Teacher's Name: Ticey Little

Domain: Exploring Computer Science

Date Range: May 12, 2025 – May 16, 2025

ACOS Standard:

31 - Create bar plots and mosaic plots with student data and related data set.

Student Friendly Outcome:

Unit 4: Data & Computing

I CAN read location data from a file and plot points on maps.
I CAN bubble plots on a map.
I CAN read and Interpret a bar plot.
I CAN create bar plots.
I CAN differentiate between categorical and continuous data.
I CAN look for trends by analyzing various plots.

Monday	Tuesday	Wednesday	Thursday	Friday
Objectives continued from last week Bubble Maps Investigation (15 minutes) Creating a Bubble Map with collected data (35 minutes	Gallery Walk: Data Storytelling using Maps and Bubble Maps (55 minutes)	Journal entry (5 minutes) Birth Months Bar Plot (30 minutes) Data Collection (20 minutes)	Journal entry (10 minutes) Public Agenda Bar Plot Activity (45 minutes)	Journal entry (5 minutes) Public Agenda Data and Mosaic Plots (35 minutes) Group Session: (15 minutes)

Instructional Lesson # 8. Days 13-14

Topic Description: Visualizing data with maps and bubble charts are skills that are essential for various fields, including urban planning, public health, marketing analysis, environmental science, and more. This topic will empower you to tell compelling stories with maps and data.

Objectives:

The student will be able to:

- Read location data from a file and plot points on maps.
- Create bubble plots on a map.

Outline of the Lesson

Day 1 Bubble Maps Investigation (15 minutes) Creating a Bubble Map with collected data (35 minutes	Bubble maps are an effective way to visualize a multidimensional data set. students will create bubble charts and analyze them
Day 2 Gallery Walk: Data Storytelling using Maps and Bubble Maps (55 minutes)	student pairs will share their/present their visualizations with neighbor partners.

Day 1

- Investigate Bubble Chart guide and examples
- With a partner, students will search an open data source to use to create a Bubble Chart or Bubble Map

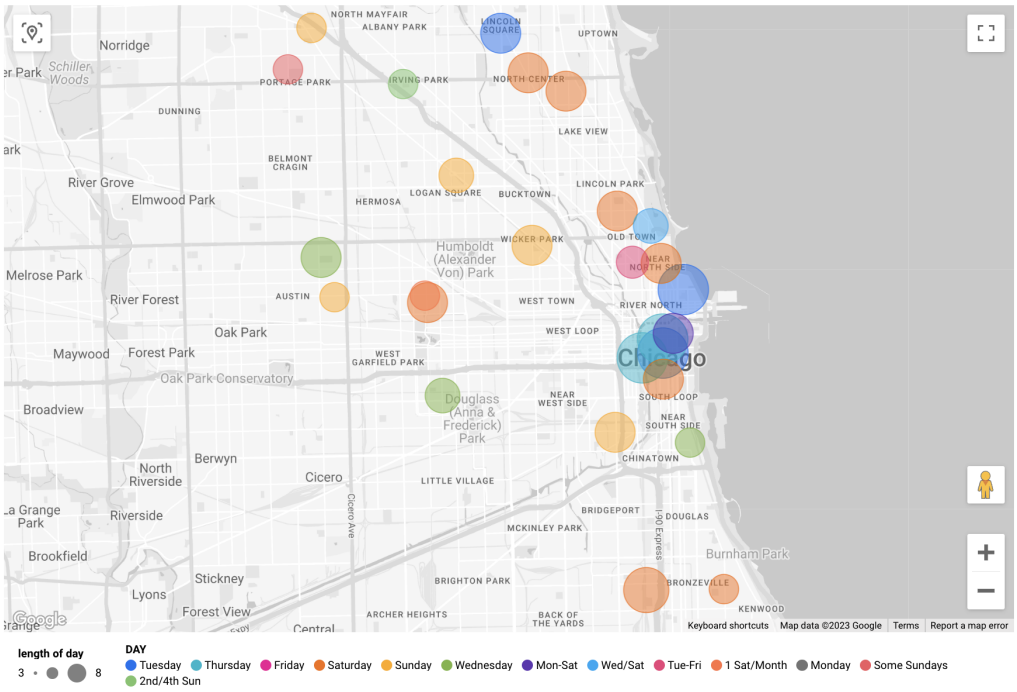
Day 2:

- Gallery Walk: Partners will present their Bubble Charts/maps to another group. Then they will switch and provide feedback to that group.

Teaching/Learning Strategies

Day 1:

- Investigate Bubble Charts & maps
    - A bubble chart/map visualization combines 3 related types of data to communicate information. These fields typically combine: location, size, and color. Users can communicate data similarities and contrasts by the size, color and location (coordinate access or map) of a bubble (circle). For example, a bubble map could be used to show schools in a city. The size of the circle might be determined by the number of students, the color could be determined by the type of school (pre-K, K-5, 6-8, and 9-12) and its orientation on the map will show its location.
    - Example: Farmers Markets in Chicago (See additional resources.)



Bubbles: Color represents day of the week; size represents hours open.

- Provide students with a link to an open data source from your community, city, county, or state. Have students search for a data set to use to create a bubble map. Their data set should include either longitude and latitude data or postal addresses. In order to save time, you can suggest a theme for the map, or preselect several data sets that contain compatible data of a bubble map visualization.

Day 2:

- Gallery Walk:
  - Each partner group will prepare a short presentation about their map and their bubble map.
  - Half of the class will stay at their computers to present, while the other half visits 2 different groups. Each station will present to one group at a time. Next the groups will switch roles and the first presenting group will visit the other half of the class, listening to 2 presentations.

Resources

- https://lookerstudio.google.com/reporting/d3e3fd39-24bf-434a-8c7c-efbe03cf79ac
- https://data.cityofchicago.org/Environment-Sustainable-Development/Farmers-Markets-Map/atzs-u7pv
- A Complete Guide to Bubble Charts. https://www.atlassian.com/data/charts/bubble-chart-complete-guide

Teacher Reflection Notes

Instructional Lesson # 9. Days 15-17

Topic Description: Bar plots and the differences between categorical and continuous data are explored. Mosaic plots are introduced as a vehicle for comparing categorical data and looking for trends in data.
Objectives

The students will be able to:

- Read and Interpret a bar plot.
- Create bar plots.
- Differentiate between categorical and continuous data.
- Look for trends by analyzing various plots.

Outline of the Lesson

Segment	Reason/Purpose
Day 1 Journal entry (5 minutes) Birth Months Bar Plot (30 minutes) Data Collection (20 minutes)	Students will be placed in different groups based on the MONTH in which they were born, how many groups would there be? Which group do you think would have the most people? This activity will give the student a relatable concept while understanding bar plots. Students discuss how they will be grouped according to their birth month. *Form your outline for your final project.* Collect data to use with your final project.
Day 2 Journal entry (10 minutes) Public Agenda Bar Plot Activity (45 minutes)	Do you think there is a relationship between grades and effort? If so, what type of relationship do you think grades and effort might have? Students experiment with bar plots commands.
Day 3 Journal entry (5 minutes) Public Agenda Data and Mosaic Plots (35 minutes) Group Session: (15 minutes)	Which items in the data you are collecting are categorical? Allow students to provide a response. Understanding “relationship” in bar plots. Have students complete the Public Agenda Data and Mosaic Plots Activity individually. Discuss student responses and ask probing questions that will lead to discussion of the data. Reflect- how might the activities in these lessons be used with your final project?

Student Activities:

Day 1

- Complete journal entry.
- Participate in the Birth Month Bar Plot discussion.
- Experiment with bar plots commands.
- Work on outline for final project.

Day 2

- Complete journal entry.
- Public Agenda Bar Plot Activity.
- Respond to questions during guided discussion.

Day 3

- Complete journal entry.
- Complete questions in Public Agenda Data and Mosaic Plots Activity.
- Group Session

Teaching/Learning Strategies:

Review Public Agenda link prior to class. (See resources.) You will share this at the beginning of class with the students. Explain what it is and how it is used. You may want to relate it to something in your own school to give the students an additional example of how a survey data file holds data collected by the private group Public Agenda.

Day 1

- Journal Entry**:** *If everyone was going to be put in a different group based on the MONTH in which they were born, how many groups would there be? Which group do you think would have the most people?*
- Birth Month Bar Plot
    - Tell students that you are going to create a bar plot (also called a bar graph or bar chart) of everyone's birth month to answer the journal question.
    - Have students help you create the skeleton of a bar plot like Sample Birth Month Bar Plot. You should end up with a similar chart, but without any counts (bars).
    - Ask each student what their birth month is. Increase the height of the corresponding bar by one until the entire class has responded.
    - The bar plot should be used for categorical data only.
    - Categorical data is expressed in terms of specific category values or labels (e.g., days of the week, answers to a multiple-choice survey).
    - Explain to the students that if we tried to do a bar plot of every student's exact height (example of 68.901 inches), we would most likely end up with a bar plot with a bar for every student each with a height of one. This type of data is quantitative (e.g., decimal numbers).
- Wrap up
    - Allow students to begin writing their outline for their final project.

Day 2

- Journal Entry**:** *Do you think there is a relationship between grades and effort? If so, what type of relationship do you think grades and effort might have?*
- Public Agenda Bar Plot Activity
    - Explain that the survey data file holds data collected by a private research group called Public Agenda (www.publicagenda.org). It is a survey of high school students and their parents designed to see if both groups have the same view of what's working (or not) with our schools. The people in the survey were identified by random selection from a list of all high school students in the United States. Respondents were asked over 100 questions—the file that will be used is a small subset.
    - Have students load the survey data file. Ask questions such as: How many different students are represented? (1293.) How many different questions were asked of a student. (Survey contains four (4) of the over 100 questions.)
    - Ask: What are the variables?
        - "year" is their year in school
        - "effort" describes how hard they are working at doing well in school
        - "homework" describes their view of the amount of homework they are getting, and
        - "grades" records how well they said they are doing in school
    - Highlight the type of each variable and possible values that are assigned to each variable.
    - Demonstrate how to create a bar plot. Point out that a bar plot is a graphical representation of the table and each bar should correspond to the count in the table.
    - Have students complete Public Agenda Bar Plot Activity individually.
    - Lead a discussion of the answers to Public Agenda Bar Plot Activity.
        - Each of the responses should generate a discussion beyond the simple solutions. Ask questions that encourage students to provide justifications for their conclusions and highlight possibilities for additional research.

Depending on your classroom engagement this lesson may be completed or carried on to the next day.

Day 3

- Journal Entry: *Which items in the data you are collecting are categorical?*
    - Allow students to provide a response.
- Public Agenda Data and Mosaic Plot
    - Reload the survey data file, if necessary.
    - Demo looking at two variables at once with mosaic plots and guide a discussion with students.
    - Note that in the previous section, bar plots about grades and effort were looked at separately.
    - A good question to ask is "are the two related?" If so, how?
        - Discuss the journal entry.
    - Create a contingency table with data to show the relationship between the answers to the two questions.
        - Ask students to explain what the items in the table mean. For example, there are 311 students that earned an A and are trying their best to do well in school. To represent this graphically, we can use a mosaic plot.
    - Demo how to create a mosaic plot to graphically compare the 2 categorical variables grade and effort.
    - How to interpret the mosaic plot:
        - The wider the columns, the more responses there are in that category.
        - Point out that the labels may not line up correctly.

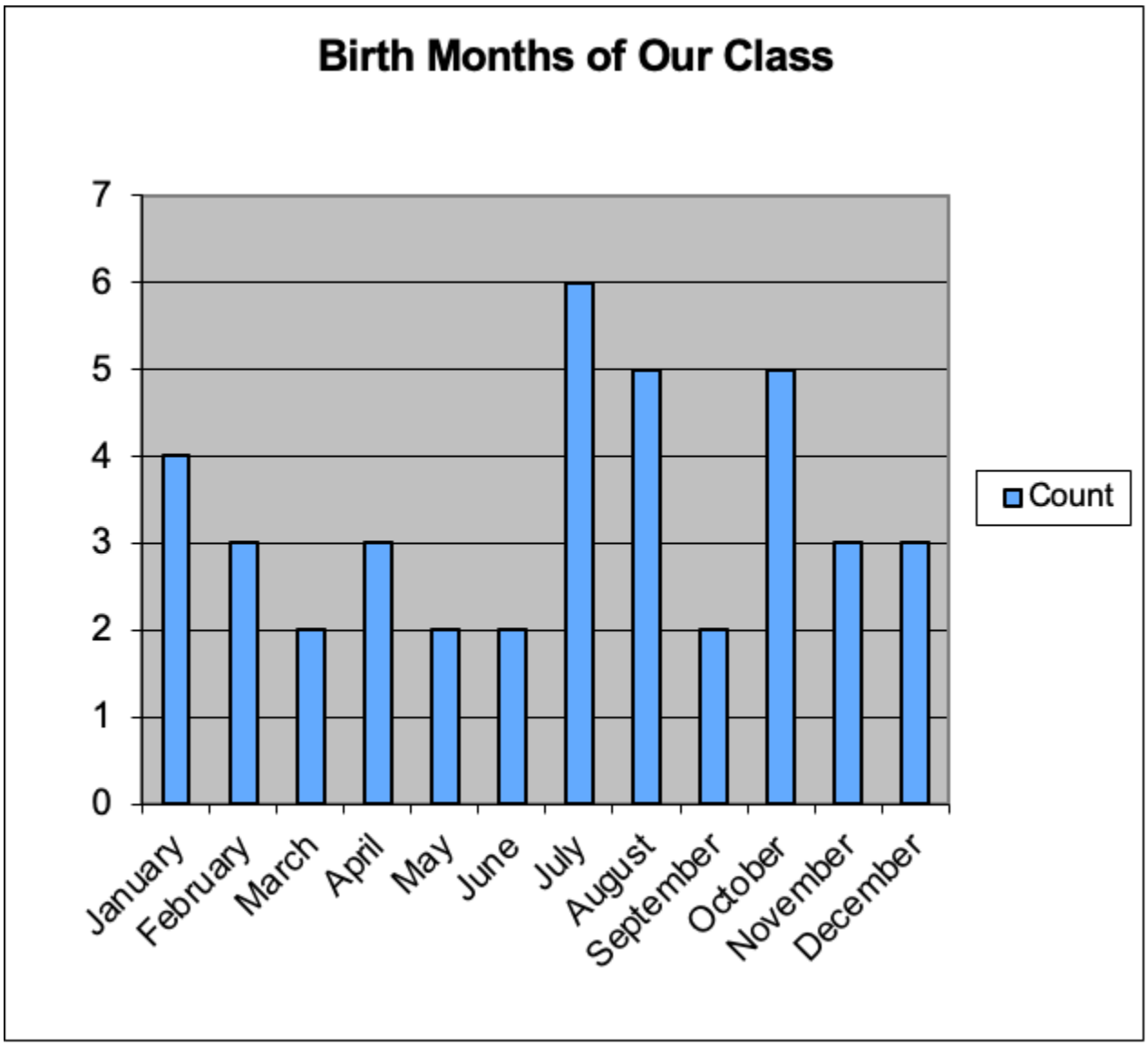
        - Allow students time to respond individually to questions such as the following before discussing them as a group.
        - What grade is the most common?
        - What grade is the least common?
        - Does that reflect the numbers in the table?
    - Within each column, the taller the row, the more responses there are in that category.
    - Allow students time to respond individually to questions such as the following before discussing them as a group.
        - Within those students with A's, are most of them trying their best or could they try harder?
        - Within those students with B's, are most of them trying their best or could they try harder?
        - All the sizes are proportional to the numbers in the tables. So if twice as many respond a certain way, then the height would be twice as tall in the mosaic plot.
        - Looking at the mosaic plot as a whole, is there a trend? What story does it tell?
    - Have students complete the Public Agenda Data and Mosaic Plots Activity individually.
    - Discuss student responses and ask probing questions that will lead to discussion of the data.
- Wrap up
    - Students think about their final project and discuss which of these visualizations they might use and why. Reflect- how might the activities in these lessons be used with your final project?

Resources

- www.publicagenda.org
- Sample Birth Month Bar Plot
- Public Agenda Bar Plot Activity
- Public Agenda Data and Mosaic Plots Activity

Teacher Reflection Notes

Sample Birth Month Bar Plot



Public Agenda Bar Plot Activity

1. Create a bar plot for effort.
    - Copy the plot to a document.
    - How does the effort of the students that responded compare?
2. Create a bar plot for homework.
    - Copy the plot to a document.
    - How much homework did most students respond to that they have?
    - How do you think that compares with students at your school?
    - If you think responses about homework are different from those at your school, why do you think students in this survey might have responded as they did? How could you test your assumption?
3. Create a bar plot for grades.
    - Copy the plot to a document.
    - What grade is most common?
    - How do you think that compares with students at your school?
    - If you think grades are different from those at your school, why do you think students in this survey might have responded as they did? How could you test your assumption?

Public Agenda Mosaic Plot Activity

1. Create a contingency table with effort as the row and grade as the column.
    - How does this table compare to the one with grade as the row and effort as the column?
2. Create a mosaic plot with (effort, grades)
    - What do you see in this plot?
    - Compare your plot to the one done previously. Does it tell a different story? Justify your answer with features of the plot.

Try making mosaic plots with three different combinations of the available variables: year, effort, homework, grades. Choose one of these other plots, describe what you see, and explain what story it tells.