send to Mobile would send the image of the map to their phone. One commented that the map would be almost impossible to read because the map on the site was already difficult at twice the size of their phone’s display. This user was asked what they would want changed about this map, and they just said that it needed more detail and less trees and numbers.

One user thought the Send to Mobile would send an SMS message with a link to the online map.

Finding a Person

Users had no difficulty with this task, and all thought that the Last Name 1st format was best. Two users also expected to have the office number and phone number returned as well as the building location of the person. One person wanted office hours as well.

Location to Location Directions

All users understood that they needed to enter the location in the “Get Customized Directions” section, but two commented that they wanted a drop down list with the locations like on the home page. One person asked whether a starting location could be a service or person, and not just a building. This person also asked how much (and how accurate) a starting

address needed to be. When asked, nobody had understood that they could complete this entire process in one step from the home page by 1st entering a search term, and also a starting location. All completed the process from the 2nd “Get Customized Directions” option.

All users voiced (pleasant) surprise at the location to location map that had the path drawn between the two buildings. Two people expected that they’d get a map with both locations in yellow bubbles, and it would be left for them to figure out. One user said that she wasn’t really sure what she expected, but it wasn’t this.

One user commented that the path drawing was good, but it wasn’t clear which building was which because they were not labeled and because this map was so different in appearance than the other maps. Another person said that it was hard to read the start and finish points, but it was clearer when he zoomed in.

All users thought this was a useful feature, but only one said that she’d be likely to use it.

Location to Location Maps with Directions (Photo and Text)

All users correctly guessed as to what the “Print Map with Text Directions” option would do. When asked why they made this assumption, users cited experience with other map programs such as Google and Map Quest.

All users had some uncertainty about what “Print Map with Text and Photo Directions” meant. “How is this different than the other option?” was asked by one user. For one person, it made them second guess what the first option did (now concluding that the first one did not include a picture of the map but was in fact text only) and that the second one included the image.

When users saw what was actually returned by the first option, they said it matched their expectations. At the second option, one user responded with “Oh”, one with “Cool”, and one with silence and a puzzled expression. The concept was explained to all and received positive feedback once it was fully understood. When asked if they had ever seen directions presented in this way, the answer was no. The person who responded “Oh” originally said his Mom would love this because “she can’t follow directions to save her life”. All users thought this feature might be handy for some people, but didn’t think they would need this level of detail themselves.

RECOMMENDED DESIGN CHANGES

Because the number of users testing this application was rather small, it would be unwise to make any drastic changes to the application based on this limited feedback. The following minor changes can safely be made, however, to enhance usability without affecting the intended interaction with the application.

- a) Change “Service” to “Student Services”
- b) Activate the Zoom In and Zoom out buttons and remove the symbols
- c) Change “Send to Mobile” to “Send Map to Mobile”
- d) Add a drop down box for the “Enter Starting Address or Location” so that user’s can easily select their option instead of typing.
- e) Zoom In the Location Map by default so the yellow highlighting is more noticeable.
- f) Add building labels to the Location to Location Map and enlarge the Start and Finish labels for better readability.
- g) Change wording under the “Get Customized Directions” to “Enter the Off-Campus Starting Address or On-Campus Starting Location”

FURTHER RESEARCH

Two subject areas will require further research before they can be adequately addressed in the design.

First, when map users are intending to get directions from one location to another, do they prefer to enter all the information (start and end points) up front, or first locate the end point? Answers to this question will help determine the placement for “Get Customized Directions”.

A second and more major issue is the subject of the photo landmarks presented in the option to “Print Map with Text and Photo Directions”. Is this really useful for people, and worth the complex programming that would need to go into building such a feature? Will having too much information actually backfire and make the navigation more difficult? General research into the subject shows that some people are more attuned to visual landmarks when finding locations, but will this apply to the relatively small geographic area that represents the Rensselaer campus?

A controlled experiment would be the best way to answer this question. The study would consist of new

students unfamiliar with the campus. The control group would be given navigational tasks using only a standard campus map. Three test groups would be setup. One would be given no visual map, but written text directions. The second test group would get only photos of visual landmarks, but no map and no text directions. The last group would be given information from all three. Each group’s tasks would be measured quantitatively by measuring the time to complete, and also subjectively by asking them to rate their ease in finding the locations being tested.

SUMMARY

This design for a Rensselaer campus map achieves a large improvement over the existing map. Users, found it easy to navigate, and were generally pleased by the various ways that navigational information could be presented. This flexibility would make this application usable to the widest possible audience. Clarifying the best way to present navigational information through further research and fixing the usability issues found can help to make this application truly user centered.