



XML

A Supplement to Exploring Computer Science, v. 5 (2013)

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XML Supplement (10 Lessons/class hours)

Introduction

Managing and interpreting data—in a variety of volume, types, and speed of accumulation/change—is part of the foundation of our information society and the economy. The ability to analyze, visualize, and draw conclusions from data sets is an important exercise of citizenship. Effective members of society can collect and analyze data, address their own questions, and corroborate "official statistics" with their own observations.

Exciting new developments in mobile technology are enabling individuals to become active participants in the role of data gathers. Individuals, spontaneous groups of people who self-organize, and community organizations can gather and analyze data, and create understanding of many phenomena. This kind of analysis leverages knowledge in the community, knowledge held by the participants, to tell stories about "who we are" and "how we live." This process is an example of what we call participatory sensing.

Citizens with mobile devices are also assisting scientists gather massive amounts of data for use in analyzing global climate, animal habitats and populations, human behaviors, and more.... Where there are humans there are data. Participants contribute time, observations, and inventiveness.

This unit has been designed to provide students the opportunity to experience the process of data collection and analysis in real-world contexts by creating their own survey campaigns and to participate in the data collection phase as the first steps in managing and interpreting data, developing understanding, and creating meaning.

The activities in this supplement and subsequent ECS units encourage students to participate in their learning using computational practices.

With skills in XML and sophisticated data analysis tools, students can employ computational practices to yield meaningful and personal results. In this supplement they can design and implement creative solutions with their own data-gathering campaigns to answer important questions, and apply abstractions and models and combine data to "discover and describe" new information. The lessons nurture additional computational practices by connecting computation with other disciplines, encouraging students to communicate thought processes and results, and work effectively in teams.

This unit has been designed to provide students the opportunity to experience the process of data collection and analysis in real-world contexts by creating their own mobile data-collection (survey) campaigns, manage and interpret data, draw conclusions, and present the results.

This supplement should be used at the beginning of Unit 5. Some of the content of this supplement will fit in between Unit 5 lessons and after students have had some experience with data analysis in Unit 5 using RStudio or other tool. See the Daily Overview Chart below for suggestions for combining the XML supplement with the content of Unit 5.

Topics to be addressed:

- Using phones to collect data
- Writing survey campaigns with XML
- Exploring topics and associated data sets
- Creating, implementing, and examining a mobile Test Campaign
- Creating, implementing, and examining a class mobile Final Campaign

- Examining data with Mobilize software suite and RStudio (or other tool)
- Creating charts to illustrate data
- Telling stories and answering BIG questions from data
- Reporting and presenting the results in a website

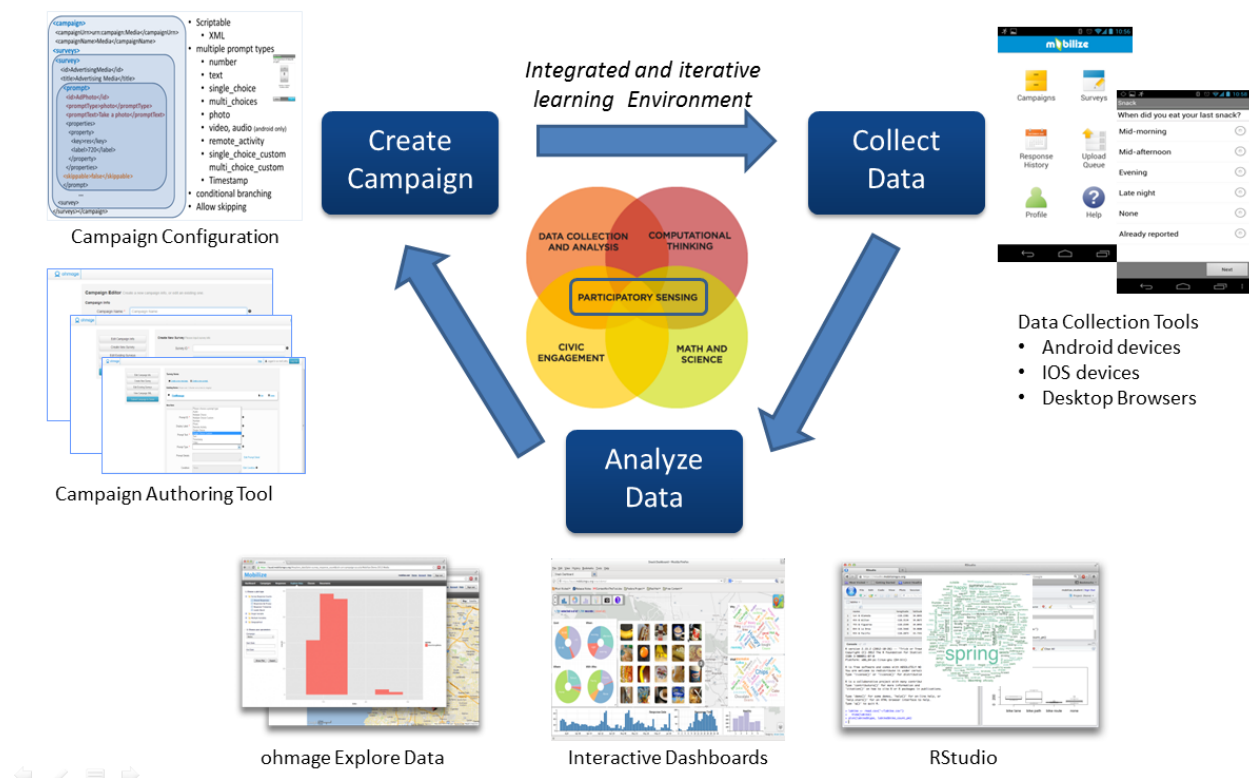
Topic Description:

This XML Supplement will guide students through the process of developing a mobile device participatory sensing campaign from start to finish. It ties together the computational practices from several units of ECS curriculum—Web Design (Unit 3), the Participatory Sensing Supplement, and Data Analysis (Unit 5)—around a topic of real-world significance to students.

Students will explore existing data on several high-interest topics and explore possible BIG questions that could be answered with additional data. They will work in teams to create a mobile device survey campaign in XML, gather data, analyze the data, combine data to “discover and describe” new information, seek to answer their BIG questions, and present their findings through a website.



Mobilize: Innovative CS Teaching and Learning



Definitions:

Campaign: A campaign is an initiative to learn more about a particular aspect of students' lives through enquiry, data collection, and data analysis. Data are collected by using a set of surveys. It is a high-level description of the overall data being collected. An example of a campaign would be a "Sleep Campaign" where someone is collecting information about users' sleep patterns through one or more individual surveys such as one before bedtime and another in the morning. Another example would be of a "Fitness Campaign" where someone is collecting information about how frequently and/or intensely a group of people exercise. This campaign might have one survey for immediately after exercising and another for the end of the day.

Survey: a collection of measurements on an individual designed to learn more about a particular action, event, intent, or purpose; these measurements can be a message, prompt, or repeatable set. It is a finer-grained assessment of a user regarding a specific event. In our "Sleep Campaign", an example survey could be the "Lay Down" survey that attempts to assess information about when a user laid down the night before, how long it took them to go to sleep, and/or what they did between laying down and going to sleep. In our "Fitness Campaign", an example survey could be the "Workout" survey that should be taken immediately after a workout, and would judge how long the workout took and/or what kind of exercises were performed.

Prompt: a single, specific inquiry/question about a user. A prompt is the finest-grained concept in the Mobilize software suite and is used to determine a specific piece of information, the collection of which should fulfill the requirements of a survey, which, in turn, should fulfill the requirements of a campaign. Each prompt must have a specific type which defines how it is displayed to the user, what kind of data it collects, and how it is exported to be analyzed later. Example prompts from the "Lay Down" survey would be "What time do you remember laying down?" that would allow the user to input a specific time or "Select activities that you performed between laying down and going to sleep?" that would allow a user to choose between a series of predetermined activities and/or allow them to enter their own choices. Example prompts from the "Workout" survey would be "How long did the exercise last in minutes?" that would allow the user to enter a numeric value or "How did you feel after the workout?" that would allow the user to enter free-form text about their feelings after the workout. Prompts may be configured to be skippable, meaning that the user may skip the prompt and continue the survey.

Message: a brief chunk of text that is displayed to the user before a prompt. While messages can appear before other messages and/or after all prompts, it is discouraged to do so. There is a specific mechanism for displaying a message, such as a "Thank you" message, at the end of a survey and a series of messages may degrade the user experience.

Repeatable set: a collection of survey items that should be used when a series of prompts, with or without messages, may be displayed repeatedly. The last prompt in the series is the "escape" prompt that will determine if the set should be repeated again or should be terminated.

Variable: a data storage element used to save the values returned by the survey prompts. The data saved in variables can be used to analyze the data set. In a survey, the variable 'name' could be used to store the user's name; 'layDownTime' could be used to store the time the user went to bed; 'exerciseDuration' could be used to store the number of minutes the user exercised.

Objectives:**The student will be able to:**

- Participate in a mobile campaign
- Ask statistical questions from data sets.
- Form BIG questions (that will require additional survey prompts) on possible topics for the PS mobile project.
- Select variables to include in a survey campaign that will be useful in answering the BIG questions.
- Learn basic XML tags as needed for the class campaign.
- Collaborate with team members to develop and implement a mobile survey campaign on the selected topic.
- Gather data.
- Examine the gathered data using Mobilize software or RStudio.
- Create charts to illustrate the data.
- Analyze the data from the survey to augment, reinforce, tell a story, verify truths, call into question, or further discover and describe information related to the selected topic.
- Communicate the findings by adding to the website project originally created in Unit 3 or through another presentation.

Specific topics for each instructional day are listed in the Overview Chart.

Overview Chart	
XML Instructional Lessons	Topic
<u>Lessons 1 and 2</u>	Set up student Smart Phones. Explore phone survey campaigns. Explore the Mobilize software suite.
<u>Lesson 3</u>	Examine effective prompts and associated plots. Learn basic XML tags through demonstrations and tutorials. Practice XML by writing a short survey using the template “My First Survey.”
<u>Lessons 4 and 5</u>	Data check-in day for the mobile campaigns from Lesson 1. Explore snack data in the Mobilize software. Examine data set associated with the class campaign topic. Dig more deeply into the class campaign topic. Use consensus to select a BIG question and to identify necessary variables.
<u>Lesson 6</u>	Each team writes a Test Campaign for the class topic and uploads to the Mobilize server. Upload. Journal entry. Homework: Students will enter survey data for a few days.
Spend time on Unit 5. Skip Unit 5 lessons for days 1, 3, 4, 5, and 6. (That content covered in this supplement.)	
<u>Lesson 7</u>	Look at Test Campaign data in Mobilize web frontend and RStudio (after work in unit 5 they should be able to use RStudio or other appropriate data analysis tool). Analyze the Test Campaign questions for effectiveness.
<u>Lesson 8</u>	Create the class campaign.... combine/condense all questions so that each team will be able to gather the data they need to answer their big questions. Run campaign for a couple weeks.
Return to Unit 5 Days 7 – 22. Skip days 23 – 30.	
<u>Lesson 9</u>	Analyze data from class project. Create and save graphs. Write summary to BIG question. Compare to contextual data set. Evaluate the computational practices of the project.
<u>Lesson 10</u>	Add information to website project.

Lessons: 1 and 2

[Back to Unit Overview Chart](#)

- **Topic Description:** Phones are distributed. Groups for the final project are created and roles and responsibilities for group members are assigned. Students will begin the task of designing and implementing creative solutions and artifacts by applying abstractions and models. Step one in this process is to navigate an android application, navigate the Mobilize web application, and develop a list of possible questions to use for the final project in which they will use technology as a tool for solving problems.

Objectives:

The student will be able to:

- Work effectively in teams.
- Explain the rules for sharing the phones and why those rules are in place.
- Login and navigate through the basic features of the phone application.
- Login and navigate through the basic features of the online system.

Outline of the Lesson:

- Phone set up (25 minutes)
- Phone application (25 minutes)
- Online system (30 minutes)
- Group roles and responsibilities (20 minutes)
- Optional: Video Learn XML Tutorial 1 (7 minutes)

Student Activities:

- Groups complete phone paperwork.
- Experiment with the phone application.
- Experiment with the online application.
- Groups discuss group roles and responsibilities.
- Optional or homework: Video Learn XML Tutorial 1

Teaching/Learning Strategies:

- Students will use either their person smart phones or complete the survey as much as possible with the online Mobilize web frontend.
 - Students will need to download the Mobilize app to their personal phones.
 - Have groups complete any phone paperwork required by your district.
 - Remind students to be respectful of personal privacy issues and school rules when using phones to complete the surveys.
- Explain how the phone application works. See the video tutorial <http://www.youtube.com/watch?v=f4d7FNIZ2yk&feature=youtu.be>.
- Demonstrate the online Mobilize web frontend (<http://ohmage.org/>). Point out the campaigns, XML campaign code, results from previous campaigns, and other dashboard tabs. Step-by-step

explanations can be found on the **Mobilize Web Frontend Step-by-Step** document and at:

NOTES: <http://wiki.mobilizingcs.org/app/web/home>.

- Mobilize software suite is an open-source participatory sensing technology platform. It supports expressive project authoring; mobile phone-based data capture through inquiry-based surveys and automated data capture as well as temporally and/or spatially triggered reminders, data visualization and real-time feedback; privacy respecting data management; and extensible data exploration. All captured data are automatically time stamped, geocoded, and uploaded for analysis and visualization.
- The Mobilize Web Frontend (powered by the ohmage project) is used to provide students secure access to their data. It supports secure login, campaign management, data management, and basic campaign monitoring and visualization. The students can review and share their data to the growing data set collected by their class. The web frontend can also be used to discover the answers to basic statistical inferences in real-time as data is being collected. When data collection is complete, the web frontend allows for easy exporting of the data to a more thorough statistical analysis tool.
- You will find links to a detailed walkthrough here: <http://wiki.mobilizingcs.org/app/web>

- Give students time to explore both applications to become familiar with the features. Make sure that each student has an opportunity to use the phone application and understands how to enter data.
- Discuss group roles and responsibilities. Use the **Role Cards** as appropriate.
- Explain to students that everyone in the group is accountable for the work in the various stages and that they need to alternate roles depending on who is the data collector for a given night, etc. They also need to come to consensus on data collection, questions for analysis, etc.
- Provide students with dates for the data check-ins/analysis with their own data. (These may need to be revised if sections take longer than anticipated.) Students should plan to collect some data prior to Lesson 4 data check-in to use for discussion.
- Answer questions and guide them as appropriate.
- Optional: Video Learn XML Tutorial 1: <http://www.youtube.com/watch?v=qgZVAznwX38>. This could be a homework assignment. It provides a nice introduction to Lesson 3.

Required Files and Resources:

- Required phone forms
- Mobilize Home <http://wiki.mobilizingcs.org/app/web/home>
- Unit 5 and Canonical Campaigns Supplement

Student activity documents are included as pages within the text of this lesson document:

- Role cards.doc
- Mobilize Web Frontend Step-by-Step.doc

Functional Role Cards for Computer Project Teams

Add additional tasks as needed for a project.
Rotate roles among team members periodically.

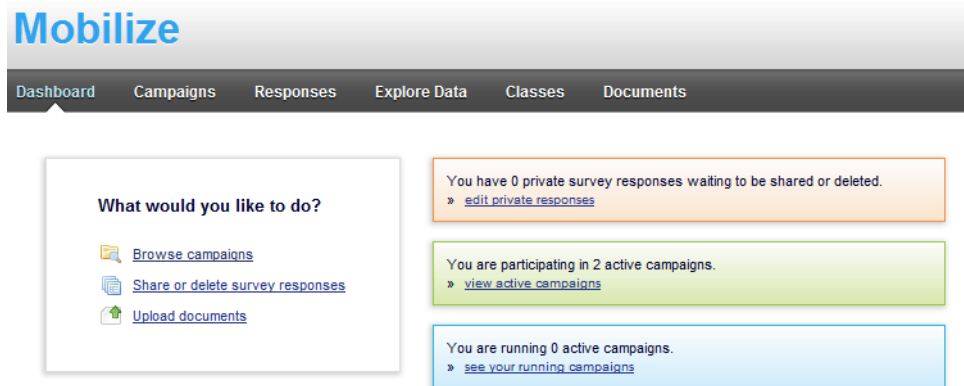
RECORDER and STORE KEEPER Write the groups ideas into planning documents. Keep track of planning documents. Record all ideas. Locate, collect, and distribute resources including informational resources. Coordinate efforts of the team members so that content and image resources are ready and available. Check progress against any due dates or timeline plans.	DESIGNER AND GUIDE Gather design ideas. Create or gathers images. Verify that design and content plans are followed. Check production against rubrics and project specifications.
DRIVER Create project content on the computer following the plans created by the team. Follow instructions of the designer and recorder/store keeper. Ask for assistance as needed.	ENCOURAGER and SPY (This is an optional role if there is a 4 th team member) Check up on other groups. Bring good ideas back to the team. Give ideas to other groups.

Mobilize Web Frontend Step-by-Step (9 steps/5 pages)

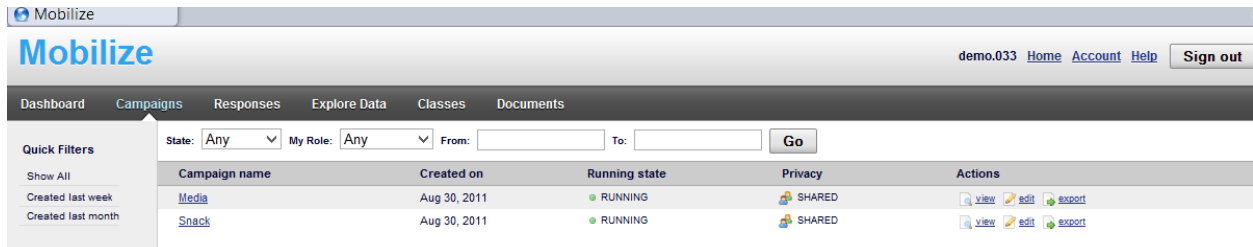
For additional information on Mobilize software, visit:

<http://wiki.mobilizingcs.org/app/web/exploredata>

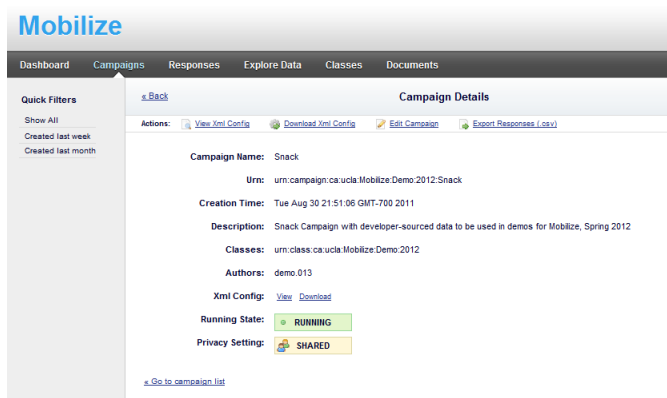
1. Log on to <https://lausd.mobilizingcs.org/web/#dashboard>. This is the **Dashboard**. Select the **Campaigns** tab.



1. Locate the campaign you wish to work with. Click on the name of the campaign.



2. The following screen will appear.



3. Select **Explore Data** tab.

The screenshot shows the Mobilize application interface with the 'Explore Data' tab selected in the top navigation bar. Below the navigation bar, there are two main sections:

- 1. Choose a plot type**: This section contains four expandable folders: 'Survey Response Counts', 'Single Variable', 'Multiple Variables', and 'Geographical'.
- 2. Choose your parameters**: This section contains several dropdown menus and text input fields for selecting parameters: 'Campaign:', 'Survey:', 'Class:' (with 'No class (just you)' selected), 'Participant:', 'PromptX:', 'PromptY:', 'Start Date:', and 'End Date:'.

At the bottom of the parameter section are two buttons: 'Draw Plot' and 'Export'.

A large grey arrow points from the right towards the 'Choose your parameters' section, with the text: *Select plot type & campaign to begin exploring data*.

4. Expand each of the plot type folders to view the choices.

This screenshot shows the same Mobilize 'Explore Data' interface, but with the plot type folders expanded to show their contents:

- Survey Response Counts**: Includes 'Shared Responses', 'Responses By Privacy', 'Response Timeseries', and 'Leader Board'.
- Single Variable**: Includes 'User Timeseries', 'Prompt Timeseries', and 'Prompt Distribution'.
- Multiple Variables**: Includes 'Scatterplot' and '2D Density Plot'.
- Geographical**: Includes 'Google Map'.

The 'Choose your parameters' section is partially visible at the bottom. A large grey arrow points from the right towards the expanded plot type list, with the text: *Select to*.

5. Use the Leader Board to see how many times each person responded to the survey:
 - a. Under **Survey Response Counts**, select **Leader Board**.
 - b. Under **Choose your parameters**, select the campaign you wish to analyze.
 - c. Click **Draw Plot**.

Mobilize

Dashboard
Campaigns
Responses
Explore Data
Classes
Documents

1. Choose a plot type

- Survey Response Counts
 - Shared Responses
 - Responses By Privacy
 - Response Timeseries
 - Leader Board
- Single Variable
 - User Timeseries
 - Prompt Timeseries
 - Prompt Distribution
- Multiple Variables
 - Scatterplot
 - 2D Density Plot
- Geographical
 - Google Map

2. Choose your parameters

Campaign:

Snack

Start Date:

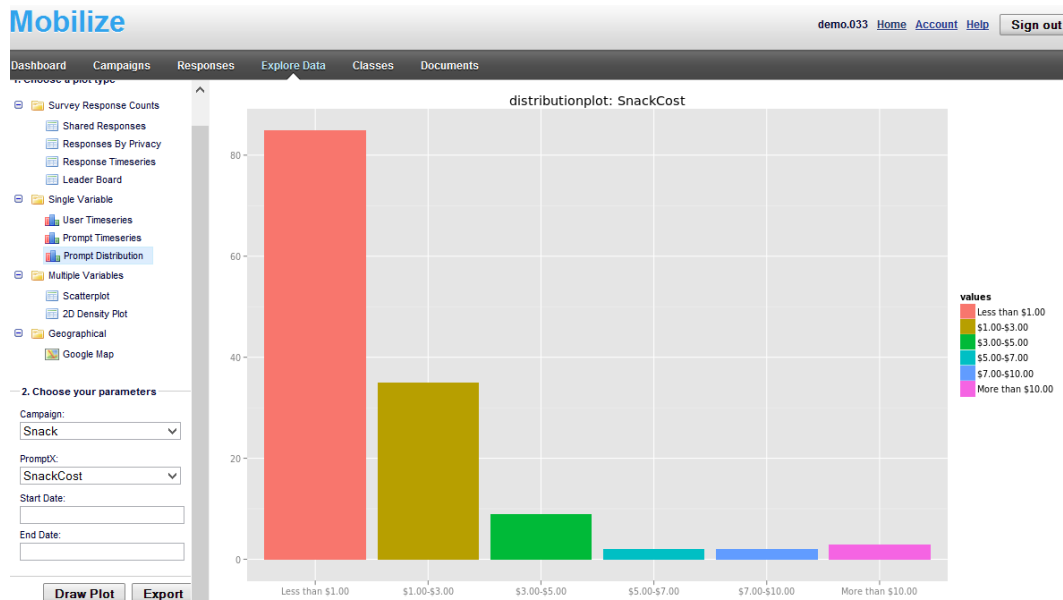
End Date:

Draw Plot
Export

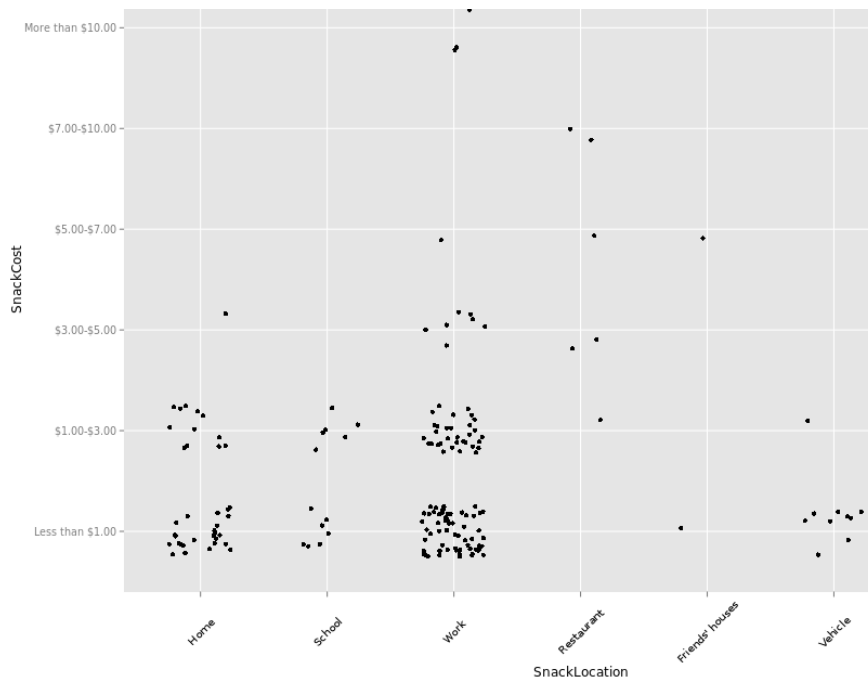
Username	Total Responses	Private Responses	Share
demo.000	2	0	2
demo.001	6	0	6
demo.002	4	0	4
demo.003	8	0	8
demo.004	1	0	1
demo.005	16	0	16
demo.006	7	0	7
demo.007	9	0	9
demo.008	5	0	5
demo.009	6	0	6
demo.010	4	0	4
demo.011	1	1	0
demo.013	6	2	4
demo.014	3	3	0
demo.015	12	1	11
demo.016	30	0	30
demo.017	8	6	2
demo.018	6	2	4
demo.019	1	0	1
demo.024	1	1	0
demo.025	1	0	1
demo.026	1	0	1
demo.027	17	17	0
demo.028	1	0	1
demo.029	1	0	1
demo.031	1	0	1
itunes.testuser	2	2	0
mobilize.admin	5	0	5
mobilize.student	11	2	9
mobilize.user	1	1	0
mw.f.cathy	1	1	0
Total (All Users)	178	39	139

6. Experiment with each of the choices under **Single Variable**. When prompted for a user, select a user who provided several responses (refer to the **Leader Board** for this information).

TheSnackLocation and **SnackCost** variables in the **Snack campaign** illustrate these single variable statistics in easy-to-understand plot charts.



7. Experiment with each of the choices under **Multiple Variables**. This is a scatterplot using the **SnackLocation** and **SnackCost** variables in the **Snack campaign**.



8. Point out to students that sometimes certain plots do not necessarily create a very understandable picture of the data. Engage them in speculating why.
9. Ask, "What information about the context can we get out of this graph." Sometimes the answer will be 'none', and then the question is "why and what should we try to improve it." This is necessary because a plot might not be understandable for two big reasons (1) it is the wrong type of plot, for instance, one designed for categorical variables but you have numerical variables, (2) it is the right plot, but the scale is wrong, for example, if you have a histogram to examine a continuous variable, but the bins are too wide and so you can't get much interesting information out of it. Students should gradually learn that there is no 'wrong' plot, but some plots provide more and some less information. And sometimes you have to look at several different plots and combine information from them.
10. Experiment with the Google Map plot in the Geographical plot type folder. Select All Users. Clicking on a simple map point expands that particular respondent's survey responses. Clicking on a circle with a number (representing how many surveys are located in that specific area) expands the map.

1. Choose a plot type

- ☒ Survey Response Counts
- ☒ Single Variable
- ☒ Multiple Variables
 - ☒ Scatterplot
 - ☒ 2D Density Plot
- ☒ Geographical
 - ☒ Google Map

2. Choose your parameters

Campaign:

Snack

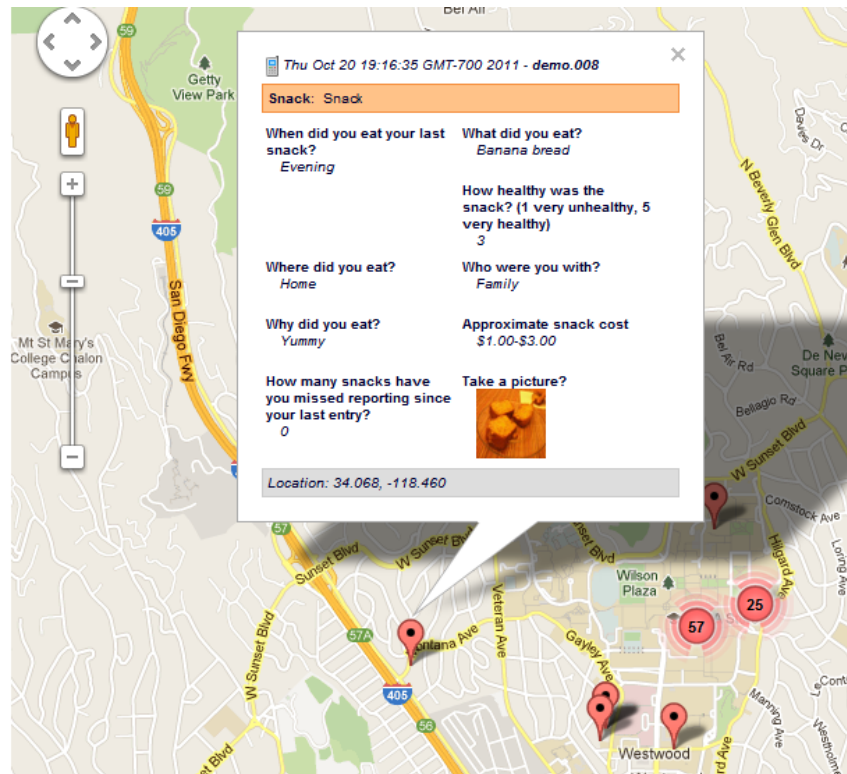
Participant:

All Users

Start Date:

End Date:

Draw Plot



XML Lesson: 3

[Back to Unit Overview Chart](#)

Topic Description:

In this lesson students will examine the traits of effective prompts and associated plots and charts. They will learn basic XML concepts and tags by completing an online tutorial and practice XML skills by creating a short survey following the patterns and code in the template **My First Survey**.

NOTE: This very brief introduction is intended to be a first-step into student learning of XML to apply abstractions and build models. Their experience with HTML and CSS will provide some background. XML for the mobile phone campaign is fairly complex; students will be using templates to create their mobile campaigns and deep learning of XML is not expected.

Objectives:

The student will be able to:

- Describe XML code.
- Understand basic XML tags.
- Replace content in XML tags to fit survey needs.

Outline of the Lesson:

- PowerPoint presentation: Designing Effective Prompts and Plots (15 minutes)
- Follow the tutorial (20 minutes)
- Replace code in the **SimpleExample** (15minutes)

Student Activities:

- Engage in the presentation
- Complete the tutorial
- Replace code in **SimpleExample**
- Homework: Journal entry

Teaching/Learning Strategies:

- Using a projection system, present the content of the **Designing Effective Prompts and Plots** PowerPoint presentation. Suggestion: Preview the W3Schools tutorial and quiz. Focus the discussion of the XML content in the presentation on the topics of the tutorial and quiz. Point out the tag format of the various prompts and emphasize how variables are used to store response data. See the notes section on each slide of the presentation for discussion points. The **Response & Plot Summary** document will be a valuable resource for students as they plan their surveys.
- Direct students to complete the tutorial with a team member. There are XML examples they can experiment with online and a quiz to self-test their knowledge.
http://www.w3schools.com/XML/xml_what.asp
- Using the **SimpleExample** file, student teams replace portions of the code to create a survey related to the class survey campaign topic. There are no right and wrong answers. Do not correct. This is intended to be exploratory team work to provide an opportunity for them to

discuss the topic and modify the XML to reflect what they are thinking about at this stage. Text Editor Suggestions:

- Windows: [notepad++](http://notepad-plus-plus.org/) <http://notepad-plus-plus.org/>
- Mac OS: [Text Wrangler](http://www.barebones.com/products/textwrangler/) <http://www.barebones.com/products/textwrangler/>

Student directions:

1. Open SimpleSurvey in Notepad++
 2. Notice the color.
 3. Replace portions of the code to create a survey related to the class survey campaign topic. There are no right and wrong answers. This activity is intended to be exploratory team work to provide an opportunity to discuss the topic and modify the XML.
 4. Save with as <different name>.xml.
- Homework: Journal entry: Which topics in the XML quiz do you need to review again?

Required Files and Resources:

- Designing_Effective_PromptsAndPlots.ppt
- Response_Plot_Summary.doc
- XML Tutorial by W3Schools <http://www.w3schools.com/xml/default.asp>

Student activity documents are included as pages within the text of this lesson document:

- SimpleExample.xml

Other Resources:

- XML Tutorial: <http://www.javaworld.com/javaworld/jw-04-1999/jw-04-xml.html>

Advanced

- XML Video Tutorial Learn XML part 1: <http://www.youtube.com/watch?v=qgZVAznwX38>
- XML Video Tutorial Learn XML Part 2: <http://www.youtube.com/watch?v=pno0FqFUhtg>

XML Lessons: 4 and 5

[Back to Unit Overview Chart](#)

Topic Description: This lesson serves as a check-in day to verify that students are able to run the trial survey campaigns assigned during XML Lesson 1. Students will examine the snack data using the Mobilize Web Frontend “Explore Data” tab.

Students will re-examine the data set associated with the selected class campaign topic in RStudio or other tool. Each team will delve more deeply into the class topic employing abstractions and models to create a solution. Tasks involve reviewing/sharing what they learned during their research in Unit 3, writing a BIG question related to the topic, and identifying variables needed in order to gather the data necessary to answer the BIG question. This is an opportunity to reinforce the skills needed to work effectively in teams.

Objectives:

The student will be able to:

- Explore the collected snack data using Mobilize mobile application.
- Draw conclusions about the data set selected for the class-topic.
- Identify issues related to the topic or aspects of the topic of particular interest to the teams.
- Identify BIG questions or describe the stories or discoveries they plan to uncover through the analysis of gathered data.
- Identify the specific variables needed to analyze the data.

Outline of the Lesson:

- Verify that the team is able to use the mobile survey tool and resolve any problems with sharing the phone. (5 minutes)
- Examine the snacking data set in Mobilize Web Frontend. (20 minutes)
- Journal Entry: What discovery or story can be told from the snack data gathered by the class? How is this similar or different from what you learned about your own snacking habits in the paper-pencil survey? (5 minutes)
- Examine the data set for the selected class topic. (20 minutes)
- Review information about the topic from work in Unit 3. (20 minutes)
- Identify BIG questions or describe stories or discoveries they plan to uncover through the analysis of data gathered on the class topic. (15 minutes)
- Identify the specific variables needed to analyze the data. (15 minutes)

Student Activities:

- Ask any questions about the phone survey; resolve any team issues.
- Explore the collected snack data in the Mobilize mobile application.
- Journal Entry: What discovery or story can be told from the snack data gathered by the class? How is this similar or different from what you learned about your own snacking habits in the paper-pencil survey?
- Examine the data set for the selected class topic.
- Review information related to the selected class campaign topic.

- Identify BIG questions or describe the stories or discoveries that can be discovered through gathered data.
- List the specific variables needed to analyze the data.

Teaching/Learning Strategies:

- This is a check-in day. Verify that all students had an opportunity to use the phones and that they were able to run the campaigns. Answer any questions and help them resolve any team problems.
- Refresh students' memory on comparing variables and plotting charts. Guide students to analyze the data in Mobilize Web Frontend. Refer to the **Mobilize Web Frontend Step-by-Step** document for navigational help. A **Snacking Analysis Checklist** is available for their use.
- Review the **Survey Flow Chart** if needed to remind students of the process for executing a survey campaign.
- Examine the class-selected topic data set using RStudio or other data analysis tool. Students should be comfortable with RStudio from their work in the Unit 5 activities. Refer to the **RStudio Video Tutorials** or the RStudio Quick Reference for additional help.
 - Open the data set for class topic. This is the data set that was first briefly examined on Lesson 4 or 5 of the Participatory Sensing Supplement.
 - Look at the variables.
 - Guide students to complete some simple data analysis. Demonstrate:
 - Length()
 - Sort()
 - Min(), max()
 - Plot(), barplot(), boxplot(), MobilizeBubble()
 - MobilizeMap()
- Review information on the class campaign topic. Students will have done extensive research on the topic while creating their website in Unit 3.
- Identify BIG questions or describe the stories or discoveries that can be discovered through analysis of data. Students did preliminary work for this task in Lesson 5 of the PS Supplement using the PS Kickoff and Topic Guide documents. Look to the students' work on those documents, or if necessary, conduct a brainstorming strategy. It is important that every team member contributes a few ideas before the team refines the ideas and selects, by consensus, one or two BIG questions.
- Teams identify the specific variables needed to analyze the data in order to answer their BIG questions. Teams can complete a new **PS Kickoff** document to record their final ideas if needed.

Required Files and Resources:

- Mobilize Web Frontend <https://lausd.mobilizingcs.org/web/#login>
- RStudio Video Tutorials

Student activity documents are included as pages within the text of this lesson document:

- Snack_Analysis_Checklist.doc

- RStudio_Quick_Reference.pdf
- Survey_Flow_Chart.doc (for reference)
- PS_Kickoff.doc (if needed)

Other Resources:

- None

Snacking Analysis Checklist

Name _____

For the past several days class members have been adding to the data in the online/mobile snacking survey. This lesson will ensure that you are able to complete basic analysis techniques. These skills will be required to analyze the Final Class Campaign at the end of this unit.

- Open the snacking survey in Mobilize Web Frontend.
- Use each of the analytical techniques listed below.
- Describe the result of each analytic by answering the questions.
- Confer with team members for assistance.
- Place a checkmark to the left of each plotting strategy when you are comfortable with the techniques in Mobilize.

☐ Lead Board: How many times has the survey been responded to?

What other question can you ask when looking at the Leader Board?

What is the answer to that question?

☐ User Timeseries: When did you consume the most expensive snacks?

What other question can you ask when looking at a User Timeseries?

What is the answer to that question?

☐ Prompt Distribution: During what time of day are responders most likely to snack?

What other question can you ask when looking at a Prompt Distribution?

What is the answer to that question?

☐ Scatterplot: Where are respondents most likely to eat the healthiest snacks?

What other question can you ask when looking at a Scatterplot?

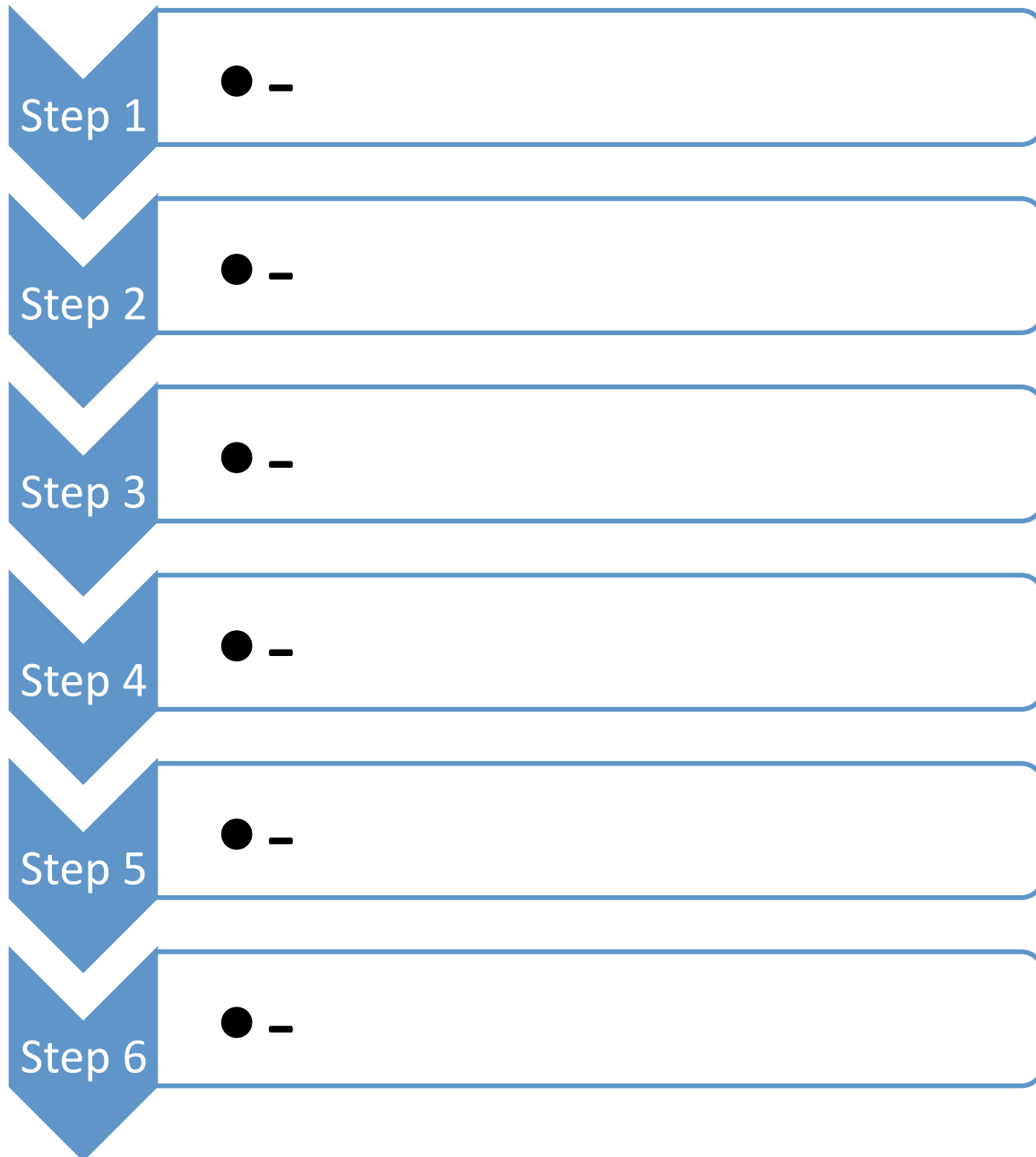
What is the answer to that question?

☐ 2D Density Plot: Where are most respondents when they consume midafternoon snacks?

What other question can you ask when looking at a 2-D Density Plot?

What is the answer to that question?

Survey Development Flow Chart



1. Ask a BIG question
2. Design a strategy (survey) to find the answer.
3. Write questions that will provide data to answer the question.
4. Collect data

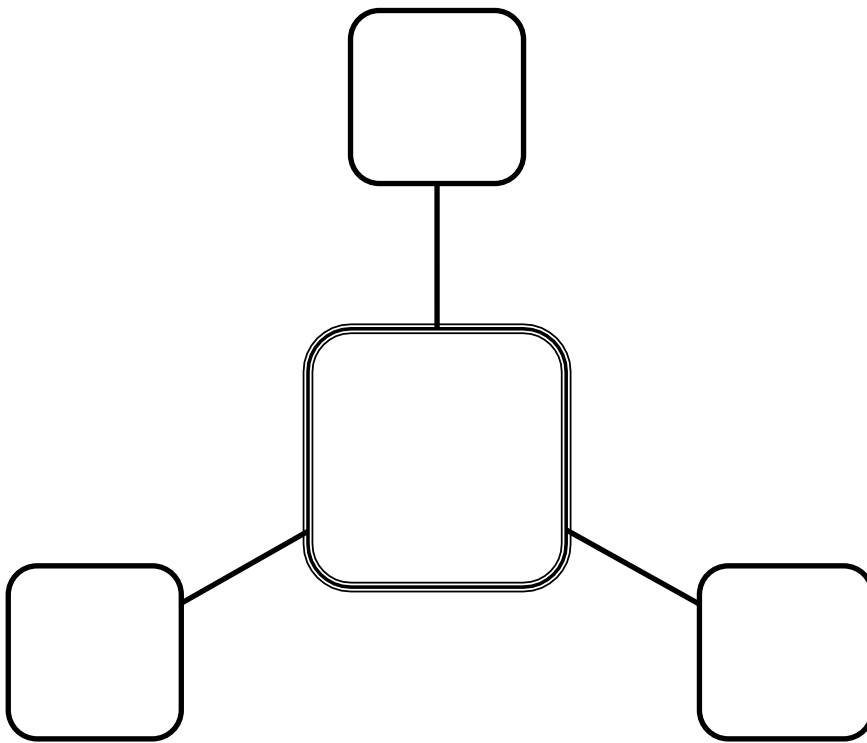
5. Analyze the data
6. Tell the story or answer the BIG question using the data

Participatory Sensing Campaign Kickoff

Team members

1. Recorder:
2. –
3. –
4. –

Add the topic for your Participatory Sensing Campaign in the center square. Add related concepts to the smaller squares. Add more shapes to add additional sub-concepts. Be sure to link/group related ideas.



BIG Question	Data Variables

BIG Question Ideas:

Topic Description:

This lesson prepares teams to write their final survey campaign by guiding them through a Test Campaign for the class topic. Critical elements of this lesson include designing and implementing creative solutions and artifacts by applying abstractions and models. The tasks include helping students to breakdown their BIG question into the variables they will need in the data analysis phase of the project and writing clear, concise prompts that will elicit the variable values. They will upload a Test Campaign to the Mobilize server and share phones to respond to the survey prompts for a few days (jump to Unit 5 during this time).

Objectives:

The student will be able to:

- Review traits of “good” survey questions.
- Write questions for a Test Campaign.
- Create the XML document.
- Upload the XML survey file to Mobilize server.
- Run the campaign for a few days.

Outline of the Lesson:

- Discuss traits of “good” survey questions (10 minutes).
- Modify the My First Survey file (25 minutes).
- Upload to the Mobilize server (15 minutes).
- Journal entry: How does the data you plan to gather with this Test Campaign relate to the larger data set on this topic?
- Homework: Share phones and enter data in the Test Campaign survey.

Student Activities:

- Review traits of “good” survey questions.
- Each team writes 4–5 survey questions.
- Copy, paste, and modify the content of the First Survey.
- Upload to the Mobilize server (15 minutes).
- Journal entry: How does the data you plan to gather with this Test Campaign relate to the large class campaign data set you viewed at the beginning of this project?
- Homework: Share phones and enter data in the Test Campaign survey.

Teaching/Learning Strategies:

- Review the traits of “good” questions for effective surveys that will reveal the information needed to answer BIG questions. Use content from <http://www.shmoop.com/basic-statistics-probability/designing-study.html>. (Originally used in PS Supplement Lesson 2.)
- Guide each team to write 4–5 survey questions with the variables that they believe will help them answer their BIG questions. Refer to their work during Lesson 5.

- Open My First Survey file to use as a template. The team can copy, paste, and modify the content to fit their questions. They should save as Test Campaign plus some identifying initials. Be sure they change the metadata at the top of the XML file to reflect the name.
- Demonstrate how to upload to the Mobilize server. Allow teams time to upload their surveys and test them on the phones.
- Journal entry: How does the data you plan to gather with this Test Campaign relate to the large class campaign data set you viewed at the beginning of this project?
- Assign homework: Share phones and enter data in the Test Campaign survey.

NOTE: While students are gathering data using their Test Campaign, jump to Unit 5. Provide opportunities for students who do not have phones to enter their data using the Mobilize web frontend. Suggestion: You can skip days 1, 3, 4, 5, 6 of Unit 5. One of the goals in Unit 5 is for students to become proficient with RStudio or other data analysis tool so that they will be able to independently analyze the data from the class survey campaign. The class survey campaign will be constructed in Lessons 7 and 8 of this XML Supplement.

Required Files and Resources:

- Designing a Study <http://www.shmoop.com/basic-statistics-probability/designing-study.html>

Student activity documents are included as pages within the text of this lesson document:

- My First Survey.xml

Other Resources:

- Mobilize wiki <https://github.com/cens/ohmageServer/wiki/Campaign-Definition#wiki-definition>
- Windows: [notepad++](http://notepad-plus-plus.org/) <http://notepad-plus-plus.org/>
- Mac OS: [Text Wrangler](http://www.barebones.com/products/textwrangler/) <http://www.barebones.com/products/textwrangler/>

Topic Description:

This lesson will provide practice opportunities for students to become comfortable manipulating and transferring data with Mobilize Web Frontend and RStudio using the small amounts of data gathered with the Test Campaign. They will be involved in analyzing the computational work of the team and communicating their thought processes as they evaluate the effectiveness of their Test Campaign survey questions. The results from the Test Campaign; their evaluation of its effectiveness; and predictions of what could be learned and possible impacts of scaling the campaign, will enable students to reflect upon the relevance of computer science and its impact on society.

Objectives:

The student will be able to:

- Create charts of the Test Campaign data in Mobilize.
- Export the data to RStudio.
- Create charts and conduct other analysis of the Test Campaign data in RStudio.
- Evaluate the Test Campaign questions to determine if they were easily understood and elicited the data they had planned on gathering.
- Predict how useful the data would be in answering the BIG question if the survey items were scaled to the whole class.
- Revise the questions to better fit the goal of answering the BIG questions.

Outline of the Lesson:

- Analyze of the Test Campaign data in Mobilize Web Frontend. (15 minutes)
- Analyze of the Test Campaign data in RStudio. (15 minutes)
- Evaluate the effectiveness of the test questions. (5 minutes)
- Predict how useful the data will be in answering the BIG question if the survey items were scaled to the whole class. (5 minutes)
- Revise the survey questions. (10 minutes)

Student Activities:

- Plot charts of the Test Campaign data in Mobilize Web Frontend.
- Export the data to RStudio.
- Create charts and conduct other analysis of the Test Campaign data in RStudio.
- Evaluate the test questions to determine if they were easily understood and elicited the data they had planned on gathering.
- Predict how useful the data would be in answering the BIG question if the survey items were scaled to the whole class.
- Revise the questions to better fit the goal of answering the BIG questions.

Teaching/Learning Strategies:

- Guide students to create charts of the Test Campaign data in Mobilize Web Frontend. Allow students to rely upon their team members and other resources such as the Mobilize Web Frontend Step-by-Step and help files.
- Export the data to RStudio.

- Create charts and conduct other analysis of the Test Campaign data in RStudio. Again, allow students to rely upon their team members and other resources.
- Evaluate the test questions to determine if they were easily understood and if they elicited the data they had planned on gathering.
 - This step involves the computational practice of communicating thought processes and results. Prompting them with questions such these will help:
 - Why do you think this question worked well to elicit the response you were after?
 - What made you think that this question (that wasn't effective) would elicit the response you were after? How can you modify it to be more effective?
 - See the **Evaluating the Test Campaign** activity document.
- Predict how useful the data would be in answering the BIG question if the survey items were scaled to the whole class.
- What conclusions, if any, can be drawn from the Test Campaign data?
 - What do you predict you will learn when this campaign is scaled to the entire class? What additional insights might you learn if it was scaled to the entire school? All students in the state? In the US? In the world?
 - What actions might result from what is learned?
- Revise the questions to better fit the goal of answering the BIG questions. The revised questions will be combined on XML Lesson 8 with the questions of all of the classroom teams for the final survey campaign.

Required Files and Resources:

- Mobilize Web Frontend and application
- RStudio

Student activity documents are included as pages within the text of this lesson document:

- Evaluating_the_Test_Campaign.doc

Other Resources:

None.

Evaluating the Test Campaign

Team members:

What is your BIG question?

CREATE PLOTS IN MOBILIZE WEB FRONTEND

What plots did you create?	What story did they tell?

ANALYZE THE DATA IN RSTUDIO

What analysis did you perform?	What conclusions can you draw from the analysis?

ANALYZING THE QUESTIONS

List one question that worked well to elicit the information you were after.	Why was it effective?

List one question that did not work as intended.	What made you think it would work when you first wrote it?
Rewrite that question to be more effective.	

CONCLUSIONS What conclusions, if any, can be drawn from the Test Campaign data?

PREDICTIONS

What will be learned when this campaign is scaled to the entire class?	
What would be learned if scaled to the entire school?	
To all students in the state?	
To all students in the US?	
To all students in the world?	
What actions could result from what	

is learned?	
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REVISIONS Revise the survey questions to better answer the BIG question. Write the questions below.

Topic Description:

This lesson will be the culmination of all of the students' work in designing and implementing creative solutions with technology. The individuals and teams will need to work effectively to combine and condense all questions from all teams into an effective survey that will gather the data needed to answer every team's BIG question and demonstrate technology as a tool for solving problems. Students will contribute data that can be used to answer the BIG questions by participating in the Final Campaign for several weeks during which work in Unit 5 will resume.

Objectives:

The student will be able to:

- Reflect on the value and process of consensus.
- Contribute to the creation of the Final Campaign by:
 - Sharing ideas.
 - Analyzing their computational work and others.
 - Communicating thought processes effectively.
 - Listening and understanding the needs of others.
 - Cooperating to build consensus.

Outline of the Lesson:

- Journal entry: What is consensus? Why is it valuable in team projects? How do individual team members help build consensus? (5 minutes)
- Gather team questions. (5 minutes)
- Guide teams to select, condense, and revise the questions from their teams to form the Final Campaign. (40 minutes)

Student Activities:

- Journal entry: What is consensus? Why is it valuable in team projects? How do individual team members help build consensus?
- Build consensus to select, condense, and revise the questions into the class Final Campaign.
- Verify that each team's questions/variables are included in the list of Final Campaign prompts.

Teaching/Learning Strategies:

- Journal entry: What is consensus? Why is it valuable in team projects? How do individual team members help build consensus?
- Build consensus to select, condense, and revise the questions into the class Final Campaign. There are several strategies that can be used to complete this task as efficiently as possible through consensus. The goal is to have a set of questions that can be combined into a single survey that will enable all teams to analyze the variables they need to answer their BIG questions.
 - Each team writes each of their prompts/questions, possible responses for multiple or single choice prompts, and the variable name on 8.5 X 11 inch sheets of paper (one prompt and variable per sheet).
 - Group the members of 2 or 3 teams together so that they can spread the pieces of paper such that each team member can see all of the prompts.

- A spokesperson for each team should share the team's BIG question and state why each of the variables/prompts is important to their research.
- The teams then look for duplication in questions, rewriting duplicates into a final question that all members of the teams can agree upon. The teacher may need to intervene in disagreements and guide consensus building.
- Repeat the process by combining these refined questions from all teams. The spokesperson of each team will be the active participant in working to build consensus among all teams. The prompts in round two can be displayed on the wall. Only the spokesperson for each group can talk.
- If the class is smaller or there are several campaign topics, the process can be compressed into just one round of consensus building.
- Each team convenes to verify that their prompts and variables are represented in the list of Final Campaign prompts.
- At this point, designate a student to create the final survey XML file and upload to the Mobilize server. When the process is completed in a day or so verify that all students can access the survey.
- Set check-in dates and periodically remind students of their survey and sharing responsibilities.
- Return to Unit 5.

Required Files and Resources:

- None

Other Resources:

- None

XML Lesson: 9

[Back to Unit Overview Chart](#)

Topic Description:

This lesson will guide students to analyze data from class Final Campaign, create graphs to illustrate their findings, and draw conclusions that will attempt to answer their BIG questions. Students will compare their data to the contextual data of the larger data set to connect their computation with the discipline/topic of the class campaign topic. A rubric will guide students to analyze their computational work and the work of others.

Objectives:

The student will be able to:

- Draw conclusions from the data gathered in the class Final Campaign.
- Answer the team BIG question. Defend the answer citing data.
- Identify the connection between their computational work and the discipline of the Final Campaign topic.
- Analyze their computational work and the work of others.
- Evaluate the team and individual performance using a team-created rubric.
- Speculate on how the gathered information could be used to solve associated problems.
- Predict how scaling the campaign could generate additional information.

Outline of the Lesson:

- Create charts and draw conclusion from the class Final Campaign using **Final Campaign Summary** activity. (25 minutes)
- Write a summary to the team's BIG question using the **Final Campaign Summary** activity. (10 minutes)
- Evaluate their individual and team performance with a rubric. (15 minutes)

Student Activities:

- Create charts and draw conclusion from class Final Campaign.
- Write a summary to the team's BIG question.
- Evaluate their individual and team performance.

Teaching/Learning Strategies:

- Distribute the **Final Campaign Summary** activity document. Instruct students to create charts, draw conclusions, and answer the BIG questions using data from the class Final Campaign according to the instructions on the activity document.
- Distribute the **Final Campaign Rubric**. Point out the project expectations and answer questions.
- Homework: Instruct students to evaluate their individual and team performance with the rubric.
 - Collect after the conclusion of the website production or other presentation.

Required Files and Resources:

Student activity documents are included as pages within the text of this lesson document:

- Final_Campaign_Summary.doc
- Final_Campaign_Rubric.doc

Other Resources:

None

Final Campaign Summary

Team members:

Plan to communicate these elements in your website or presentation.

Conclusions

What conclusions can you draw from the data you collected and the analysis of that data?

1. –
2. –
3. –
4. –

List the charts to include. Be sure they illustrate the conclusions drawn from the survey. Include labels and informative headings.

1. –
2. –
3. –
4. –

The BIG question

What is your BIG question?

- –

Answer the question.

- –

Defend the answer citing data.

- –

Scaling

- Predict how scaling the campaign could generate additional information. Identify surveyed groups and/or campaign changes.

Solving problems using your research

- Speculate on how the information you gathered could be used to solve associated problems.
- Imagine how other problems associated with this topic or related topics could be addressed by asking different questions or using similar technology?

Final Campaign Rubric

Team members:

Use this rubric to evaluate how successfully your team communicated the conclusions of your research.

	Points Possible	Points Earned	Justify the score
Does your website or presentation:			
Include 2 or more descriptive well-labeled plots that complement/reinforce the story?	5 pt each (20 pt max)		
Answer the BIG question?	10		
Tell a story based on your data? (How does this data support your story?)	10		
Predict how scaling the campaign could generate additional information?	5		
Address how this data could impact others or make a difference?	5		
Predict how the information gathered could be used to solve problems?	5		
Speculate on how other problems associated with this topic or related topics could be addressed by asking different questions?	10		
Connect discovered data to larger data set?	10		
Include other visuals that add to the story being told?	5		
Include data from an outside source that supports your story?	5		
Describe/list the survey questions?	5		
Describe the respondents (how many and population traits such as age, etc.)?	5		
Speculate on the validity of the data?	5		
Include a description of what you learned in this unit (analysis techniques, etc.)?	10		
Total	100 – 120		

Topic Description:

- This lesson guides students to communicate their analysis of the Final Campaign data on the website created in Unit 3. The emphasis is on communicating their thought processes and results, the connection between computation and the topic of the campaign, and how the information they generated could be used for creative solutions to problems associated with the campaign topic.

Objectives:

The student will be able to:

- Report the findings of their research on the website or other presentation format

Outline of the Lesson:

- Add content to the team website project from Unit 3 with defined headings.(50 minutes)

Student Activities:

- Add content to the team website project from Unit 3 with these headings:
 - Conclusions: Display charts that illustrate conclusions drawn from the survey. Include labels and informative headings.
 - BIG Question: State and answer the BIG question. Defend the answer citing data.
 - Scaling: Predict how scaling the campaign could generate additional information. Identify surveyed groups and/or campaign changes.
 - Connect the gathered data to the larger data set.
 - Solving Problems: Speculate on how the information gathered could be used to solve associated problems. Imagine how other problems associated with this topic or related topics could be addressed by asking different questions or using similar technology?

Teaching/Learning Strategies:

- Teams can use the **Final Campaign Summary** as a guide for including their data into their website or presentation.
 - Conclusions: Display charts that illustrate conclusions drawn from the survey. Include labels and informative headings.
 - BIG Question: State and answer the BIG question. Defend the answer citing data.
 - Scaling: Predict how scaling the campaign could generate additional information. Identify surveyed groups and/or campaign changes.
 - Make Connections: Connect the gathered data to the larger data set.
 - Solving Problems: Speculate on how the information gathered could be used to solve associated problems. Imagine how other problems associated with this topic or related topics could be addressed by asking different questions or using similar technology?
- Guide teams as they communicate their findings on their website or other presentation.
- Collect the **Final Campaign Rubric** at the end of the production of their website or other presentation on the final campaign.

Required Files and Resources:

- Refer to the **Final Campaign Summary** and **Final Campaign Rubric** from Lesson 9.

Other Resources

- None