C3: DESIGN EVALUATION & REPORT

PART I: *BASIC EVALUATION PLAN*

As an early stage of the user-centered design process, we tested participants using hand-drawn prototypes of our data visualizations. This was a quick and easy method to determine if the information we planned to visualize was interesting to potential users and allowed us to create an initial visualization layout. The paper prototype was developed through the sketching and resulting group discussion led by the Five Design Sheets exercise in class. We established three key visualizations that we wanted to create from our data.

We knew that a map-based visualization would be a key component since our initial design question focused on identifying areas within the city of Seattle where there were large numbers of accidents involving bicycles. While a map is effective in displaying location information, it makes it difficult to identify trends that aren't related to frequency and position. Our second visualization, a heat map, was designed to display collision trends throughout the year which would allow users to identify the risk of a collision during a particular month. The final visualization was a line chart. While this could be considered a fairly basic visualization, we felt that it was nevertheless an important part of telling our data's story by highlighting the movement of collision totals across multiple years.

With these visualizations agreed upon, we began creating user tasks and sketching out the initial paper prototype that we would use for evaluation purposes. During user testing, one team member was tasked with moderating and taking notes, while a second team member performed as the computer and manipulated the visualization in response to participant input. Results from in-class and at home usability tests were consolidated in a spreadsheet for further analysis.

Our tasks were given as follows:

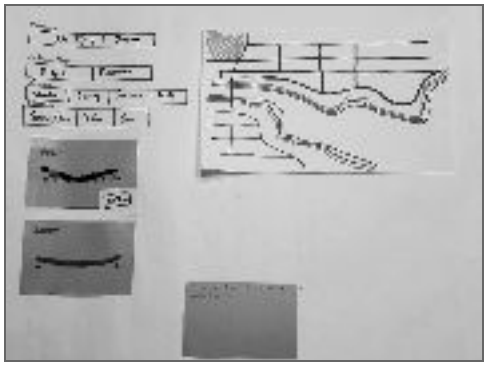
- ★ TASK I: Find details about a bicycle accident in 2010
- ★ TASK II: Compare details on a bicycle accident in 2010 and 2011
- ★ TASK III: Find which areas of Seattle have the most pedestrian accidents

TASK I: *Find details about a bicycle accident in 2010.*

We designed this task to determine if users could successfully use the filters on the left side of the visualization. Our visualization included filters for *outcomes* (if an injury occurred in the accident), *collision type* (bicycle or pedestrian), *season* (winter, spring, summer, fall), and *weather condition* (snow/ice, rain, sun), and

year sliding scale (2010-2014). Pink and blue dots were used to represent bicycle and pedestrian accidents respectively. Our visualization also included details on demand. The user could click on a pink circle on the graph to learn more about a specific collision.

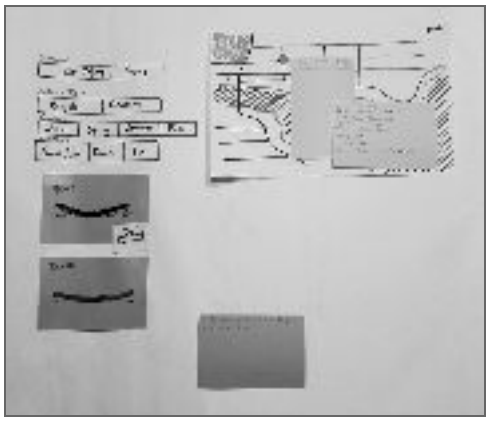
In this task, we classified each task as a success if the participant was able to move the year filter to 2010, select "bicycle" as the collision type, and click on the pink dot to learn more details about the accident.



TASK II: *Compare details on a bicycle accident in 2010 and 2011.*

We designed this task to test how users would like to compare data. We determined that comparison over time would be an important use case.
In our visualization, users could drag the year sliding scale (by using a bead on a pipe cleaner) from 2010 to 2011. When the participant moved the sliding scale, the number and location of the bicycle (pink dots) and pedestrian (blue dots) on the map would change displaying the change in bicycle and pedestrian accidents between the years.

This task was considered a success if participants selected bicycle accidents in the filters, slid the bead from 2010 to 2011, and clicked on the dots to compare the number of accidents.



TASK III: *Find which areas of Seattle have the most pedestrian accidents.*

We designed this task to determine if users could navigate the map easily to analyze different areas of Seattle. In this task, we wanted users to be able to use the zoom slider to zoom out from a close up view of an intersection to view the entirety of Seattle. This task was considered a success if participants moved the zoom slider to the left to see more of the map.

PART II: *SIMPLE EVALUATION & RESULTS*

Based on feedback and observations of our initial three test participants, we implemented a few minor changes in our prototype to minimize confusion during the next round of testing. Each team member then tested the revised paper prototype on non classmates using the same tasks from our in-class exercise.

USABILITY ISSUES:

We identified three major usability issues in our design.

1. Filter Selection

Participants felt the need to make a selection on each filter listed. Our intention was to have users only select specific filters and not select every one. All three participants selected more than just the year and incident type filters for the first task.

> “Do I select all…?” -P2
>
> “What is meant by ‘outcome’?” -P3

2. Size of Dot for Frequency

When users were comparing the number of accidents between 2010 and 2011, they were unable to determine why some of the accidents were labeled with large dots and some were labeled with small dots. Users did not understand that the size of the dots was used to display the number of accidents at that location.

3. Quality of Map

Multiple of our users stated confusion about what our visualization was displaying. Upon further questioning, we determined users did not recognize our map immediately as a map.

> “What is this...thing [pointed to map]...of?” -P2

RECOMMENDATIONS:

1. Filter Selection

To resolve our filter selection issue, we added “all” to the filters for those users who felt selecting something was required. We determined that having “all” as a default, would keep users focused on the task elements instead of multiple filter options. We also created a range slider for years to allow users to view multiple years of data at once.

2. Number of Dots for Frequency

Because users were unable to understand that the size of the dot was showing the number of accidents, we changed our visualization to show multiple accidents in the same location with more dots instead of increased area of the size of the dot.

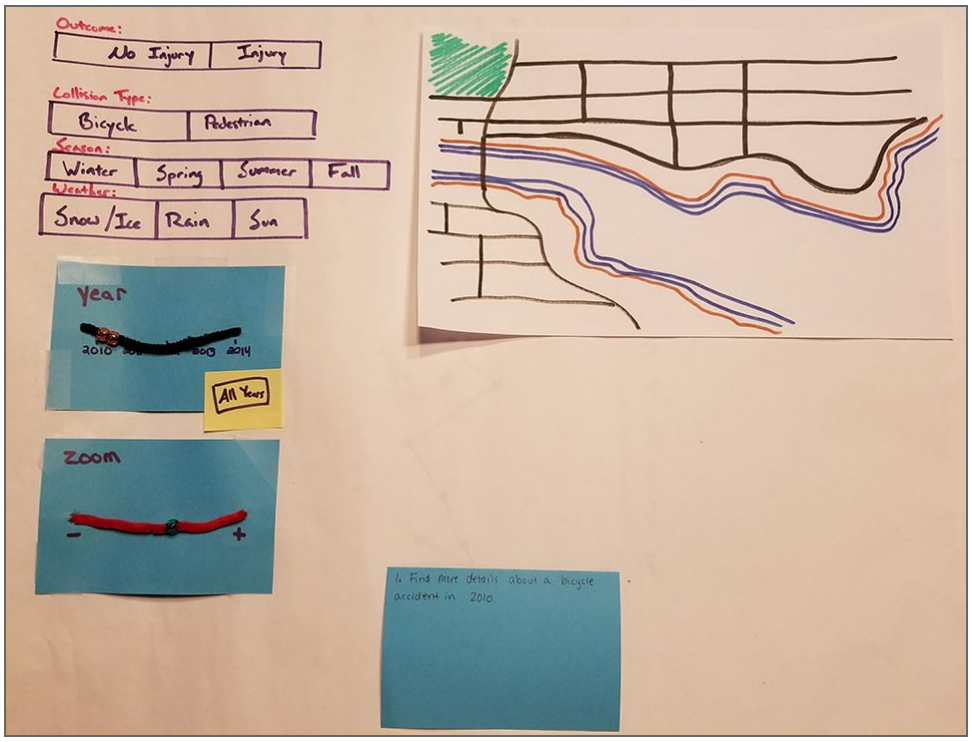
3. Digital map

In order to make our map visualization more obvious to users, we re-tested our visualization with a digital map from Tableau. Users were able to successfully zoom in and out and locate different areas of interest in the Seattle data.

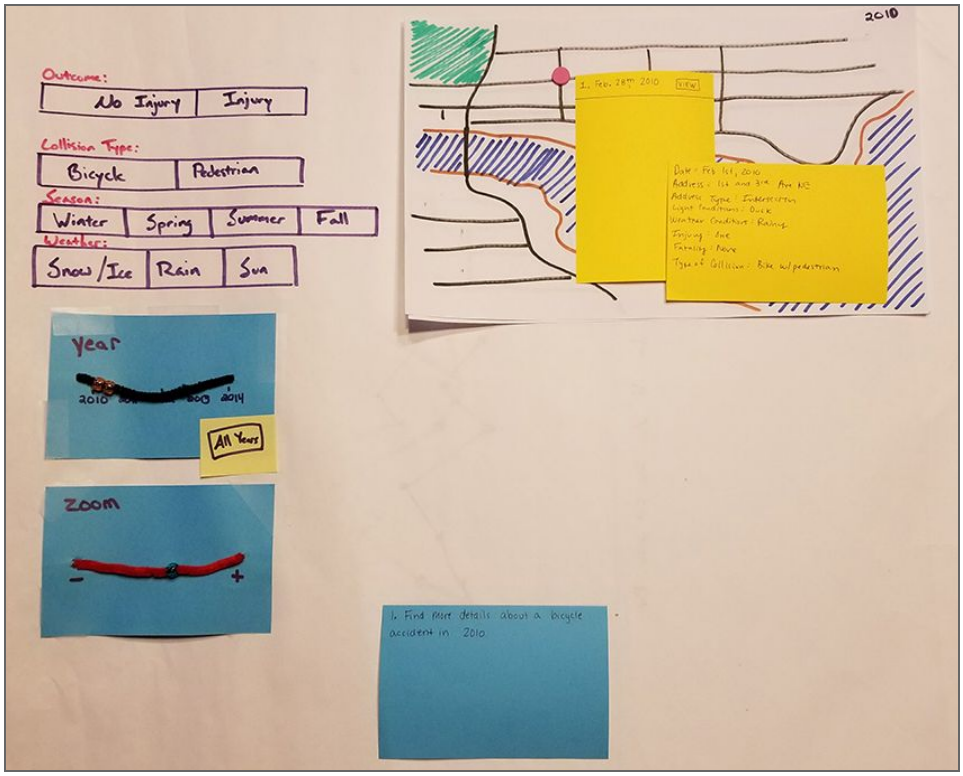
APPENDIX

I. Images from prototype

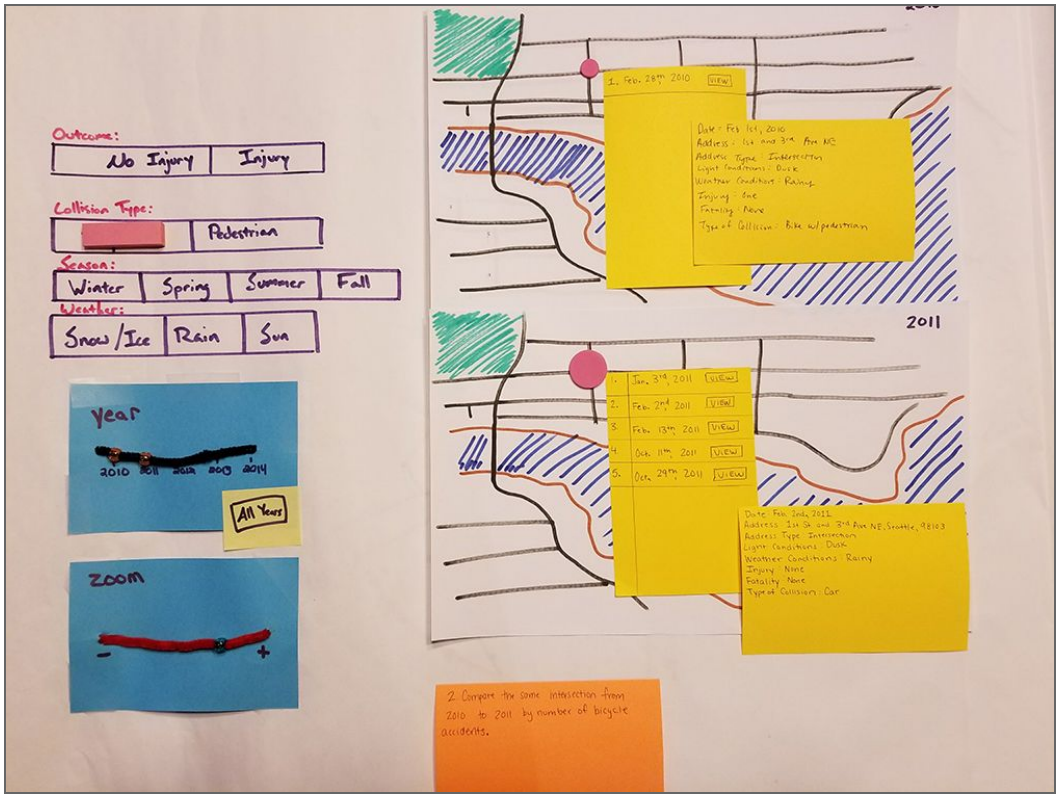
Initial test “screen”



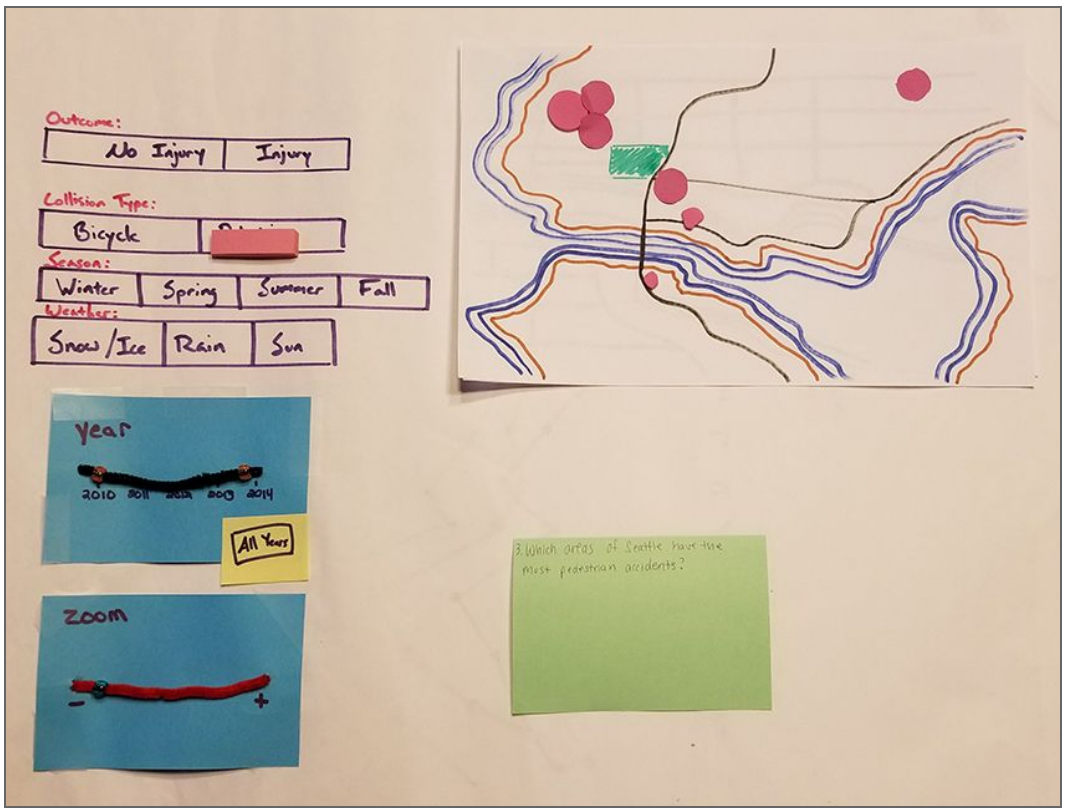
Task 1: Find details about a bicycle accident in 2010



Task 2: Compare details on a bicycle accident in 2010 and 2011



Task 3: Find which areas of Seattle have the most pedestrian accidents



II. Participant Summaries by Task

	P1	P2	P3
TASK I	Had to be guided to click on the dot for more information but this may have been due to being unfamiliar with "rough" paper prototyping. “What is this...thing [pointed to map]...of?”	Selected all filter options, but "didn't care" about the seasons, only wanted to see weather conditions. "I want to know if accidents are more likely in the rain?" Tried to zoom into map to see intersection name instead of clicking on point on map. Wanted to see fatality option with "injury / no injury" options. "What does collision mean? Is it a car hitting a bike? Was it the car's fault or the cyclist?" “Do I select all…?” -P2	Tried to click on multiple tabs under weather "autumn and spring and summer and fall" to highlight each one. Wanted the year to be a slider with a min and max. “What is meant by ‘outcome’?”
TASK II	Was confused by the two beads on slider. Thought the range was not inclusive (e.g. 2010-2012 would be dates up to 12/31/2011.	Did not use range slider. Selected dates individually. Interested in seeing years overlayed on top of one another. Was confused by some of the info displayed in details on demand - "Why is car collision listed on the info? I thought it was only bikes & peds?"	Wanted to see 2010 and 2011 on the map together as opposed to viewing each separately and comparing.
TASK III	Did not seem to notice the size differences of the dots and looked for concentrated areas of them instead	Thought colors were confusing. Wanted data keyed to different colors. Bikes = blue and Peds = purple.	Had trouble identifying "cluster", didn't notice differences in size of dots,more interested in number of dots