



# Focus Sheets: Units 1-3

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

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## **Mobilize Prime Focus Sheets**

### **Introduction**

Managing and interpreting data—in a variety of volume, types, and velocity—is part of the foundation of our information society and the economy. The abilities to analyze, visualize, and draw conclusions from data sets are important exercises of citizenship. Exciting new developments in mobile technology are enabling individuals to become active participants—citizen scientists—in the roles of data scientists. Individuals, spontaneous groups of people who self-organize, and community organizations can gather and analyze data, and create understandings 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.” The Participatory Sensing units detailed in the Mobilize Prime curriculum incorporate a variety of skills and knowledge that characterizes a “doer” of math and science. These included: problem formulation, computational strategies and algorithmic design, computer implementation, software sharing, teamwork, and basic research, analytical and technical skills. We believe this portrayal of a scientist and mathematician as someone who is engaged in multiple aspects of doing is important to attract and support diverse students.

Mobilize Prime includes two supplements to the Exploring Computer Science Curriculum: Participatory Sensing Supplement (before Unit 3) and XML Supplement (within Unit 5).

The Participatory Sensing (PS) unit has been designed to provide students the opportunity to experience the process of “being a citizen scientist” in real-world contexts by designing and implementing surveys, and managing and interpreting data.

The XML Supplement encourages 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 and develop understanding. Students 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.

Focus Sheets for Units 1, 2, and 3, support teachers as they build their students capacity for success in Mobilize Prime Supplements. Students who are prepared to think about data concepts including data gathering, data validity, data exploration and manipulation, and combining data to discover new knowledge, will more easily learn and retain knowledge from their experiences within the Supplements. The suggestions found in each Focus sheet “tweak” lesson activities to refocus and spotlight concepts related to the foundational knowledge necessary for future learning in Mobilize Prime.

While “data science” is a very complex topic, it can be approachable and engaging at even the most basic level. The goal is to incrementally build student understanding and skills toward their eventual work in PS and data analysis projects. The goals of each lesson remain unchanged. The introduction of basic data concepts will create a scaffold on which students will build their learning while achieving lesson goals and objectives. Use a spiraling process to build the scaffold; begin with very basic ideas about a concept that students can easily accommodate and assimilate into their understanding, and repeatedly re-visit concepts with progressively more complexity to add layers of and depth to their understanding and skills.

Include these data concepts:

### **What is data?**

Begin with their experiences of seeing spreadsheets or sports tallies typically comprised of numbers. Expand their understanding of data to include words, images, sounds, dates, and other values that can be stored and analyzed for meaning and relationships. Spiral to include the data that scientists gather to study phenomena and solve problems related to nature, medicine, social interactions, economics, and more. This step is important because students will become “citizen scientists” in the Mobilize Prime projects.

### **How is data generated?**

Begin with data that students might have intentionally recorded (sports stats, library records, journals, grades, game scores, budgets). Expand to other intentionally recorded data (images from their cameras, audio). Talk about data that is automatically generated that they might or might not be aware of (the use of a library card, internet use, school security system). Expand this to include other automated and embedded data collection systems (geographic location from their cell phone or automobile; automobile performance-tracking systems; their timed images captured with ATMs, retail stores, transit-system and traffic-control cameras; their location associated with credit or debit card use; health conditions from medical devices; as well as data collected in industries and business). Spiral this concept to include the sensors that scientists use for gathering data to conduct research and solve problems (weather, tides, earth quakes, animal migration, emissions/pollution, water use, air/auto/pedestrian traffic). Inform students that they will become citizen scientists when they gather and analyze data using PS strategies in their team projects later in the course.

### **How can data be used?**

Begin with decisions students personally make or have witnessed based upon gathered data (their school work/effort, spending and savings, a coach’s selection of team players to participate in an event). Include family decisions that are made based upon data. Expand this to discuss decisions made by others with data that is automatically collected that students might not be aware of (traffic control, store inventories, business decisions, security patrols). Spiral the concept to discuss discoveries made and problems solved by scientists using huge quantities of data (weather prediction, earthquake warning systems, engine efficiency, climate changes, sea level changes, curing diseases, mapping the human brain). Remind them that they will also make discoveries and solve problems in their PS projects.

### **What makes data understandable?**

Begin with simple images, graphs, and charts that students have seen or created that “show” meaning from data (line, bar, circle charts). Expand to more complex mosaic and bubble charts. Spiral to interactive and other type of images seen in some of the videos and resources. Relate the various graphics to the complexity of the data.

### **How does data collection impact privacy issues?**

Begin with discussions about students’ expectations about the privacy of their grades or medical records. Expand to assumptions students hold about the privacy of data generated when using their phone or social media. Look at other assumptions about privacy related to data collected without their knowledge (cell phone location data, traffic/business camera data, online browsing and shopping data). Spiral to discussions about situations when limited personal privacy might be acceptable (perhaps in

apprehending thieves) and when it is not (perhaps eaves-dropping on law-biding citizens). Who owns what data? Where is the line between acceptable and unacceptable use of personal data? How do citizens in our society determine the line? What can be done to protect personal privacy? These topics require serious discussions.

### Resources

The resources below are suggested as preparation for discussions about data throughout the curriculum. Some of these resources may be valuable for use by students, also. A “flipped classroom” strategy may be useful. Assign students to view selected videos or explore interactive sites outside of the class time. Prepare them with one or two prompts to focus their attention and prepare them for discussion during class. Specific recommendations are included within the following suggested lesson modifications. Preview all resources prior to student use.

### Videos

- Eric Berlow: Simplifying Complexity. A 3-minute demonstration of how to make complexity (of data) manageable. <http://fellows.ted.com/profiles/eric-l-berlow>
- Jer Thorp: *Make Data More Human*  
Thorp creates beautiful data visualizations to put abstract data into a human context. At TEDxVancouver, he shares his moving projects, from graphing an entire year’s news cycle, to mapping the way people share articles across the internet. He emphasizes building tools to solve problems using data. [http://www.ted.com/talks/jer\\_thorp\\_make\\_data\\_more\\_human.html](http://www.ted.com/talks/jer_thorp_make_data_more_human.html)
- *Making Sense of Too Much Data* (10 TED talks)  
Explore the concept of data through the short presentations of 10 researchers. Learn about data as it relates to visualization, social media, human-computer cooperation, and much more. These are very engaging videos and provide valuable information on data, research, and data imagery. [http://www.ted.com/playlists/56/making\\_sense\\_of\\_too\\_much\\_data.html](http://www.ted.com/playlists/56/making_sense_of_too_much_data.html)
- *Listen-n-feel: An Emotion sensor on the phone using speech processing*  
<http://www.nydailynews.com/news/national/smartphone-mood-article-1.1213451>  
<http://research.microsoft.com/apps/video/dl.aspx?id=152567> (video)

### Citizen Scientist Projects

UCLA High School Scholars program (<http://research.cens.ucla.edu/education/highschoolsolars/>)

- Water Busters  
<http://research.cens.ucla.edu/education/highschoolsolars/2009/docs/WaterBusters.pdf>
- UC Explorers  
<http://research.cens.ucla.edu/education/highschoolsolars/2009/docs/UCExplorers.pdf>
- Bird Watch <http://research.cens.ucla.edu/education/highschoolsolars/2010/docs/bird-watch.pdf>
- Invasive Plant Identification  
<http://research.cens.ucla.edu/education/highschoolsolars/2010/docs/automated-image-classification.pdf>
- Sign Whine (damaged signs)  
<http://research.cens.ucla.edu/education/highschoolsolars/2010/docs/sign-whine.pdf>

- Healthy Hiking Path  
<http://research.cens.ucla.edu/education/highschoolsolars/2010/docs/healthy-path.pdf>
- Save It! (energy conservation)  
<http://research.cens.ucla.edu/education/highschoolsolars/2010/docs/save-it.pdf>
- Help the Homeless  
<http://research.cens.ucla.edu/education/highschoolsolars/2011/docs/HelpTheHomeless.pdf>
- More information on UCLA CENS research  
<http://research.cens.ucla.edu/sen/>

### **More Citizen Scientist Projects**

- California Roadkill Observation System (CROS)  
[http://www.wildlifecrossing.net/california/doc/about\\_cros](http://www.wildlifecrossing.net/california/doc/about_cros)
- Citizen Scientists (a variety of environmental science projects)  
<http://www.citizenscientists.com/examples/>
- Scientific American (a variety of projects)  
<http://www.scientificamerican.com/citizen-science/>
- National Science Foundation (a variety of projects)  
[http://www.nsf.gov/news/special\\_reports/science\\_nation/citizenscience.jsp](http://www.nsf.gov/news/special_reports/science_nation/citizenscience.jsp)

### **Interactive Data imagery**

- Gapminder (teacher resources, video, downloadable data and interactive graph)  
<http://www.gapminder.org/for-teachers/>
- Information is Beautiful (many graphs – some interactive and many have data sets)  
<http://www.informationisbeautiful.net/>
  - See the graph of US budget “Billion Dollar-o-Gram 2013 here:  
<http://www.informationisbeautiful.net/visualizations/billion-dollar-o-gram-2013/>
  - See data SS here:  
<https://docs.google.com/spreadsheets/ccc?key=0Aqe2P9sYhZ2ndGxWNjVKQmNcVIR3Q0JkZmF4WmV4SEE>
  - Goes with this video: Goes with this video: David McCandless: The beauty of data visualization [http://www.ted.com/playlists/56/making\\_sense\\_of\\_too\\_much\\_data.html](http://www.ted.com/playlists/56/making_sense_of_too_much_data.html)
- Flight Traffic (animation based upon flight data) [http://flightaware.com/analysis/allflights\\_movie.rvt](http://flightaware.com/analysis/allflights_movie.rvt)
- Baby Name Wizard <http://www.babynamewizard.com/>
- Maze Generator <http://www.mazegenerator.net/>

## Mobilize Prime Focus Sheet Unit 1

**Focus:** Data, the power of mobile phones, and making data understandable

Suggestions include ideas for including concepts about data science; and mobile communication and computing; privacy.

More than one suggestion is provided for some days. Select the lesson modification(s) to fit student and class needs.

### Unit 1 - Days 1–2

Cell phones have become powerful tools. In addition to communication, they provide opportunities for collecting a variety of data. Some of the data is collected by action of the user; other data is collected by virtue of features and settings on the phone.

Lesson Activity	Modification
Journal entry	<ul style="list-style-type: none"> <li>In what ways is a cell phone a computer?</li> </ul>
Exploring computers	<ul style="list-style-type: none"> <li>Have a brief discussion of the power of cell phones. Ask students to share new/upcoming phone features that they have heard about.</li> </ul>
Classification	<ul style="list-style-type: none"> <li>Have student groups (3 or 4) create a list of various examples of data that a cell phone can be used to send/receive and save. Add to the list examples of data that can be generated or collected by a cell phone? Who can see each type of data?</li> <li>Share some of the student PS citizen scientists projects listed under “Citizen Scientist Projects” in the Resources list. Talk about the data collected.</li> <li>Discuss with students the various ways in which they are aware of data being collected by their phones.</li> <li>Some phone companies are track user locations, movements, and web-browsing habits, and selling the aggregate (not individuals’) data to marketing companies and other businesses. Phone companies can keep a record of the calls, messages, and emails sent for up to 6 months. Discuss the privacy issues related to this. Discuss when such tracking and records might be “good” thing and when it might be a “bad” thing.</li> </ul>
Defining terms	<ul style="list-style-type: none"> <li>What is data and where does it come from? (automatically generated and user-generated)</li> </ul>
Computer buying project	<ul style="list-style-type: none"> <li>Add cell phone as a choice for this assignment.</li> <li>Modify the “Computer Buying Project” document to include the names two phones. Change the features listed in the chart.</li> <li>Modify the “Computer Components Checklist” document to include cell phone features. An easy-to-use list of features, as well as definitions, can be found at <a href="http://cellphones.about.com/library/graphics/blguide.htm">http://cellphones.about.com/library/graphics/blguide.htm</a>. Students can use this site as a reference when comparing phones.</li> </ul>
Extra activity	<ul style="list-style-type: none"> <li>Use a Flipped Classroom strategy:</li> <li>View (Malte Spitz: <i>Your phone company is watching</i>) a TED Talk on cell phones and data prior to this lesson. Engage students by asking them to think about these questions:</li> </ul>

	<ul style="list-style-type: none"> <li>• What can be learned from phone records about a user?</li> <li>• What can be learned from combining user records?</li> <li>• How do you feel about this capability? Can this technology be good and bad?</li> <li>• Invite them to share their ideas during the “Classification” activity.</li> <li>• See current US phone privacy laws: <a href="https://www.privacyrights.org/fs/fs2b-cellprivacy.htm#serviceprovider">https://www.privacyrights.org/fs/fs2b-cellprivacy.htm#serviceprovider</a></li> </ul>
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**Unit 1 - Days 3–4**

Students complete hardware research with mobile phone as an option. Modify activity documents as suggested above.

**Unit 1 - Days 5–7**

Lesson Activity	Modification
<p>Learning Strategies:</p> <ul style="list-style-type: none"> <li>• Scavenger hunt</li> <li>• Other resources for finding information</li> <li>• Experimentation with resources</li> </ul>	<ul style="list-style-type: none"> <li>• Guide students to find data about their community. Combine the learning strategies to focus on finding data about their community by “indexing” according to zip code. In addition to the sites listed, include sites that provide “raw data” in the form of CSV (common separated lists), spreadsheets, XML, etc.</li> <li>• Modify the list of scavenger hunt items to include the topics listed below (all filtered by zip code or city). <ul style="list-style-type: none"> <li>○ Toxic waste releases <a href="https://explore.data.gov/Environment/EPA-Toxics-Release-Inventory-Program/wma8-v5fi">https://explore.data.gov/Environment/EPA-Toxics-Release-Inventory-Program/wma8-v5fi</a> (zip code)</li> <li>○ Tomorrow’s forecast (National Weather Service) <a href="http://www.weather.gov/">http://www.weather.gov/</a> (zip code)</li> <li>○ Crime statistics map <a href="http://www.trulia.com/crime/">http://www.trulia.com/crime/</a> (city)</li> <li>○ Earthquake reporting <a href="http://earthquake.usgs.gov/earthquakes/dyfi/">http://earthquake.usgs.gov/earthquakes/dyfi/</a> (filter location of earthquake reporters by zip code. Data files available here: <a href="http://www.data.scec.org/research-tools/index.html">http://www.data.scec.org/research-tools/index.html</a>)</li> <li>○ Search for a variety of demographic info at US Census bureau <a href="http://www.census.gov/epcd/www/zipstats.html">http://www.census.gov/epcd/www/zipstats.html</a></li> <li>○ Endangered species <a href="http://www.enature.com/zipguides/">http://www.enature.com/zipguides/</a> (zip code)</li> </ul> </li> <li>• Add an open-ended task to the scavenger hunt—“Find and record five additional data located by indexing using zip code.”</li> <li>• Discuss the organizations or agencies who are among “data publishers” used in this activity.</li> <li>• For deeper and more complex exploration visit: <a href="http://catalog.data.gov/dataset">http://catalog.data.gov/dataset</a>. Search by zip code by entering zip code into “Filter by location” field. Explore various data sets. XML files typically can be viewed and manipulated in the browser.</li> </ul>
<p>Website evaluation</p>	<ul style="list-style-type: none"> <li>• Add the following questions under the “Accuracy”:</li> <li>○ Is the information supported by data?</li> </ul>

	<ul style="list-style-type: none"> <li>○ Are any graphs or other images used to illustrate the data easily understandable?</li> <li>○ Is there a link to the original data source?</li> </ul>
Extra activity	<ul style="list-style-type: none"> <li>• Explore the following sites or other web data interfaces. These services present data in interesting and engaging forms. What story does the image tell? What do you think the “raw data” looks like? <ul style="list-style-type: none"> <li>○ Flight Traffic (animation based upon flight data) <a href="http://flightaware.com/analysis/allflights_movie.rvt">http://flightaware.com/analysis/allflights_movie.rvt</a></li> <li>○ Baby Name Wizard <a href="http://www.babynamewizard.com/">http://www.babynamewizard.com/</a></li> </ul> </li> </ul>

### Unit 1 - Days 8–9

Lesson Activity	Modification
Identification of communication mechanisms	<ul style="list-style-type: none"> <li>• Add a method to the top of the “Communication Methods Chart:” <ul style="list-style-type: none"> <li>○ Mobile app for recording and sending data</li> </ul> </li> <li>• Add 2 scenarios to the chart: <ul style="list-style-type: none"> <li>○ Send details of spotting a unusual bird to a scientific researcher</li> <li>○ Record family recycling efforts</li> </ul> </li> </ul>
Impact of changes to communications	<ul style="list-style-type: none"> <li>• Add a question for discussion: Individuals who participate in data gathering are called “citizen scientists.” How can citizen scientists impact discoveries and improve our lives? List 3 additional research topics for which the observations of citizen scientists would be valuable.</li> <li>• Share topics from the Resources listed under “More Citizen Scientist Projects.”</li> </ul>
Add a Flipped Classroom activity	<ul style="list-style-type: none"> <li>• Assign students to view the TED Talk video, “Malte Spitz: <i>Your phone company is watching</i>” (<a href="http://www.ted.com/playlists/56/making_sense_of_too_much_data.htm">http://www.ted.com/playlists/56/making_sense_of_too_much_data.htm</a>)</li> <li>• Assign small groups of students to read and report on sections of the following website: <a href="https://www.privacyrights.org/fs/fs2b-cellprivacy.htm">https://www.privacyrights.org/fs/fs2b-cellprivacy.htm</a>.</li> </ul>
Privacy activity	<p>Add the following scenarios to the “Privacy Activity” document:</p> <ul style="list-style-type: none"> <li>• A college student is questioned by police after he made several phone calls to fellow students from a country known as a “terrorist haven” as a part of a research project.</li> <li>• A teenager’s parents use “Chaperone” phone application which texts parents when their child leaves parentally-designated geographic boundaries.</li> <li>• An industry lobbies to make it easier to get the location data of mobile technology users so that customized advertisements can be sent to users when they are physically in the area of a specific store or restaurant.</li> </ul>

### Unit 1 - Day 10

Lesson Activity	Modification
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Journal Entry	<ul style="list-style-type: none"> <li>Ask: What does data look like?</li> </ul> <p>The goal is to have students think about “raw” data that might be numeric values and data that is represented in other graphic forms (charts, interactive elements, images, etc.). Students will have “seen” data represented in many forms during the previous nine days.</p>
Homework	<ul style="list-style-type: none"> <li>Add a column to the “Data Journal” document for the student to record if the data they generated was “automatically” generated (image taken at the convenience store, cell phone location and other data, toll booth passage) or was “intentionally” generated (used a camera, purchased something online, used an ATM, update a social networking site).</li> </ul> <p><b>Note:</b> The content of the “Communication Methods and Data Chart” to be used for day 10 was originally modified for its initial use on days 8–9. Add the following content if necessary:</p> <p>Add a method to the top of the “Communication Methods Chart:”</p> <ul style="list-style-type: none"> <li>Mobile app for recording and sending data</li> </ul> <p>Add 2 scenarios to the chart:</p> <ul style="list-style-type: none"> <li>Send details of spotting a unusual bird to a scientific researcher</li> <li>Record family recycling efforts</li> </ul>

#### Unit 1 - Days 11–14

Lesson Activity	Modification
Design Tool activity and research	<ul style="list-style-type: none"> <li>Reduce this activity to three days.</li> </ul>
Add a “flipped classroom” activity	<p>Assign students to view 3 videos from the listed Resources not previously seen.</p> <p>Prepare students with anticipatory prompts.</p> <ul style="list-style-type: none"> <li>What problem/solution is discussed?</li> <li>How is data involved in this problem/solution?</li> <li>How is data “illustrated” in this problem/solution?</li> <li>What is the interaction between technology and humans to solve this problem?</li> <li>What discoveries were made by examining or manipulating the data?</li> </ul>
Class Activity	<ul style="list-style-type: none"> <li>View the video: David McCandless: The beauty of data visualization <a href="http://www.ted.com/playlists/56/making_sense_of_too_much_data.html">http://www.ted.com/playlists/56/making_sense_of_too_much_data.html</a></li> <li>Explore “Information is Beautiful” site <a href="http://www.informationisbeautiful.net/">http://www.informationisbeautiful.net/</a></li> <li>See the graph of US budget “Billion Dollar-o-Gram 2013 here: <a href="http://www.informationisbeautiful.net/visualizations/billion-dollar-o-gram-2013/">http://www.informationisbeautiful.net/visualizations/billion-dollar-o-gram-2013/</a>. See data file here: <a href="https://docs.google.com/spreadsheet/ccc?key=0Aqe2P9sYhZ2ndGxWNjVKQmNCVIR3Q0JkZmF4WmV4SEE">https://docs.google.com/spreadsheet/ccc?key=0Aqe2P9sYhZ2ndGxWNjVKQmNCVIR3Q0JkZmF4WmV4SEE</a></li> <li>Allow students to explore other graphs on the site.</li> <li>Explore GapFinder <a href="http://www.gapminder.org/for-teachers/">http://www.gapminder.org/for-teachers/</a></li> </ul>

### Mobilize Prime Focus Sheet Unit 2

**Focus:** Aggregated data, digitization, individuals as data collectors, solving community problems

More than one suggestion is provided for some days. Select the lesson modification(s) to fit student and class needs.

**Unit 2 - Days 1–2**

Lesson Activity	Modification
Sharing Communications Methods and Data Chart	<p><b>Note:</b> The content of the “Communication Methods and Data Chart” to be used for day 1 was originally modified for its initial use in Unit 1. Add the following content if necessary:</p> <p>Add a method to the top of the “Communication Methods Chart:”</p> <ul style="list-style-type: none"> <li>• Mobile app for recording and sending data</li> </ul> <p>Add 2 scenarios to the chart:</p> <ul style="list-style-type: none"> <li>• Send details of spotting a unusual bird to a scientific researcher</li> <li>• Record family recycling efforts</li> </ul>
Data Journal Class Discussion	<p><b>Note:</b> The content of “Data Journal” document was modified in Unit 1 for the student to record if the data they generated was “automatically” generated (image taken at the convenience store, cell phone location and other data, toll booth passage) or was “intentionally” generated (used a camera, purchased something online, used an ATM, update a social networking site).</p> <ul style="list-style-type: none"> <li>• Replace the articles about aggregate search data with one of these TED Talk videos if it wasn’t used in Unit 1.  <a href="http://www.ted.com/playlists/56/making_sense_of_too_much_data.htm">http://www.ted.com/playlists/56/making_sense_of_too_much_data.htm</a> <ul style="list-style-type: none"> <li>○ “Jamie Heywood: <i>The big idea my brother inspired</i>” (amazing application of aggregate data – associated site: PatientsLikeMe <a href="http://www.patientslikeme.com/">http://www.patientslikeme.com/</a>)</li> <li>○ “Malte Spitz: <i>Your phone company is watching</i>”</li> </ul> </li> <li>• Other choices for articles on data Recent court rulings about the data collected and kept by the FBI can spur discussions about different kinds of data (biometric), how it can be used, and privacy.           <ul style="list-style-type: none"> <li>○ Supreme Court Rules DNA Can Be Taken After Arrest <a href="http://www.npr.org/2013/06/03/188397999/supreme-court-rules-arrest-dna-collection-reasonable">http://www.npr.org/2013/06/03/188397999/supreme-court-rules-arrest-dna-collection-reasonable</a></li> <li>○ The Pros and Cons of Gathering Biometric Data</li> <li>○ <a href="http://www.npr.org/2012/09/18/161355293/the-pros-and-cons-of-gathering-biometric-data">http://www.npr.org/2012/09/18/161355293/the-pros-and-cons-of-gathering-biometric-data</a></li> <li>○ FBI: Fingerprints and other Biometrics <a href="http://www.fbi.gov/about-us/cjis/fingerprints_biometrics">http://www.fbi.gov/about-us/cjis/fingerprints_biometrics</a></li> </ul> </li> </ul>
Solving community Problems	<ul style="list-style-type: none"> <li>• Show students the California Roadkill Observation System (CROS) <a href="http://www.wildlifecrossing.net/california/doc/about_cros">http://www.wildlifecrossing.net/california/doc/about_cros</a> as an example of “participatory sensing” and citizen scientists who are helping to solve a community problem (studying the animals of CA) with aggregate data.</li> <li>• Discuss problems they observe in their school. Talk about how data might</li> </ul>

	<p>help for either “making a case” (advocacy) or for “discovery” of data that can be used to learn about the problem.</p> <ul style="list-style-type: none"> <li>• Focus the student activity on a specific school problem. Complete the team activity as directed.</li> <li>• Add another question to the list of research questions students might ask: “What would be the value of aggregating the data on this topic over a wider survey group?”</li> </ul>
Journal (additional)	<ul style="list-style-type: none"> <li>• Show the 3 minute video, Eric Berlow: <i>Simplifying Complexity</i>. <a href="http://fellows.ted.com/profiles/eric-l-berlow">http://fellows.ted.com/profiles/eric-l-berlow</a></li> <li>• Ask students to speculate on how these concepts might apply to the school problem they worked on in their team during the activity. (If this short video is not used for a Journal activity, it can serve as an introduction to problem solving on Day 3.)</li> </ul>
Contextualizing Preview (additional)	<ul style="list-style-type: none"> <li>• Preview the team research project in Unit 5. Briefly describe the topics and tell them that they will be planning and executing a participatory sensing (PS) project to either make a case for or discover data to solve a problem. <ul style="list-style-type: none"> <li>○ School Safety and Bullying</li> <li>○ Exercise and Health</li> <li>○ Teens, Social Media, and Online Behavior</li> <li>○ Teens, Video Games, and Civic Engagement</li> </ul> </li> </ul>
Assignment	<ul style="list-style-type: none"> <li>• It may be possible for some students to use the “My Tracks” tool from Google (<a href="http://www.google.com/mobile/mytracks/">http://www.google.com/mobile/mytracks/</a>) as an additional means for gathering and imaging location data for the assignment. It is worth showing students the website at a minimum. There is a video that shows how it works.</li> </ul>

### Unit 2 - Day 3

Lesson Activity	Modification
Introduction (additional)	<ul style="list-style-type: none"> <li>• If not used on Day 2, Show the 3 minute video, Eric Berlow: <i>Simplifying Complexity</i>. <a href="http://fellows.ted.com/profiles/eric-l-berlow">http://fellows.ted.com/profiles/eric-l-berlow</a></li> <li>• Discuss the difference between complex and complicated.</li> <li>• As the problems are presented throughout this unit, ask students to ask if the problem is complex or complicated. Revisit these distinctions when discussing the topics for the participatory sensing research project they select.</li> </ul>

As the various computational practices (sorting, searching algorithms) are used in activities over the course of this unit, revisit the topics students will select from for their PS research project. Ask students to think about why they might want to use these techniques on the data they collect. What might be discovered from sorting their data? What might be discovered from searching the data?

## Mobilize Prime Focus Sheet Unit 3

**Focus:** Planning a site to report research findings, making data understandable, telling a story from data

**NOTE:** The Participatory Sensing (PS) supplement is intended to be used before Unit 3 (Web) to prepare students to select a topic for a research project and the web design project.

The XML supplement (in conjunction with Unit 5 (Data)) is to be used immediately after Unit 3. Students will return to and complete the final web design project for Unit 3 during the XML Supplement.

The topic selected during the PS Supplement activities will be the subject of students' website projects in Unit 3. During Unit 3, it will be important for students to think about their teams' BIG questions as they plan the design of, and gather more information for, the website. Ultimately, after they complete their research/survey campaign in the XML Supplement to Unit 5, they will add content about and data/graphs from the research to their website as a part of their final PS project.

During Unit 3 students will work in the teams formed during the PS Supplement. Use the role cards to guide participation. Rotate roles to ensure all team members participate to their full potentials. Periodically remind students of the upcoming data-gathering campaign and analysis. Guide students to practice computational practices. Use computational terms in class discussion and in oral or written instructions.

Help students to include the terms in talking about their projects.

- decomposition - breaking problems down into smaller parts that may be more easily solved.
- abstraction - simplifying from the concrete to the general as solutions are developed.
- negotiation - working together to merge parts of the solution into a whole.
- consensus building - working to build group solidarity behind one idea or solution.

**IMPORTANT:** All of the technical learning about HTML and other technologies should be placed in the context of what students will eventually include on the website. Teach all skills in context of reporting on the research. This is particularly important in lessons about creating tables and including images. Emphasize readability and effectiveness in "telling the story" of the data.

More than one suggestion is provided for some days. Select the lesson modification(s) to fit student and class needs.

### Unit 3 - Days 3–4

Lesson Activity	Modification
Creating a Storyboard	Students should plan their site to accommodate these topics from their research: <ul style="list-style-type: none"> <li>• Introduction: Description and background of the problem.</li> <li>• Objectives: The BIG question the team hoped to answer. What do you want to advocate for or discover?</li> </ul>

	<ul style="list-style-type: none"> <li>• Methodology: Their strategy (survey questions) to find the answer.</li> <li>• Results: Description of the data collected (number of responses and the types of data)</li> <li>• Analysis: Manipulation of the data. This will include charts or images. <ul style="list-style-type: none"> <li>○ How was the collected data combined with the data set provided?</li> </ul> </li> <li>• Conclusion: Tell the story or answer the question using the data. How does the data support the claim or discover information?</li> <li>• Supporting details: images and links that support the topic.</li> <li>• Projection: What could be learned if the researched was scaled to a larger group? Who would be included in the larger group?</li> </ul> <p>Team members should assign production tasks, create a timeline, and employ other organizational strategies. These techniques will be necessary because this web design project will extend over many weeks and will not be finalized until the end of Unit 5. Students will need to “come back to” their web design project after leaving it for some time.</p>
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**Unit 3 - Days 22-25**

Lesson Activity	Modification
Final Project	<p>The final details in the production of the students’ projects cannot be completed until the PS research project in the “XML Supplement” (blended into Unit 5: Computing and Data Analysis) is complete. Students are not completing the final project described on Days 22–25 in Unit 3.</p> <p>At the completion of Day 25, websites should be ready to receive the elements from the research. Put the projects on hold until the research is completed. It may be possible to add some content and details (the Big Questions, objectives, methodology) during the research phase as time permits. Suggestion: If a team member is “without a task” on a particular day during the XML Supplement, working on the website may be a productive choice.</p> <p>Use the <b>Final Campaign Rubric</b> found in the XML Supplement to evaluate the research components of the website project.</p>