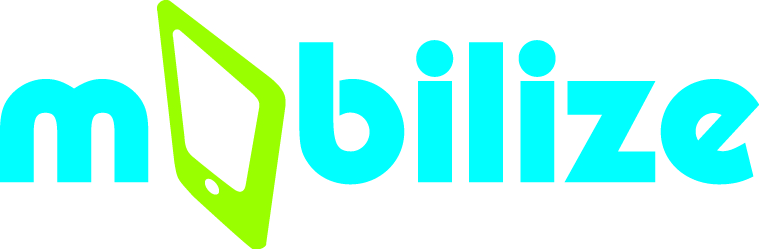




**Office of Curriculum, Instruction, and School Support**

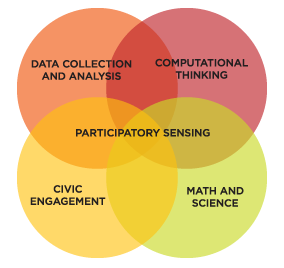


**Mobilizing for Innovative Mathematics/Science Teaching and Learning**

**A Partnership between LAUSD and UCLA**

**MOBILIZE 2012-2013**

**Mathematics & Science Curriculum Design**

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**LESSON 1: Life With Big Data**

This inquiry lesson will engage students’ thinking about the fact that Data are everywhere, and in this age of technology, they must become users of data and not just generators of data. They will become aware of the large amounts of data they generate through social media, how it is monitored and analyzed, and therefore their role in generating data responsibly.

This lesson will set the stage for computational thinking, the conceptual underpinnings of computer science, as well as many modern scientific and mathematical disciplines. What is data and how the use of data in today’s society affects us is foundational to this unit. Having students think of how the use of computers can simplify problem solving and aid in analysis of results, engages students in computational and statistical thinking.

**LESSON 2: Mobilize Application**

Students will learn to download and use the mobile applications that will be used most often during the project to gather data. The application can gather data via surveys, images and GPS tracking. Beyond just gathering data, mobile application users will be able to view their data submissions and track the upload progress of their submissions via the Response History section.

There are two different options available:

1. **Android:** A native Android application called “UCLA MobilizingCS” is available from the [Google Play Store](https://play.google.com/store/apps/details?id=org.ohmage.mobilizingcs).
2. **iOS:** The mobile application called “Mobilize MWF” is available from the [iOS App Store](https://itunes.apple.com/).

**LESSON 3: Data in My Life**

Students will analyze height data that they collect on themselves and on members of their families. This lesson presents students with an opportunity to explore and gain a deeper understanding of key characteristics to look for when analyzing data and interpreting graphs. Students will learn how to determine if there is a relationship between two sets of data, and that the change in the independent variable, x, cause a change in the dependent variable, y.

Students will identify features of a scatterplot and have an understanding that for data collected on real-life events, variability makes it more difficult to see patterns clearly. Basic techniques that will help find patterns in data will be explored to see how these patterns help us understand our world.

**LESSON 4: Algebra in the World of Data**

Students will represent the rate of growth as an expression and interpret the structure of expressions, both alone and in comparison to the other rates. Students will reason with equations and represent and solve equations and inequalities graphically.

**LESSON 5: Mobilize Web Front End**

In this lesson student will learn Ohmage, the **Software** program that will allow them to collect and analyze data. Students will learn to use Ohmage, the Web Front End to gain access to the data they collected and to use the knowledge gained in the previous lessons to explore and analyze that data**.**

* Students can review and share their data to the growing data set collected by their class and have an enduring understanding that they are in charge of the data visualizations that are generated, by selecting the variables in the data set and the visualization parameters.
* They will understand why visualizations change depending on the variable selected, and depending on the analysis of one variable alone or multiple variables in relationship to each other.

**LESSON 6: Recognizing Patterns in Big Data**

Students will interpret graphical representations of health data, analyze graphical patterns, draw conclusions, and generate arguments regarding the observed patterns.

**LESSON 7: Modeling with Big Data**

Students will bring together all the tools and understandings gained in the previous four lessons to create a campaign **on** how their daily activity can be a factor which impacts their weight. By correlating different variables such as time of activity, level of activity, time of day, and calorie burn, students will determine which correlation is linear. Students will engage in participatory sensing by using smart phones to collect data. They will measure their heart rates throughout the day after various activities, beginning with their resting heart rate when they wake up and continuing through the day, after walking to school, climbing stairs, skate boarding, etc. The campaign will consist of a sequence of questions regarding the activity students were performing prior to measuring their heart rate, such as duration of the activity, their feelings about the activity, whether or not it was strenuous, etc. Ultimately, students will determine what effect the increase in heart rate has on the rate of calories burned and weight loss.

**Mathematics Common Core State Standards (CCSS)**

Modeling is best interpreted not as a collection of isolated topics but in relation to other standards. Making mathematical models is a Standard for Mathematical Practice, and specific modeling standards appear throughout the high school standards indicated by a star symbol (★).

1. High School: Number and Quantity  Quantities (N-­‐Q):
   1. Use units as a way to understand problems and to guide the solution of multi-­‐  step problems; choose and interpret units consistently in formulas; choose and  interpret the scale and the origin in graphs and data displays.
   2. Define appropriate quantities for the purpose of descriptive modeling.
   3. Choose a level of accuracy appropriate to limitations on measurement when  reporting quantities.
2. **High School: Algebra :** Seeing Structure in Expressions (A-­‐SSE): Interpret the structure of expressions 1. Interpret expressions that represent a quantity in terms of its context.★

a. Interpret parts of an expression, such as terms, factors, and coefficients.

Creating Equations★ (A-­‐CED): Create equations that describe numbers or relationships

1. Create equations and inequalities in one variable including ones with absolute value and use them to solve problems in and out of context, including equations arising from linear functions.
2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.*  Reasoning with Equations and Inequalities (A-­‐REI): Represent and solve equations and inequalities graphically

10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).

11. Explain why the *x-­‐coordinates* of the points where the graphs of the equations *y* = *f (x)* and *y* = *g (x)* intersect are the solutions of the equation *f (x)* = *g (x);* find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where *f (x)* and/or *g (x)* are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.★

**III. Interpreting Functions F-­‐IF**

Interpret functions that arise in applications in terms of the context

4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.

5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h (n) gives the number of person-­‐hours it takes to assemble *n* engines in a factory, then the positive integers would be an appropriate domain for the function.★

6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.★

7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.

**Building Functions F-­‐BF**

Build a function that models a relationship between two quantities 1. Write a function that describes a relationship between two quantities.

**Lesson Overview**

This inquiry lesson will engage students’ thinking about the fact that Data are everywhere, and in this age of technology, they must become users of data and not just generators of data. They will become aware of the large amounts of data they generate through social media, how it is monitored and analyzed, and therefore their role in generating data responsibly.

This lesson will set the stage for computational thinking, the conceptual underpinnings of computer science, as well as many modern scientific and mathematical disciplines. What is data and how the use of data in today’s society affects us is foundational to this unit. Having students think of how the use of computers can simplify problem solving and aid in analysis of results, engages students in computational and statistical thinking.

**Common Core State Standard:**

**Mathematical Practices Standard 3**: Construct viable arguments and critique the reasoning of others.

**Enduring Understanding**

Upon completing this two-day lesson, students will have the enduring understanding that Data are everywhere, and in this age of technology, they must become users of data and not just generators of data. They will become aware of the large amounts of data they generate through social media, how it is monitored and analyzed, and therefore their role in generating data responsibly.

Students will have the enduring understanding of modes of data collection, data usage, and data Visualization. Discussions around these topics will help students become more aware of their role in creating data as well as the implications for future jobs.

**Language Objective**

1. Students will use complex sentences to construct a summary statement on their understanding of data, how it is collected and used.
2. Students will present their summary statements and engage in a class discussion, stating their position in reference to statements presented by their piers.
3. Students will use complex sentences to write two paragraphs on the he overarching question for the lesson: **How can data affect my life now and in the future?**

**Materials:**

**Lesson Power Point:** Lesson 1\_Big Data in Our Lives.pptx

**Lesson Flow Document:** Lesson 1\_Big Data in Our Lives.docx

**TED Video:** [Conrad Wolfram**: Teaching kids real math with computers**](http://www.ted.com/talks/conrad_wolfram_teaching_kids_real_math_with_computers.html)

**PBS Video:** Hunting for Cool

**Student Handout** **1** The Data Four-Fold organizer

**Student Handout 2** Video Notes Organizer

**Homework Worksheet:** Data Collection Chart

**Data Visualization images (9)**

**Performance Task/Essential Question**

Based on evidence presented from several social networks and industry data sources, students make a claim in response to the prompt:

**How can data affect my life now and in the future?**

Claims will be supported by three pieces of evidence, selected from the presented sources. Students are required to generate a summary statement based on this evidence.

This question is asked initially to collect students’ prior knowledge regarding data, and again at the end of the lesson to assess learning. The guiding question for the lesson is: How do most organizations collect, use, and store data? Discussions around this topic will help students become more aware of their role in creating data as well as the implications for their futures.

**🕮** **Vocabulary**

Students may need frontloading of the following terms:

* Big Data
* Independent & dependent variable
* Participatory Sensing
* Target audience
* Focus group

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| **Day 0** | |
| **Teacher/Student Activities** | **Time / Notes** |
| **Pre-Test Implementation:** Prior to thefirst day of instruction, teachers will implement the CRESST developed pre-test, to measure students knowledge of computational and statistical thinking prior to this unit.  **CRESST will provide the materials required and the instructions for implementation. Evaluations will be returned to CRESST.**  **In the remaining time of the class period, play the following video.**  **Video:** [Conrad Wolfram**: Teaching kids real math with computers**](http://www.ted.com/talks/conrad_wolfram_teaching_kids_real_math_with_computers.html)**.** From rockets to stock markets, many of humanity's most thrilling creations are powered by math. So why do kids lose interest in it? Conrad Wolfram says the part of math we teach -- calculation by hand -- isn't just tedious, it's mostly irrelevant to real mathematics and the real world. He presents his radical idea: teaching kids math through computer programming.  **This video is an introduction to the Mobilize Unit.** Explain to studentsthat in this unit we will gain an understanding of how important computers are in our daily lives, and how large amounts of data are collected every day to analyze trends in every facet of our lives. They will collect our own data and analyze it to determine trends in our daily snacking habits.  They will analyze this data to answer the statistical question: *Which nutritional component, of the snacks that we eat, has the greatest impact on calories?* | **Time: 30 minutes**  **Video: 17 minutes**  Introduces the 4-step definition in response to “What is Math.”  Helps student of think of Math as a tool to analyze real world data and determine trends in our every day lives. |

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| **Lesson 1 -- Day 1** | |
| **Teacher/Student Activities** | **Time / Notes** |
| **Engagement:**  Working individually, students will engage in a brainstorming activity that will provide foundational ideas and understandings that will be used to construct arguments about how data is collected and used. Students will complete **Student Handout 1**, the Four-Fold organizer, as a tool to sort ideas for discussion on four prompts:   1. What is Data? 2. How is it used? 3. Where does it come from? 4. **How can data affect my life now and in the future?**   Pass out the Four-Fold organizer as you explain the brainstorm activity to the students. The questions should not be pre-printed on the organizer. Have students write them in as they appear on the screen, which will allow them ample time to think on each idea before moving to the next idea. This organizer will be collected to assess the level of student knowledge prior to the lesson and again after the lesson.  Using the **Double Round Robin** approach below for this activity ensures that every student will have a chance to respond, with assistance from the team, and is thus held accountable for contributing. | Time Suggestion:  28-30 minutes Total  The **Frayer Model** is a vocabulary development tool. In contrast with providing a straight definition, the model helps to develop a better understanding of complex concepts by having students identify not just what something is, but where it come from, or how it is used. The center of the diagram shows the concept being defined, while the quadrants around the concept are used for providing other details. |
| **⌛ Idea Brainstorm: Double Round Robin** (Slide 2 & 3):  Divide students into groups of three or four. Review the following rules, checking for understanding by asking a student from each team to repeat and explain their understanding of the rule or the implication for their team.  **Review the Team Rules:**   1. Each team will number off from 1 to 4. 2. You will be given a topic to brainstorm; first write down your ideas individually for 2-3 minutes. No talking or discussing ideas yet. 3. Next you will put your ideas together as a team. You will have **5 minutes to develop a team strategy for providing answers.** 4. I will call on each team for one idea, and move to the next team for a different idea. 5. Team member 1 will provide the first idea in round one. Team member 2 gives the second idea, in round two, and so on. Strategize to ensure that no one on you team will run out of ideas to share.   **Explain the Team Points:**  1. Teams will gain a point for each idea shared.  2. Repeating an idea already given by a previous team will cause you to lose a point, so LISTEN carefully.  3. ‘Pass’ if your team member has no ideas. No points gained or loss.  4. Wait time for each idea is 5 seconds. (Count down 5-4-3-2-1)  Points are an excellent management tool. It ensures teams are listening to all of the answers, so they wont repeat an answer. It also prevents students from **shouting out answers**, which would **also results in the loss of a point.** In that each answer must be given within 5 seconds, teams stay on task | Time Suggestion:  **Individual Brainstorm Rules** (2 mins to review)  Guidelines, which are set for classroom discussion, generate an equitable environment for students to share ideas. They ensure that all students are included in the discussion. Setting clear student expectations is critical in building an environment in which students can explore and discuss ideas, build arguments, and critique the thinking of others. |
| **Teacher/Student Activities** | **Time / Notes** |
| 🖉 **Individual Journaling:** (Slide 4)  Each question appears one by one on the slide. Reveal Question 1 and have students write the question in the top left quadrant. Allow students a couple of minutes to generate ideas just on question 1, then reveal question 2, which should be written in the top right quadrant, allowing a couple of minutes think time. Reveal question 3 in the same manner. Prior to answering question 4, have teams strategize and share answers for 1-3 via Round Robin. *(Note: Students’ ideas about “Data” may be narrow, focusing on T-charts and graphs generated in class. By engaging students in this brainstorming activity we will determine their current knowledge level, any misconceptions, and how to build on their current foundation. Some students may have a broader sense of data connected to technology, which will expand the level of others during the sharing process.)*  It is critical for students to first develop their own ideas and therefore have the ability to add to the ideas and strategies of the team as a whole.  ⌛ Using the Round Robin rules, call on each team for an answer to question 1, starting with team 1, and member 1. Collect answers a second time on question 1, from member 2 of every team. Wait only 5 seconds for each answer, and record a quick version of the answers on a chart size copy of the Four-Fold. After all teams have answered twice record a point per team for every answer. Continue gathering answers until all three questions have been answered.  Ask students if any of the answers gave them new insight into Data? Did they learn anything new? After the discussion have students fill in the last quadrant with the answer to the essential question:  ***How can data affect my life now and in the future?***  Summarize the ideas collected after students have shared.  In this lesson, we will learn:   * The idea of data has changed in this age of technology. Data is collected in many different ways. * Data is being gathered on line every time we post on social networks or order products and services. * We must be careful and responsible about the data that we put out in cyber space. * “Big Data” is a new term based on the large amounts of data generated on the Internet and mobile devices today.   Ask kids if they’ve notices how ad’s that pop up when they are on the internet is something they’ve searched or bought? How coupons in the store are also the things that they normally buy? That’s because a database of information is stored on our purchases to better serve us. | Time Suggestion:  Brainstorm- 3 min  Note: Do not provide ideas for students. Critical Thinking must be fostered. Students will build on their ideas or gain new insights from team members during the Team strategy time.  Sharing – 12 minutes  (3 min each quad)  Summarize – 3 min |
| **EXPLORATION:**  **🖳 Video: Hunting for Cool** (slide 6)  As you discuss the background of the video, give students **Handout 2:** **Video Notes Organizer** to take notes while watching the Video: Hunting for Cool is a Frontline documentary on ‘coolhunting’. Coolhunting is a term coined in the early 1990s referring to a new breed of marketing professionals. It is their job to make observations and predictions in changes of new or existing cultural trends. A coolhunting firm is a marketing agency whose exclusive purpose is to conduct research of the youth today. (Handout shown on Next slide.)  **When coolhunters make observations, what data do you think they are looking for?**  This video will show you how they collect data, what data they want, and talk about how they use that data. Capture as much information as you can.  **Focus Questions:**  1.“Why do Coolhunters focus on the teen market?” and  2. “Why is the teen market the most exciting today?  This slide provides preliminary information that answers these question:   * Teens are an ever growing power base, 32 million strong, 17% growth in this market, * They adopt fashion and influence the spending of their parents.   **Challenge Students to take as many notes as possible.** Ask: “Who has already written down some data/information from this slide?”   * What did you write for question 1?” The teen population is 32 million with 17% growth * How about for question 3?” Cool hunters gain data by observing teens.   **Continue to collect more ideas for these 3 questions.** | Time Suggestion:  Introduction - 2 min,  Copy Handout 2 on the back of Handout 1. |
| **EXPLORATION:**  **🖳 Video: Hunting for Cool**   * **Start Video:** Hunting for Cool It presents data on just how large the teen demographic is and how much money teens get their parents to spend each year. It focuses on one coolhunting firm, and follows them as they collect data on teens. * After the video, discuss Questions 1-3. What could students add to the question “What is Data?” Chart additional information. * Revisit the essential question: “How does this data affect me now?” In your adult life, i.e. jobs? | Video - 8 min  **NOTE:** Students may want to discuss being trendsetters, but focus them on Data.  Using a Four-Fold to write ideas on “What data is being collected on teens, why, and how is it collected?” |
| **🗈HOMEWORK:** Hand out **Data Collection** Worksheet. (Slide 10)   * Students will collect their own personal data. * Students will collect data for themselves and at least 4 other people in their family; sisters, brothers, cousins, aunts and uncles. * Using the data collection chart, collect each person’s name, gender, birth length, current height, and current age. * We will discuss the graph tomorrow, so for now just collect the data. | Time Suggestion:  5 minutes  **Challenge Students** to collect as much data as possible by tomorrow. |

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| **Lesson 1 -- Day 2** | |
| **Teacher/Student Activities** | **Helpful Hints** |
| 🖉 **DAY 2 WARM UP:** **Data Analysis** (Slide 11)  Reconnect students with the questions that pertain to **data collection**.  1. What was the method of data collection? 2. How can we use this data?   * Students will analyze the collected family data to discover patterns in growth data and how it should be represented on the graph. * Students will learn **Modes of Data Collection b**y discussing the method of data collection used, other methods that could have been used, and why we would choose to use either, * Also during the warm-up we want student to think about how the data will be graphed. Pose the suggested questions and others to have students realize there will be two points graphed per person; one for birth length and one for current height.   **🗨 Discussing Family Data:** Yesterday we gained knowledge of how “**coolhunters”** collect data. Now discuss how they collected their own data.  **TIPS:** Have students think on the following questions, jot down their own ideas, and discuss their answers with a partner:   1. *How was your data collection the same or different from the cool hunters?* 2. *Is your method of data collection reliable?* 3. *What other collection method could your have used that is for height more reliable?*   Also have students think about: What is one “piece” of data? **How many pieces of data did they collect for each person?** As well as how should these “pieces of data” be graphed? | Time Suggestion:  Analyze Data -5 min  Discussion – 5 min  Vocabulary: dependent and independent variable  Graphing – 5 min  **1-2 minutes per day** |
| **⭡⭧**  **Graphing Family Data:** (Slide 12) Allow students time to discuss and analyze their data. Guide students to discover, through questioning, why the **birth length** must be plotted on the **Y-axis**, at zero years.  Lead students to the realization that ‘**current age’** is thex-variable, and ‘**height’** is they-variable. “**What causes our height to change?” *Age*.** *“Our height changes as we get older, so height is* ***dependent on*** *age?*  *Students may not have birth data****. Ask: “How long do you think a newborn baby is?”*** *Have students build viable arguments and use reasoning to defend the reasonableness of anything over 22” or below 16”.*    Each student will graph the data they’ve collected so far on the graph at the bottom of their collection sheet. Have students discuss with a partner:   * “**What should we graph?** * **“How will the data be plotted on this graph?”** * Use a **red marker** for **female** data and a **blue marker** for **male** data. * How many points will be plotted for their data?   **At the start of class, for the next 2-3 days, as students enter the class, have them all plot their data on a chart-sized graph. (Now that individual graphing is complete.)** | Graphing discussion – 2-3 mins |
| **🗐Engage/Explore/Explain:“How is** **Data used?** To tell a story or to prove a point.” In the video data was used to tell a story about the teen market. Data is presented to us in many ways, but always to make an impression on how we think.  **Data Visualization refers to how data is presented** and is used to communicate information clearly and effectively.   * Arrange students in teams of 3-4, pass out one visualization per team. Have students silently investigate the visualization, as each student captures their own ideas.   **⌧ Instructions**: **Ink Your Thinking -- NO talking:** Allowing students 2 minutes, to explore the ***visualizations*** with the following questions in mind:   * Is this an effective way to present data & why? * What is the data telling you? * How do you think this could have been used?   Allow teams 2-3 minutes to put their ideas together, letting them know that every team member must contribute information on the visualization.  Project each image and members of the teams will share their insights. For each image, ask the other teams if they notice anything additional or if they have any questions. | Total Time –  25 minutes   * **IYT** – 4-5 minutes * Discussion–20 min   (2 minutes per image) |
| Partners should “construct” a **summary sentence** on their view of visualization and use of data. |  |
| **⌧ Summary:** We are in Very Exciting Times (Slide 23)   * As data usage increases, and companies collect large amounts of sensitive personal data, students must be aware of their personal role in putting data on the web. * What is our responsibility to our own data security? * Once your data is in cyber space it belongs to the world.   🖉 **Quick Write:** Ask students to write down all new ideas that they’ve learned  about data. Have them turn to a partner to share. Together they will pick their  top 3 ideas to share with the class. |  |
| **How is data Collected?** Now, let’s **Explore Sensors** that provides data in many situations automatically. This discussion will help students gain a deeper understanding of **sensors** and the many places that sensors exist. Many sensors we take for granted, but with the onset of technology, data is now being stored on chips from sensors.  **Coral Response:** Go back to the question: **“Where does data come from?”**   * Let’s think of data in our every day lives, not the Internet. What about data * in our homes, our cars, while we drive? * **“What is a sensor? “** After some discussion, provide the definition * Ask students for examples under each category. And display answers after they answer. **Reveal page 2.**   Now let’s **Explore Participatory Sensing,** that provides data in many situations automatically. A **Big Idea** for students is that with the growth in mobile devices, such as the iPhone, which has multiple sensors, it has made participatory sensing viable in the large-scale. **Present this new information to students.** | Time suggestion  2-3 minutes |
| **Jobs in the 21st Century**  Many STEM jobs will require Computing, and computing will be a big part of all jobs.  Jobs in research, data management and data analysis are some of the jobs of the future. The **Team project** will be based on jobs that students are interested in. What data might these companies use and why?  **Critical Thinking: STEM Jobs**   1. This data is only about STEM jobs. What is the chart telling us about STEM jobs? 2. What is the chart telling us about computing jobs? 3. What does it indicate about future jobs?   **What is Computer Science?** | Time suggestion  2 minutes |
| **🖳HOMEWORK:** **Team Project – Data in Business**  Students will apply their new insights to do online research and think about how real life companies benefit from collecting and using data.   * Some companies provide services, other produce a product. How will the use of data differ?   **Research Questions**:   * What data is useful to this business and Why? * How does this business collect data? * How does this business use data? * How do they keep track of the data?   Assign each team a business from the list on the slide, and ask them does their business provide a service or a product? How does that affect their data usage?  **⌧ HW Instructions:** *Assign one question from the Frayer model to each person on your team, for them to research and bring back information.*   * Tell them that they are now ALL researchers just like the market researcher in the video. What do they want to accomplish through data collection? How will the collect it? * **Teams will report tomorrow** on their findings. Each team will create a poster size Frayer model with the data they discovered. The name of the business should be in the center of the Frayer model. * Posters will be presented in a Gallery Walk. Inform students that they will each be responsible for questions from the class on their information. | Assign Homework:  5 minutes |

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| **DAY 3: GALLAYR WALK PRESENTATIONS**  Each team will use the data on their poster to “tell a story” about the organizations they researched.   1. Allow teams 10-15 minutes to prepare their posters. 2. Provide each team with a set of post-its notes to leave comment/ suggestions for each poster. 3. As teams view each poster, discuss the information and leave your note. 4. Have teams also prepare a question to ask that team on additional information you may want on each poster. 5. Allow 2 minutes at each poster before rotating. (18-20 minutes total)   **Class Discussion:** After the gallery walk, ask teams what they discovered, and what type of comments did they leave for each poster.  **What additional information would you like to know on one of the posters?**  Call on each team to ask a question of another team, and discuss collection and uses of data. | Time Suggestion  15-20 minutes  **As students enter class, continue graphing family height data; male in blue and female in red.** |
| **Formative Feedback:**  The intent of this lesson is to change the way students think about data , it’s use, and collection. It also lays the foundation for the entire unit.  Student’s answers to this journal prompt will provide information on how mush learning was attained through this lesson.  **Exit Ticket:** After all of the teams have presented their results, end the lesson with students having to do a **final quick write** on this four-fold questions.  Provide a second copy of the **Four-fold organizer** from the start of the lesson**.** Have students answer the 4 original questions and collect it when they are done. |  |

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| **Lesson 1 -- Day 3** | |
| **Teacher/Student Activities** | **Helpful Hints** |

**Lesson Overview**

Students will learn to download and use the mobile applications that will be used most often during the project to gather data. The application can gather data via surveys, images and GPS tracking. Beyond just gathering data, mobile application users will be able to view their data submissions and track the

**Common Core State Standards**:

Mathematical Practices Standard 3: Construct viable arguments and critique the reasoning of others

**Enduring Understanding**

In this lesson student will learn Ohmage, the **Software** program that will allow them to collect and analyze data. They will download the Mobilize Application for collecting data and by engaging in an authentic participatory sensing experience students will gain the enduring understanding that their mobile phones quickly become a data collection devices.

**Language Objective**

Students will learn to form conjectures about or data. They will formulate questions that can be phrased as "I wonder if....". Conjectures based on data are often made to consider what would happen if we saw another group of observations.

**Materials:**

**Lesson Power Point:** Lesson 2\_Mobilize App.pptx

**Lesson Flow Document:** Lesson 2\_Mobilize App.docx

**PBS Video:** What most schools don't teach, Published on Feb 26, 2013

**Student Data Collection Devices:** Cell Phones, iPads, or iPods

**Student Handout** **1:** Nutrition cards

**Performance Task/Essential Question**

Using their phones students will gather, through data collection, the evidence, required to investigate patterns in their snacking habits. They will answer the questions:

**What will I learn about my eating habits from the data that I collect?**

* **What is the healthy level of the snacks I eat on a daily basis?**
* **What is the affect of carbohydrates, fats, and sugar on my calorie intake?**

Claims will be supported by three pieces of evidence, selected and cited, from the presented sources. Students are required to generate a summary statement based on this evidence.

**🕮** **Vocabulary**

Students may need frontloading of the following terms:

* Participatory Sensing
* Ethics
* Browser-based

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| **Lesson 2 -- Day 1** | |
| **Teacher/Student Activities** | **Time / Notes** |
| **Engagement Discussion Prior to learning the Software** program that will allow us to collect and analyze data, students must be excited and committed to collecting data. There should be an understanding of the types of questions they can answer by analyzing the data  **Engagement Question:**  Think about data collected in the US on children your age.  • What is one of the top concerns about teens health?  • What would help us define healthy eating? What is “Good Nutrition”?  • What questions would you want answered about concerning eating healthy?  • How can you collect data to provide these answers?  Ask students what do they know about First Lady Michelle Obama’s campaign? It’s called “**Let’s Move”** and she promotes healthy eating.   * Bring up the 5 pictures. They will appear one at a time.The title of this Newsweek (final picture) is, “**Feed Your Children Well.”**   Ask students what do they think that means. Have students explore **“What is healthy eating?”**  **Chart all of students’ questions and tell them “We will focus on those regarding calories, junk food, ingredients in food, such as carbs & fats.”**  Over the next four to five days you will record and collect enough data on the way you snack to hopefully answer some of these questions. | **Intro Time: 2 minutes**  **Video: 6 minutes**  **As students enter, continue graphing family height data; male in blue and female in red.** |
| **Data Collection:** In the last lesson we said you would “behave like a sensor.” For this unit, you will collect a **“Data Diary”** of every snack you eat. DO NOT collect data for full meals, like breakfast, lunch or dinner, but for anything you eat in between meals, like fruit, chips, cookies, nuts, or sodas. |  |
| **🖳 *The next 8 slides will guide students through the log on process & App down load.***  **Ohmage Overview Software:**  The software you will learn has three main tools that you will use in the Mobilize projects. The **Mobilize software suite**, which is powered by ohmage is used to provide data collection and visualization in the Mobilize units.  Ohmage is the **Software** program that will allow us to collect and analyze data.  \* For our use there are **3 components**.  **1.** M**obilize App** that you will download on your phone, both Android & iOs platforms. (iOS refers to iPhone, iPod Touch)  **2. Bowser Based Version:** For those whose phone is not be compatible for the App. You will use the bowser-based version of the app to collect data.  **3. Web front-end:** The last component will be used to see all the data you collected. You will use a computer for the Web Front End and we will learn to use it later. | **Logon & App –**  **10-15 minutes** |
| **Teacher/Student Activities** | **Time / Notes** |
| **Participatory Sensing: Data Collection via a Mobile Applications**  The mobile applications will be used most often during the project to gather data. The application can gather data via surveys, images and GPS tracking.  **There are 2 different options available:**  **1. Android**: A native Android application called “UCLA MobilizingCS” is available.  **2**. **iOS:** The mobile application called “Mobilize MWF” is available from the [iOS App Store](https://itunes.apple.com/).  **Note:** For those that do not have mobile phones, a browser-based version to perform data collection.  *“We are now going to engage in our own PS activity, in which you will collect your own data using your phone.”*  You will enter your data one or 2 ways.  A smart phone, an iPod touch or tablet. If you don’t have a smart device you will use the **browser-based version** that requires a computer.  ***“Next we’ll determine if your phone is compatible.”*** | Time: 2 minutes |
| **Smart Phone Questionnaire:** To determine the compatibility of your smart phone, iPod Touch, or iPad.  **Results** of the questionnaire ( 3 questions), will show either of 2 colors:   * **Green** indicates your device **is compatible** and you can use it. * If **RED** shows up your device is not compatible and you will have to use a computer.   **Questionnaire:** Take out your device.  1. Go to the internet on your device and enter the URL being shown. 2. Enter your **name.**  **3. Select your class**. **Teachers LAST NAME & PERIOD** should appear.  4. Answer the last question and **SUBMIT**  **5. Scroll down to select “INSTALL APP**” Now you have the Mobilize App that we will use to collect data. | **Time: 2 minutes**  **Before the next slide pairs students without devices with students that have one.**  DISTRIBUTE USER NAMES AND PASSWORDS AS STUDENT ARE COMPLETING THE QUESTIONAIR. |
| **iPhone App – Login:** To install the Mobilize application, you search for “Mobilize MWF” directly from the app store (make sure the logo looks like the logo on the upper left of this web page). Once installed, follow the instructions below to get started!  Tap on the Mobilize App, which will take you to the log-on page.  \* If you are an Android user, **Go to the next slide,** to show how it will look.  \* If you are an iOS user, **Go to the next slide,** to show how it will look. | Time: 2 minutes |
| **Teacher/Student Activities** | **Time / Notes** |
| **CAMPAIGNS:** The main purpose of the mobile application is to take and submit **surveys/responses**. This is a very straightforward process and is detailed below. If you don't currently have any surveys on this screen, you can add some via the [**Campaigns**](http://wiki.mobilizingcs.org/app/android/campaigns) **area.**  The Campaign screen will show you what campaigns are available to you.  For this class you will add the **Algebra V2 campaign** to your phone. | Time: 2 minutes |
| **SURVEYS:** First, when you tap on the survey icon from the mobile application main menu, you will be asked which survey you would like to take.  Now select your **Survey:**   * **Got to the next slide** to show how it will look if you are an Android user. * **Go to the next slide** to show how it will look if you are an iOS user. * On the main screen select Campaigns**.** * For this class you will select the **Nutrition survey.** | Time: 2 minutes |
| **ANSWERING THE SURVEY:**  Give students the ‘nutrition cards’ that contain snack information to practice entering data. As students practice entering data, let them know this is the process for “collecting data.” Answer any questions they may have.  To ensure that data will be collected, discuss what students consider “snacks” to be, how often do they think they “snack?” and that they will answer the survey each time they snack, including soda. Not meals.  Now we will practice answering the survey. There is one question asking for each piece of nutritional information:   1. What is the name of the snack? \_\_\_\_\_\_\_\_ 2. How many servings? \_\_\_\_\_\_\_ 3. How much per serving? \_\_\_\_\_\_\_ 4. How much per serving? \_\_\_\_\_\_\_ | Time: 5-10 minutes  **Note:** Nutritional cards must be cut to one per students.  Select Next slide to show each question. |
| **BACK TO MAIN SCREEN**  Go back to the main screen, by tapping on the ‘**Home’ button.**  *“For those of you that have limited data plans you don’t have to upload the data now.**The survey responses are held in a Que.”* (Show the Animation)  **REMIND STUDENTS:** Answering survey questions does not use their data plan. Uploading the data does. You can upload when you get to a wifi connection at home.  **Show the slide** **animation** to circle the location to select where all your surveys will be waiting for you to upload later. (For both android and iOs users). | Time: 1 minute  **Animation will circle where to select for each** |
| **Teacher/Student Activities** | **Time / Notes** |
| **ETHICAL ISSUES:** Ethics or morals are like rules for distinguishing between right and wrong, such as the Golden Rule ("Do unto others as you would have them do unto you"), a code of professional conduct like the Hippocratic Oath ("First of all, do no harm"), or a religious creed like the Ten Commandments ("Thou Shalt not kill..."). This is the most common way of defining **"ethics" is** **norms for conduct** that distinguish between acceptable and unacceptable behavior.  We’ve all been told that “Sharing is Caring, but in this case, to keep you privacy in tack, **Please don’t share your user information with anyone.** | Time: 2 minutes  (Show animation.) |
| **ONE RULE FOR TAKING PHOTOS**  You cannot take a picture of any identifying features. Nothing that can identify a person can be in the picture; faces, hair, hands, tattoos, etc.  It is Very Important that we only take pictures of the snack you are collection data on. So here are two pictures of snacks; which is appropriate.  Specifically the snack item | Time: 2 minutes |
| **DATA ENTRY ROUND 2**  Now that we know how to properly take a picture, let’s do ROUND 2.  Switch cards with your partner and take the survey again. | Time: 5 minutes |
| **Reminders:** The mobile application offers a reminder system to help users remember when or where to enter data. It can be triggered by time or location. You can access the reminders for a specific survey by tapping the "Reminder" on the survey description page.  Because collecting data is something new, we want to set reminders several times a day, we might forget to complete the survey when we are having a snack. **But we can set remainders.**  **For Android users, select on the top right, and for iOS users, select on bottom right.** | **Animation will circle where to select for each.** |
| **Technical Questions? Go to** [**https://wiki.mobilizingcs.org/**](https://wiki.mobilizingcs.org/)  This wiki was created to support the LAUSD students during the Mobilize deployments. On this Web page you can view different help options, or find the most used help pages. |  |

**Lesson Overview**

Students will analyze height data that they collect on themselves and on members of their families. This lesson presents students with an opportunity to explore and gain a deeper understanding of key characteristics to look for when analyzing data and interpreting graphs. Students will learn how to determine if there is a relationship between two sets of data, and that the change in the independent variable, x, cause a change in the dependent variable, y.

Students will identify features of a scatterplot and have an understanding that for data collected on real-life events, variability makes it more difficult to see patterns clearly. Basic techniques that will help find patterns in data will be explored to see how these patterns help us understand our world.

**Common Core State Standards:**

**Number and Quantity**: Reason quantitatively and use units to solve problems.

**High School – Algebra:** Seeing Structure in Expressions & Interpret the structure of expressions **High School – Algebra:** Creating Equations★

**High School – Functions:** Interpreting Functions

**Enduring Understanding**

Upon completing this two-day lesson, students will have the enduring understanding that **interpreting graphs** provides useful information regarding the data graphed**.** We can determineif there is **a relationship** between two sets of data, and that if there is, therelationship is driven by the change in the **independent variable, x,** which causes a change in **the dependent variable, y.**

Students will have the enduring understanding that correlations show trends in relationships, which are **positive or negative,** dependent on how the y variable reacts to the changes in the x variable.As x increases, does y increase or decrease? More importantly, how is this information interpreted?

Students will identify features of a scatterplot. And have the understanding that for data collected on real-life events, variability makes it more difficult to see patterns clearly. Some basic techniques will help to find patterns in data and see how these patterns help us understand our world.

This lesson focuses on interpreting graphs with overarching questions for the lesson:

“***What is a correlation?”*** When there is a correlation, is it ***positive, negative, or constant?***

Students will determine rates of growth over several age intervals to determine if growth rates are constant for all age groups. They will also calculate the average rate of growth for themselves and determine if the can use this rate to predict further growth.

**NOTE:** Students sometimes feel that snack data is “boring” to collect. However, for **Participatory Sensing we need data with variability.** Students snack often, on different things and it is easy to collect. IT WORKs!!!

**Language Objective**

Mathematical Practices Standard 3: Construct viable arguments and critique the reasoning of others.

Provide students with discussion stems to build arguments about their interpretation of the correlations and how the variables relate.

**Discussion Stems:**

* **I agree with \_\_\_\_\_\_\_\_\_\_\_\_, but I also think \_\_\_\_\_\_\_\_\_\_\_**
* **That may be true, but \_\_\_\_\_**
* **I disagree because I feel \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Materials:**

**Lesson Power Point:** Lesson 3\_Data in My Life.pptx

**Lesson Flow Document:** Lesson 3\_Data in My Life.docx

**Student Pre-test:** The Hurdler’s Race

**Student Handout 1:** Analyzing Scatter Plots

**Student Handout 2:** CDC Growth Reference Data for boys, ages 2-20

**Student Handout 3:** CDC Growth Reference Data for girls, ages 2-20

**Performance Task/Essential Question**

Students will also practice drawing trend lines for scatter plots and describing what they represent in terms of the two variables.

The essential questions that will guide the interpretation are:

1) What is the trend (the general pattern) and the direction of the trend? (positive/negative changing)

2) How much variability is there? (Strength of the plot: lots, little, strong, weak.)

3) Are there unusual features? (outliers? deviations from the overall pattern.)

Students will explore this data to determine thir personal percentile of growth and calculate their average rate of growth thus far. Using this rate, students will determine if their average growth rate can be used to predict further growth. Through this activity students will learn that change in height is not at a **constant rate.**

**Can your average growth rate be used to predict your future height?**

Claims will be supported by evidence from their exploration. Students are required to generate a summary statement based on this evidence.

**🕮** **Vocabulary** Students may need frontloading of the following terms:

* Rate
* Rate of Change
* Trends
* Percentiles
* Constant Rate of Change
* Conjecture
* Trend
* Outliers
* Variability, Variab

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| **Lesson 3 -- Day 1** | |
| **Teacher/Student Activities** | **Time / Notes** |
| **5 Minute Warm-up: Participatory Sensing**: In lesson 2 students learned to collect data on their phones. Have students to share theirdata collection experience with a partner**. Ask: *“****Who engaged in PS yesterday, and used their phones to collect the nutrition data for the snacks they ate yesterday?” \** “How was the experience of collecting data?” *\** “What did think about the healthy levels of their snacks?” *\** “Does the code for the survey need to be modified at all?”  ***Focus Questions:*** “What will happen if we collect more data?” . “How will it change the look of the plots?”  **Log on to Ohmage to “Review Responses.”** Show students the pictures of the data that has been entered in **just one day!**  **Remind students to be sure to collect data on everything they snack on. Data analysis requires as much data as possible.** | **Time: 5 minutes** |
| **🗐Pre-Test:** At the start of Lesson 2 give students the **pre-test** before starting the lesson. The pre-test contains a graph for students to analyze and describe the situation that is represented by the graph. Students’ answers will help determine the level of prior knowledge regarding reading graphs, and understanding what each **interval** means.  Pass out the **pre-test** as you explain the instructions. Let students know, “You may already know this, or not, but it is part of what this lesson will focus on.” | **Quiz Time: 5 minutes** |
| **Pre-Test Instructions: 1.** Read the situation carefully, and analyze the graph carefully. **2.** Describe in words what the graph tells you about the race? 3. Answer the five questions about the graph.  **After the Quiz:** Have students discuss with a partner what they thought about the graph activity, and then answers the five questions.   1. **Who won the race?** How does a racer win a race? (Being the fastest.) Using the graph how do we find the finish time for each runner? (Time on the x-axis.) What is the time for each runner? (Aprox.15sec, 18 sec, 25 sec) 2. **Did each runner finish the race?** How long was the race? (100 m) With the graph how can we tell how far each runner ran? (Meters on the y-axis.) 3. **What do you think happened to runner B?** (Various answers. How can you tell he stopped? No gain in distance; flat.) 4. **How would you describe how fast each runner ran the race?**   Allow students to answer and discussion this question, with out validating any answers. Move to the real life information on the next slide to give students more ideas about measuring and thinking about speed.  **Tell students that this lesson will be on interpreting graphs and describing what patterns are in data.** | **Collect pre-test after 5 minutes**  The analysis of this graph will lay the foundation for students’ understanding of rate.  **Discussion: 5 min**  Next Screen shows only the graph for student discussion. |

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| **Teacher/Student Activities** | **Time / Notes** |
| **Measuring Speed & Comparing Units**   * When you think of fast, what do you think of?   ***Who is the fastest man in the world?*** Usain Bolt, (born 21 August 1986), is **a** [**Jamaican**](http://en.wikipedia.org/wiki/Jamaica)[**sprinter**](http://en.wikipedia.org/wiki/Sprint_(running))**.** His 2009 record-breaking margin for [100 m](http://en.wikipedia.org/wiki/Men%27s_100_metres_world_record_progression), went from 9.69 seconds (his own previous world record) to 9.58 seconds.  ***How fast is a racecar?*** During the 2006 season, the top speeds of Formula 1 cars were a little over 300 km/h (185 mph). [BAR Honda](http://en.wikipedia.org/wiki/British_American_Racing) team claim to set an unofficial speed record of 413 km/h (257 mph) on a one way **straight line** run.  **Discuss:**   * The racecar’s speed is written in m/h * How would you write the units for Usain’s speed? (m/sec)   Using this information, how would you describe the speed of each runner in the Hurdler’s race? (100m/15 sec = 6m/sec, etc) | **Time: 5 minutes** |
| **Constant speed:** Make references to the difference in race car speed on the straight away versus the track, which has curves, and lead students in a discussion of speed that varies versus speed that is more constant. Through these lessons we will gain a better understanding of **constant speed**   1. **Which runner ran at almost a constant speed?** 2. **Which runner started the fastest?**.   **3. If runner B had not fallen what could his/her time have been?**  Get students to recognize the most time in the least number of minutes. | **Time: 2 minutes** |
| **Analyzing Plots:** We want to analyze the family height data that we collected and graphed.   * **What is that type of graph called?** * **How is it different from the Hurdler’s graph?**   **There are specific characteristics that we look for when we analyze scatter plots.**  **Review the definition and use of a Scatter Plot:** A graph of plotted points that show the relationship between two sets of data.  A **scatter plot** can suggest various kinds of **correlations** between variables. For example, weight and height, weight would be on x axis and height would be on the y-axis. Correlations may be positive (rising), negative (falling), or null (uncorrelated). If the pattern of dots slopes from lower left to upper right, it suggests a positive [correlation](http://en.wikipedia.org/wiki/Correlation) between the variables being studied. If the pattern of dots slopes from upper left to lower right, it suggests a negative correlation. | **Time: 2-3 minute** |

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| **Teacher/Student Activities** | **Time / Notes** |
| **Analyzing Scatter Plots:** The graphs we saw for the hurdle race were **idealized curves**. When we collect data on **real-life events**, **variability** makes it more difficult to see patterns clearly.  **What do you think of when you hear the word Trend?** (Latest fashion) **A Trend** is when something tends to move in particular way; showing a pattern. It may be fashion that is moving in new way so we call that a trend.  Are there a **wide** **variety** of styles at this school? If everyone dresses the same, then there is **low variability, not strong**. If there is a **wide** **variety** of style then there is **high variability, strong**.  **Explain to a partner when variability is high or low. Share out ideas.**  Some basic techniques will help you to find patterns in data and see how these patterns help us understand our world.  We focus on four characteristics of a scatterplot to help us make sense of it in the face of variability:  1) What is the trend?  The general pattern. Is it linear? Non-linear?  2) What is the direction of the trend?  Positive/negative changing  3) How much variability is there? (Strength)  Very subjective: lots, little, strong, weak.  4) Are there unusual features?  Outliers? Deviations from the overall pattern | **Time: 5 minute**  **Key Vocabulary:**  \* Variability  \* Scatter Plots  \* Trend  \* Outliers |
| **Analyze the data and Practice drawing trend lines**.  Pass out **Student Handout 1:** **Analyzing Scatter Plots.** Explain each plot.  1) This plot shows the heights and weights of 14-year-olds who reported being in "Excellent" health. Each data point represents a person. The data come from the Center for Disease Control Risk survey. Draw the trend line. What units do you think the data are measured in? Is the trend positive or negative?  2) This plot shows the maximum ozone levels and the high temperatures at different dates in eastern Los Angeles Country. Ozone is a pollutant. The data come from the Air Quality Management district. Draw the trend line.  3) This plot shows the heights of the same 14-year olds above in both inches and centimeters. Why is the trend so strong?  **Task: With a partner, analyze each scatterplot using the 4 characteristic questions.** Discuss and draw a line that you feel shows the **Trend** or general pattern or direction of the data in each scatter plot, Is it linear? | **Time: 10 minutes**  **This activity is designed to help students see the relationship between real data and an “ideal line.”**  **Students will draw general trend lines, not based on mathematical ideas of standard deviation or mean.** |
| **Data Analysis.** Data analysis happens when we relate a graph or summary of data to the real world process that produced the data. For instance, in graph 1 we would analyze the data by saying, *“among these fourteen-year-old girls, the taller girls tend to weigh more. The trend is linear, which means there is a constant rate between weights and heights”.*  **Follow up Discussion:** Why do we say *'****tend*** *to weigh more”* and not *'weigh more'*? **Answer:** Just because one girl is taller than another doesn't mean she will definitely weigh more. Some taller girls weigh more than some shorter girls, but some weigh less. However, the trend in the data--the general tendency--is that taller girls weigh more.  **How would you analyze graph 2 (ozone)?** | **Time: 10 minute** |
| **Sources of variation.** ***What causes the variation in style? Variation in popularity of music?*** Get several ideas.  Characteristics of people and things often show variation, and it is useful to think about what might cause this variation. **TIPS:** Allow student a few minutes to think of each of these question.  **Think-Ink-Pair-Share*:* What causes variation in height?** (Genetics, nutrition at beginning of life, age, gender.) **What causes variation in weight?** (Genetics, diet, gender, height, others?)  Notice that the scatterplot of the fourteen year olds shows us that height is **one** possible cause of variation in weight. Why? Because we see that taller children tend to weigh more. So if we know someone's heights, we know a little something about how much they might weigh (and vice versa). | **Time: 5 minute** |
| **Key Concept: Cause-and-effect.** Just because there is a trend does not mean the two variables are in a cause-and-effect relationship. For example, if one of these girls grows taller, will she *definitely* gain weight? What if she joins the swim team and starts to exercise with more intensity? What if she stops eating ice cream or changes her diet to be more healthy? The variation in weight has many sources other than age, and changes in some of these variables might counteract changes in others.  The Ozone graph tells us that, beyond a certain temperature, hotter days tend to have more ozone. Does this mean that the ozone level always must go up when it gets hotter? Scientists know that ozone varies for several reasons: temperature, cloud cover, wind speed and direction, geography (valleys can trap pollutants), and other reasons, too. So if it gets hotter but the wind speed changes, the ozone might go down even though, in general, we see increases. | **Time: 2 minute** |
| **Key Concept: Critical Thinking about Data.** When analyzing data, it is important to ask some questions:  a) Who or what was observed?  b) How were the data collected?  In the case of the height and weight graph, the "who or what" is a group of fourteen year old girls who said they were in excellent health. In this case, we don't know too much about how the data were collected, except that it was part of a study by the Center for Disease Control, and it seems reasonable to believe that the girls were weighed and measured by the researchers. However, it is possible the girls were asked to report their height and weight.  **For the Family data that you collected, Who was observed? How were the data collected? Can we believe the data that was collected?** | **Time: 5 minute**  Before analyzing our family data, lay a foundation for how to think critically about data. |
| **Family Data Analysis:**  Looking at the aggregate class data, focus on the four characteristics of a scatterplot to help us make sense of this data:  **1) What is the trend?** The general pattern. Is it linear? Non-linear?  **2) What is the direction of the trend?**  Positive/negative changing  **3) How much variability is there?** (Strength) Very subjective: lots, little, strong, weak.  **4) Are there unusual features?**  Outliers? Deviations from the overall pattern.  **Team Talk:**  Start with individual think time. Each member of the team should write their answers to these questions then teams will discuss the height data using the discussion stems to form agreement and /or provide a different point of view.  Call students from each team to “air draw” the trend line through the data, continuing to use the agreement and disagreement stems. | **Team Work – 5 min**  **Sharing – 3 min**  **MPS 3**: Construct viable arguments and critique the reasoning of others. – Provide that will help initiate the conversation and get students started**:**  **Post Discussion Stems: \* I agree with \_\_\_\_\_\_\_\_, but I also think \_\_\_\_\_\_\_**  **\* That may be true, but I think \_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **\* I disagree because I feel \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** |
| **More Critical Thinking about Data.**  When analyzing data, it is important to restrict our descriptions and conclusions to the group of people or objects who were considered. We know that this scatterplot is a good description of heights and weights for these girls, but we don't know what it would look like for another group.  Many times, we will want to form ***conjectures*** about or data. Conjectures are questions that can be phrased "I wonder if....". Conjectures based on data are often made to consider what would happen if we saw another group of observations. For instance, "I wonder how the weight and height trend would differ if we looked at 16 year -old girls?" "I wonder how the weight and height trend would differ if we looked at girls who were not in excellent health." "I wonder if we would see the same height and weight trend if we looked at *all* fourteen year old girls in the United States, instead of just these few." | **Time: 5 minutes** |
| **Consider your age growth data.** What conjectures can you come up with? (Think about how this graph might differ if you asked a middle school classroom to fill it out. Or if you added the data from another class at your school. Or if you did the same survey in Japan.)  **Form Conjectures:**  Each team will develop 2-3 conjectures statements, phrased "I wonder if....". | **Time: 5 minutes**  **Consider these Data Patterns**  **a.** Clusters at **birth, x=0**  **b.** Any spaces in data  **c.** Any outliers in data  **d.** Flattening of the data  **e.** Projection after 20? |

**Lesson Overview**

Students will represent the rate of growth as an expression and interpret the structure of expressions, both alone and in comparison to the other rates. Students will reason with equations and represent and solve equations and inequalities graphically.

**Common Core State Standards**:

**Number and Quantity:** Reason quantitatively and use units to solve problems.

**High School -- Algebra**: Seeing Structure in Expressions & Interpret the structure of expressions. **High School -- Algebra**: Creating Equations★

**High School -- Functions :** Interpreting Functions

**Mathematical Practices Standard 3**: Construct viable arguments and critique the reasoning of others.

**Enduring Understanding**

This lesson presents students with an opportunity to explore and gain a deeper understanding of **rate of change**, and the role it plays in interpreting graphs and understanding data. “***What does the rate tell us about the relationship between two variables?”***

* Students will interpre CDC Growth Curves for boys and girls with the overarching question for the lesson: ***How does a constant rate appear in the graph? How do we determine if a rate is constant?***
* Using CDC data, students will determine rates of growth over several age intervals to determine if growth rates are constant for all age groups.

**Language Objective**

1. Students will use the language of Caparison and Contrast to formulate questions for a partner on the similarities and differences of growth rate of girls versus boys.
2. Students will use listening skills to understand the question being asked and to provide the appropriate information when formulating answers based on the data analyzed.
3. Students will use the language of Caparison and Contrast to write a comparison paragraph on the similarities and differences of growth rate of girls versus boys, using facts gathered during the Compare and Contrast conversation with a partner.

**Materials:**

**Lesson Power Point:** Lesson 4\_Algebra in the World of Data.pptx

**Lesson Flow Document:** Lesson 4\_Algebra in the World of Data.docx

**Student Handout** **1**: Compare & Contrastcharts

**Student Handout** **2:** The Compare and Contrast Fame

**Student Handout 3:** Data Collection Chart

**Student Handout 4:** CDC Growth Reference Data for boys, ages 2-20 (Given yesterday).

**Student Handout 5:** CDC Growth Reference Data for girls, ages 2-20 (Given yesterday).

**Performance Task/Essential Question**

Based on evidence presented from several social networks and industry data sources, Students will make claims in response to the prompt:

“***What does the rate of change tell us about the relationship between two variables?”***

Claims will be supported by evidence, calculated from analyzing the CDC graphs. Students are required to generate summary statements based on their conversation comparing and contrasting girls growth rate to boys growth rat at different age intervals.

**🕮** **Vocabulary**

Students may need frontloading of the following terms:

* Rate
* Rate of Change, (Positive and Negative)
* Zero Rate of Change

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| **Lesson 4 -- Day 1** | |
| **Teacher/Student Activities** | **Time / Notes** |
| ***Explore/Explain:* Growth Rate**  Students will explore growth rate by thinking about the rate at which they’ve grown since birth.  **\* How much have you grown since birth?**  **\* How much did you grow each year?**  **\* Can you use the rate to predict your age in 2 years?**  Give kids time to discuss each question as it comes up on the slide. Allow them time to figure out the calculations and to have discussions on the rate.  Engage students in a conversation around these three questions so they can determine a way of calculating their growth rate from birth to now.    Their plan should include finding their **Growth amount = Current height – Birth length**  **\* Average growth each year = Growth amount / age = Growth / year = Average Rate of Growth**  Discuss the amount per year, and get students to agree it is not a **constant rate.**  **Average Rate of Growth**  Talk about a “constant rate” as a characteristic of linearity. Refer to the graphs and discuss if these lines are linear. | Time: 2-3 minutes (Intro Slide discussion) |
| **Is Human Growth Constant?** At what rate?  \*\* *Who grows faster? Boys or girls?*  \*\* Is the rate higher for boys than for girls?  \*\* At first look, the graphs seem to have quite a bit in common. Both girls and boys seem to grow with the same patterns of growth. However, with a closer look, students will notice some differences. | Time: 2-3 minutes (Slide 2) |

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| **Lesson 4 -- Day 1** | |
| **Teacher/Student Activities** | **Time / Notes** |
| **Growth rates:** Students will discover that the rate of changes during different stages of childhood, and at some stages it’s faster for girls and at others, it’s faster for boys.**Students will compare their beliefs to actual data when they View Responses.** |  |
| ***Engage/Explore/Explain***  Pass out the **Compare & Contrast** charts to students. Guide them to fill in the headings. Tell students they will have **2 minutes** of **Individual time** to write observations of how the graphs are the **same** and how they are **different,** then **2 minutes to discuss** their ideas with their team.  **Critical Thinking questions:**   1. Ask students to enter **‘girls-height-for age’** for “**Item #1”** and for “**Item #2”** enter **‘boys-height-for age.’** 2. Be sure your team members are looking at the correct graph --- height not weight. 3. As a team look for ways that the two are alike and write **one idea from each team member** on the graphic organizer. 4. As a team look for ways that the two are different and write **2 ideas from each team member** on the graphic organizer. | **Write observations:**  **2 minutes** of **Individual time.**  **2 minutes to discuss** |
| **🖉 Language Objectives** should go beyond key vocabulary words. Students should also be able to express final conclusion of ideas in complete conversation.  By using a Language structure, it is simple for students to accomplish this goal.  **Pass out the Language organizer,** and allow students time to practice discussing their ideas. From the compare and contrast chart. | ***Explain findings (5min)***  **Standards for Math Practices: SMP 5**  **U**sing appropriate tools strategically |
| **Compare Height-to-age data: girls to boys With a partner,**   1. Circle the following ages for both the girls & boys: 2, 5, 10, 15 and 20. 2. Highlight all five age-lines. 3. Fold the girls graph at age two and overlay it on the graph for boys. What are your observations?   Continue doing the same for all other ages and gather data to answer the following questions:   1. At which age range is the most rapid growth? 2. Each team will find the growth rate for one age and 3 percentiles, either male or female. 3. We will look at ages 5, 10, 15, and 20, and the 5th, 50th and 95th percentile. 4. Draw a circle around these ages and use a ruler to highlight these 5 age lines. | **Age analysis - 15 min in student pairs (10-15 mins for teams to share data)** |

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| **Lesson 4 -- Day 1** | |
| **Teacher/Student Activities** | **Time / Notes** |
| ***Explore/Explain***  **Analyze data by age groups:** Students will analyze the data calculated at the five intervals and analyze the rates at each interval  **Growth rates at each age interval**: Each team members will discuss the questions on their data sheets with other team members. Use the table on the back for question 1.   1. Compare all male data to all female data. Are there any conclusions that you can make? What are they?   2. Compare birth lengths. Are there any conclusions that you can make? Why? | **Team Work – 5 min**  **Sharing – 3 min** |
| ***Engage/Explore/Explain***  Students have already noticed and discussed that growth levels off as we reach our 20s.  This is the perfect opportunity for students to discover if there is **no growth**, the rate **= 0.**  **How does the rate change as you reach 20? What does it mean about the rate?**  Allow students time to discuss the questions and guide them to the understanding that no growth means that the rate =0. | **Quick Check – 2 min** |

**Lesson Overview**

In this lesson student will learn Ohmage, the **Software** program that will allow them to collect and analyze data. Students will learn to use Ohmage, the Web Front End to gain access to the data they collected and to use the knowledge gained in the previous lessons to explore and analyze that data**.**

**Common Core State Standards**:

Mathematical Practices Standard 5: **U**sing appropriate tools strategically.

**Enduring Understanding**

* Students can review and share their data to the growing data set collected by their class and have an enduring understanding that they are in charge of the data visualizations that are generated, by selecting the variables in the data set and the visualization parameters.
* They will understand why visualizations change depending on the variable selected, and depending on the analysis of one variable alone or multiple variables in relationship to each other.

**Language Objective**

Students will learn to form conjecture statements about the data they collected, to drive the analysis. They will formulate analysis and visualization questions that can be phrased as "I wonder if....". Conjectures based on data analysis are often made to consider what would happen if we analyzed other data visualizations.

**Materials:**

**Lesson Power Point:** Lesson 5\_Web Front End.pptx

**Lesson Flow Document:** Lesson5\_Web Front End.docx

**Student Handout** **1:** Student Self Evaluation

**Performance Task/Essential Question**

Based on the evidence in the data collected, students will select parameters to produce a variety of data visualizations required to investigate and interpret the patterns they discover in their snacking habits. They will answer the questions:

**What will I learn about my eating habits from the data that I collect?**

* **What is the healthy level of the snacks I eat on a daily basis?**
* **What is the affect of carbohydrates, fats, and sugar on my calorie intake?**

Claims will be supported by three pieces of evidence, selected and cited, from the presented sources. Students are required to generate a summary statement based on this evidence.

**🕮** **Vocabulary**

Students may need frontloading of the following terms:

* Participatory Sensing
* Ethics
* Browser-based

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| **Lesson 5 -- Day 1** | |
| **Teacher/Student Activities** | **Time / Notes** |
| **5 min Warm-up**  **Students** **Self Evaluation:** Self-evaluation helps students judge the quality of their work, based on evidence and explicit criteria, for the purpose of doing better work in the future. When we teach students how to assess their own progress, and when they do so against known and challenging quality standards, we find there is much to gain.  **Have students fill in the Self-evaluation prior to reviewing data.** Student’s beliefs about their own work is not always realistic. Comparing their responses to actual data gives them valuable insight. **Ask:** *“How did you do collecting data? What snack do you eat? Healthy?”*  **Students will compare their beliefs to actual data when they View Responses.** | |
| **Introduction:** In this lesson, students will learn to use Ohmage, the Web Front End to gain access to the data they collected and to use the knowledge gained in the previous lessons to explore and analyze that data**.**  We will now learn the software developed by the UCLA Center for Embedded Networked Sensing (CENS). This software collected the data from the survey and will allow us to explore it and analyze our results.  Students can review and share their data to the growing data set collected by their class and have an enduring understanding that they are in charge of the data visualizations that are generated, by selecting the variables in the data set and the visualization parameters. | Intro Time: 2-3 minutes (Slide 1)  **NOTE: the next 8 slides DO NOT REQUIRE ACTION.**  **Students will WATCH ONLY to become familiar with the tabs and heading.** |
| **🖳 Ohmage Review**: Students logged on to Ohmage to collect data after lesson 1. This review will ensure that students remember the technology components of Ohmage.   * The **web frontend** (powered by the [Ohmage](http://www.ohmage.org/) 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 Red Circle** indicates to the students that today’s lesson will focus on the Web frontend to explore the data they collected.   ***Students should NOT be on computers until it is time to log in. They should take notes to use later.*** | Time: 2-3 minutes (Slide 2)  **Standards for Math Practices: SMP 5**  **U**sing appropriate tools strategically |
| **🖳 Home - Login:** The Mobilize Web Frontend is compatible with all modern browsers, but works best with Chrome, Firefox and Safari. Internet Explorer, if used, should certainly be updated to the latest version.  Your login information is the same as the login used for the data collection App.  ***1.*** The **home page** will first request for your **username and password.**After you enter your username and password and **Choose login**, you will be taken to the **dashboard**.  ***NOT logging on yet!***  **Tabs:** When we are ready to navigate we will go through the tabs one-by- one. (**Indicated by the arrows)** | Time: 5-6 minutes (Slides 3-11)  **The next 8 slides should take less than 5 minutes to go through. HOLD ALL QUESTIONS UNTIL THEY ARE ACTUALLY ON THE PAGE.”** |

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| **Lesson 5 -- Day 1** | |
| **Teacher/Student Activities** | **Time / Notes** |
| **2. The Dashboard:** The dashboard provides you with quick links, listed on the left side. You can [browse campaigns](http://wiki.mobilizingcs.org/app/web/campaigns), [share or delete survey responses](http://wiki.mobilizingcs.org/app/web/responses), or [upload documents](http://wiki.mobilizingcs.org/app/web/documents) from these links. **(Last one does not apply).**  The dashboard also summarizes your activity in the three boxes located in the center of the page. The orange box tells you how many private responses you have waiting on the server, and allows you to [edit private responses](http://wiki.mobilizingcs.org/app/web/responses). The green box has a count of how many surveys you are participating in, and allows you to [view active campaigns](http://wiki.mobilizingcs.org/app/web/campaigns). Also, the blue box has a count of how many campaigns you are personally running, and allows you to see your [running campaigns](http://wiki.mobilizingcs.org/app/web/campaigns).   1. **Campaigns Tab:** Here you view the campaigns you are participating in or learn more about your campaigns. **Students will not have access to do any edits on this page.** When we are ready to navigate we will go through the tabs one-by- one. (**Indicated by the arrows)** 2. **Responses Tab:** allows you to:  * View the data you have contributed. * Change the privacy state of your data (e.g. share data that has been uploaded with a default state of “private”). * Delete data you have contributed. * View shared data contributed by other users of the campaign.   **Explain the Tabs:** When you select the tab, you will be brought to a page that looks like this slide:  **Notice** that there are two states listed near the top left of the tab: **Browse Responses** and **Edit Responses**. If Browse Responses is selected, you can browse through all the data, and if Edit Responses is selected you can edit responses. In order to see any data, you must make some selections from the dropdown menus on the left. For example, we can simply choose a campaign and leave all the other defaults intact. After selecting “Show Responses” under the dropdowns, a screen something like this will appear:   1. **Explore Data Tab:** allows you to create simple plots of shared data in order to get a snapshot of what is happening in a campaign.  * When you select this tab, you will be brought to a page that looks like this slide. * During the data collection phase we must encourage participants to ensure they are submitting enough campaign responses.   To begin looking at plots first choose a plot type from the list. Select the name of a category to expand the list of options. Here, we've selected Survey Response Counts and then selected Shared Responses. | **Time: 1-2 minutes per slide**  (**Indicated by the arrows)** |

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| **Lesson 5 -- Day 1** | |
| **Teacher/Student Activities** | **Time / Notes** |
| **To view Responses:**  When you select the **Responses tab,** you should see this page with the **Campaign** and **Survey** menu.  Allow students to select the **‘View Response’** tab and notice that **nothing happens. “You must 1st select the filters.”**  Tell students there are two tabs that you can select to see your responses, (red arrows).  **ASK:** *“What happens when you try to select either?”* ***Nothing.***  **Notice** the instructions at the top of the page. “**Please make a selection from the filters on the left.”** | **Time: 1-2 minutes per slide** |
| 1. **Select filters:** Enter the same **CAMPAIGN** and **SURVEYS** that were selected from the mobile application main menu, when we began collecting data. Our data has been stored by the Campaign and survey names. 2. Now **Select View Responses. (green arrow)**   **Review the Self-evaluation and compare to actual data.**  **Tell Students:** *“Now you can see how you did collecting data, and look at what snacks you ate. Were they Healthy?”* ***Have a discussion about “What is healthy?”*** | The **Campaign** is **Algebra V2.**  The **Survey** is **Nutrition.** |
| 3. **View Responses**  The default state here is “expanded,” meaning that the complete response is visible (the picture, the text, etc). This is useful for reviewing the data. But, you can also toggle to a collapsed format, by selecting “collapse. ”  Notice that the first few responses are **marked as private.** A teacher can see private responses to **review appropriateness prior to sharing**.  Using additional dropdown menus or adding a date range, then selecting “Show Responses” again, you can modify the selection of responses.  **Students will view all data and not use additional menus.** | Time: 3 minutes |
| **Collapsed** **View of Responses**  By selecting “collapse”, you can also toggle to a collapsed format. This view is more like a spreadsheet, but has no useful information other that time and date of data.  Have students selecting “collapse” just to see a summary of all their snacks.  **Edit Responses to SHARE DATA**  Once students have competed the evaluation form and viewed their own data, they will now share their data so that the entire class has access to one full set of data.  **Now that you are in the responses tab, we will share the data.**  First everyone must **edit** his or her data to share it with the class. | **Time: 5 minutes** |

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| **Lesson 5 -- Day 1** | |
| **Teacher/Student Activities** | **Time / Notes** |
| **6. Classes Tab:** Teachers will see the names of the participants.   * When you select this tab, you will see the user names of your classmates without the names. Remember you are not allowed to share your user names & passwords**.** |  |
| **5. Documents Tab:** allows users to store documents (instead of using a flash drive or saving documents directly on a computer)  \* Share documents when you select the documents tab, it will something, like seen on this slide.   * Teacher can share docs that that others can view, download and print. * Students will be able to share URL links from their research on this page. |  |
| 8. **Important Tabs:**  For the remainder of this unit, students will learn to explore and analyze the data that has been collected by the class, using their knowledge of Algebra.  Now that we’ve reviewed all the tabs, these are the three that are most important and that we will use the most.  **Please Login Now**  **We are now ready to get started.**  Now we will actually login. Please go to the website at noted here, and enter your Username and Password. [**https://lausd.mobilizingcs.org/**](https://lausd.mobilizingcs.org/)  Logging in will take you to the ‘**Dashboard’** page. | **Time: 1-2 minutes per slide** |
| **There are 3 Ways to Look at Responses.** From the ‘**Dashboard’** page, there are three ways to get to the responses. Two options are only from this page and the third way is a tab that is always available. (Notice the arrows on Slide 13)  From the **dashboard tab,** and we will go to **view the Responses next.**  We can use the navigation (First red arrow) or you can select the first summary rectangle (2nd arrow) or you can select the actual **Responses tab.** (green arrow) | **Time: 1-2 minutes per slide** |
| **1. Select Responses tab:** Students will now view their own data that they contributed as answers to the survey. They will determine how much they snack, and if there is a pattern in their snacking habits.  We will use the **Responses tab at the top,** because that tab is always visible here. (Green arrow) | **Time: 1-2 minutes per slide** |

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| **Lesson 5 -- Day 1** | |
| **Teacher/Student Activities** | **Time / Notes** |
| **Select Filters**  There is NO DATA until you SELECT FILTERS TO BRING UP DATA.  The left hand selection bar allows you to see and edit YOUR survey responses. So select the Campaign, | **For Algebra:**  **Campaign:** Algebra V2  **Survey:** Nutrition  **Privacy:** All  **Start date & end Date** : LEAVE BLANK |
| **Share Responses**  Notice on the top menu bar that there are three actions that you can select to edit your data: **SHARE, MAKE PRIVATE, or DELETE.**  **FIRST,** select the data that you want to edit. You want to **“Select all.”**   * **Choose “Select all” (red arrow)** to mark all of your data to be shared.   **NEXT, Choose “Share” (green arrow)** to share all of your data with the class.  Now we are ready to **Explore** all the data. |  |
| **The Explore Data Tab** will allow you to create simple plots of shared data in order to analyze the numerical patterns in the quantities of the collected data.   * Select the **Explore Data Tab:** Now that the entire class can view all of the data, everyone can explore the same data.   A plot type must be selected in order to explore data. The types available are:  **1. Choose a plot type**   * **Survey Response counts** * **Single Variables** * **Multiple Variables** * **Geographical**   Each plot type allows you to explore data from different perspectives. We will explore several plot types that will provide insight into the data collected.  We will follow the **Lesson 6:** **Exploration Worksheet** to explore data. |  |
| **Explore Data from the Math Nutrition Campaign using the worksheets and instructions in Lesson 4- Patterns in Data.**  **Select the appropriate Campaign to begin exploration.** | **Use Lesson 6 to Explore and Analyze data.** |

**Lesson Overview**

Students will interpret graphical representations of health data, analyze graphical patterns, draw conclusions, and generate arguments regarding the observed patterns

**Common Core State Standards:**

Mathematical Practices Standard 3: Construct viable arguments and critique the reasoning of others.

**Enduring Understanding**

In this lesson student will learn Ohmage, the **Software** program that will allow them to collect and analyze data. Students will learn to use Ohmage, the Web Front End to gain access to the data they collected and to use the knowledge gained in the previous lessons to explore and analyze that data**.**

* Students can review and share their data to the growing data set collected by their class and have an enduring understanding of how and why the many data visualizations are created to represent selected variables in the data set.
* They will understand why visualizations change depending on the variable selected, and depending on the analysis of one variable alone or multiple variables in relationship to each other.

**Language Objective**

Students will to form conjecture statements about the data they collected, to drive the analysis. They will formulate questions that can be phrased as "I wonder if....". Conjectures based on data are often made to consider what would happen if we saw another group of observations.

**Common Core State Standards**:

Mathematical Practices Standard 3: Construct viable arguments and critique the reasoning of others

**Materials:**

**Lesson Power Point:** Lesson 6\_Patterns in Data.pptx

**Lesson Flow Document:** Lesson6\_Patterns in Data.docx

**Student Handout** **1:** Nutrition cards

**Performance Task/Essential Question**

Based on the evidence in the data collected, students will investigate patterns in their snacking habits. They will answer the questions:

**What will I learn about my eating habits from the data that I collect?**

* **What is the healthy level of the snacks I eat on a daily basis?**
* **What is the affect of carbohydrates, fats, and sugar on my calorie intake?**

Claims will be supported by three pieces of evidence, selected and cited, from the presented sources. Students are required to generate a summary statement based on this evidence.

**🕮** **Vocabulary**: Students may need frontloading of the following terms:

* Browser-base
* Ethics

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| **Lesson 6 - Day 1** | |
| **Teacher/Student Activities** | **Time / Notes** |
| **Lesson 4 – Patterns in Data**  In lesson 4 students will explore several plots with both single variables and multiple variables. Students will:   * Discuss the types of plots, what they means, and why the computer picked that type of plot for the single variable selected. * Sketch and discuss the features of plots.   **Work in partner pairs:** After each plot is sketched, discuss with a partner what the plots tell you. Then, write the explanation in your own words and explain your answers to each other. Discuss any differences.  **Move on to the next plot & discuss.** | **Intro Time: 2 minutes** |
| **The Exploration Worksheet** will step you through all 4 of the plot types. Have students record their discoveries in the spaces provided. Explain in their own words what information is in the plot and what they think it means.  “We will step through the first exploration together, and then you will work with a partner to complete the others explorations.  **Choose the first plot type**  **Survey Response counts** |  |
| **Survey Response counts:**  Under the plot type **Survey Response counts** are four choices:   * Shared Responses * Response by Privacy * **Response Timeseries** * Leader Board   Select **Response Timeseries** and select the **Campaign: Algebra 1**.  \* Leave the Dates BLANK. We want all the dates that data was collected.  \* Then, select ‘**Draw Plot.”**  **\*** Sketch the plot on the Exploration worksheet  \* Explain in your own words what the information means. | **Continuously have partners check each other and assist each other.**  **Note: For Class Discussions,** You may log on to Ohmage and bring up the same plot students are seeing, with their data. |
| **Response Timeseries:**   1. What type of graph is this ? Why? 2. What information is given?    1. Title of Graph    2. Labels of each axis    3. Legend 3. Explain in your own words what the information means.   *Additional questions as required*  Allow more than one student to answer for each, using the five **‘Talk Moves.’**  1) **Revoicing**; clarify or restate their reason 2) **Restating**; clarify or restate someone else’s idea. State their idea in your words. 3) **Apply your own reasoning**; why do you think they said what they said? 4) **Expand;** agree/disagree, add your ideas. 5) **Wait Time;** Quietly wait for responses |  |

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| **Lesson 6 - Day 1** | |
| **Teacher/Student Activities** | **Time / Notes** |
| **2. Single Variable**  -- Prompt Distribution  **Name of Snack**   * Why are some words larger than others? What is the largest for students? * There is lots of variety. What are other common snacks? How can you tell? * What are common snacks for students? * What are some of the most unusual?   Continue using the five **‘Talk Moves’** to drive discussion.  Group discussions prior to whole group share out will provide all students with ideas to share and deepen clarity.  Students may be familiar with this form of data representation. Allow them time to explain to each other, probe for questions that students may have for clarity of understanding.  **Conclusion Statements:**  You want student to make conclusions in full sentences, such as: ***“Bananas is the snack that most teachers eat, because it is the largest word in the cloud, but most students snack on Cheetos because that’ shows up the larges in our cloud. Teachers are healthier snackers than kids.”*** | **Time: 5 minutes**  This plot is a  **Word Cloud.** The definition is on the slide. |
| **ExplorIng Nutrition,** Page 3  This **Exploration Activity** is a partner activity. Have partners exchange papers when they are done with page one to read and “edit” each other’s explanations. **Create a safe environment for sharing.**  Allow time for students to complete the 3 plots on this page before class sharing.  **For each plot Ask:** What is the type of graph? and ‘What does each mean?’  **Partner Sharing** provides a level of accountability for all students and ensures that all students are involved in the learning process, and are growing their ideas about data.  Circulate around the class listening to explanations and questions, to determine the pace, misconceptions and /or difficult areas for larger groups of students. | **NOTE:** As you circulate, if you hear explanations that all students can learn from, ask that student, ***“I’d like you to share that thought in a minute.”***  Allow the learning to happen through the exploration. |
| **Bar Graph vs. Histogram**  **Discrete vs. Continuous data**  Histograms and bar graphs look very similar.  **Can you see a difference in them?** Have students **TPS first.** Let's look at an example of each. Here's a bar graph for **Sweet or Salty. - What do you notice about the bars?**  Scroll to next slide: **Histogram of Calories. (**#5 on the Worksheet.) What is this graph telling us?  ***Discuss with your partner the typical calorie count of your snacks? How does that relate to this graph?*** | **Bar graph** *(definition on slide.)* |

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| **Lesson 6 - Day 1** | |
| **Teacher/Student Activities** | **Time / Notes** |
| **Student Should notice:** In a Bar graph, the bars represent different categories and are not connected. A Histogram represents the change in one variable over time.  **Key Questions:** “Could we rearrange the bars if we wanted? For example, could we move "Salty" to go after "Sweet"? Does the order matter at all as long as we can compare the categories?  Let's take a look at a histogram now and tell me what you notice.  Does the order matter with these categories? Why?  Continue using the five **‘Talk Moves’** to drive discussion.  Continue with **Group discussions** prior to the whole class sharing.  Ask kids to use **TPS:** **T**hink, **P**air, **S**hare as they compare and contrast the Bar Graph and the Histogram.  **Students must formulate conclusion statement.** | **Time: 5 minutes**  Go to the next slide: **Healthy level,** #4 on the Worksheet. |
| **Healthy level** will be researched in more detail for the final project. Get students to discuss what they feel the **Healthy level** means.  How did they decide which number to select for their snack? Level 5 was most healthy and Level 1 was least.  Discuss how their data differed from what we see here?   * Which level had the highest count? * Which level had the lowest count? * What types of snacks did they consider most healthy?   What types of snacks did they consider least healthy? Would they change?  **What factors should be in the definition of healthy?**   * **Calories?** * **Fat?** * **Sodium?** * **Sugar?** * **Carbs?**   **How do we decide?** |  |
| **ExplorIng Nutrition, Page 4**  **Guide Students** through the exploration of **Multiple Variable** plots   * **Scatterplot** and * 2D Density Plot   We will select **Scatterplot. *(Slide animation will circle the choice.)***  Notice under **“Choose Your Parameters”** we must select **two variables,** which will be plotted on the **x & y-axis.**  **Multiple Variable**   * Based on what we’ve seen with **‘Single** **Variable”** plots, what do you thinkwill be different with a **“Multiple Variable”** plot?   **Guiding Questions:**   * What two variables do you think have an affect on each other? * Discuss what it means for one variable to have an affect on another.   Discuss **Independent and Dependent Variables** (See definition below) | \* As students analyze the scatter plots for multiple variables, ask: **What is the strength of the relationship?** |

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| **Lesson 6 - Day 1** | |
| **Teacher/Student Activities** | **Time / Notes** |
| The **"dependent variable"** represents the output or effect, or is tested to see if it is the effect. The **"independent variables"** represent the inputs or causes, or are tested to see if they are the cause. | **Time: 5 minutes** |
| **Review what students recall about Scatter Plots:**   * **Trend** of the data. * **Variablity –** Strong, high, weak, low * **Correlations -** positive (rising), negative (falling), or null (uncorrelated). * A **Correlation** is the lieness between two things.   A **scatter plot** can suggest various kinds of between variables with a certain [confidence interval](http://en.wikipedia.org/wiki/Confidence_interval). For example, weight and height, weight would be on x axis and height would be on the y-axis. Correlations may be positive (rising), negative (falling), or null (uncorrelated). If the pattern of dots slopes from lower left to upper right, it suggests a positive [correlation](http://en.wikipedia.org/wiki/Correlation) between the variables being studied. If the pattern of dots slopes from upper left to lower right, it suggests a negative correlation.  . For example, the less you eat, the skinnier you get. The longer you stay up, the sleepier you get. |  |
| **Multiple Variable** plots  **PURPOSE: Working in pairs,** students will select two variables that they think may have an affect on each other and analyze the presented scatter plot to determine the correlation between the two variables and what it means.  Students will begin the work that will result in their understanding of what nutritional component has the biggest impact on Calories? Therefor, **the rise in Calories is dependent on the amount of sugar, carbs, fat and protein**. | \* As students analyze the scatter plots for multiple variables, ask: **What is the strength of the relationship?** |
| **Lesson 6 – Day 2 – Analyzing Nutritional Data** | |