Bike NYC

Teacher: Ms. B. Williams	**Date**:
Subject: Mathematics	**Grade**: 7th
Time Frame: 3 - 4 class periods	**Unit: Statistics & Probability**

Lesson Overview

Objectives/Aims: Students will demonstrate understanding/learning around the following Big Ideas:

- SWBAT Determine the measures of center for a given data set.
- SWBAT Construct a box plot or dot plot to display the provided data set.
- SWBAT Create a final presentation of the data enhanced with the use of their self created video vlogs or pictures from their experience throughout the bicycle program.

Aligned Standards:

- 7.SP.1 - Construct and interpret box-plots, find the interquartile range, and determine if a data point is an outlier.
- 7.SP.4 - Use measures of center and measures of variability for quantitative data from random samples or populations to draw informal comparative inferences about the populations.

Materials & Resources:

- NYC Citi Bike Data Months April - October
- Computers
- AI Software
- Calculators
- Graphic Organizer
- Project Packet
- Rulers
- Google Slides
- Colored Pencils

Concepts/Vocabulary:

- Artificial Intelligence (AI)
- Mean
- Mode
- Median
- Range
- Interquartile
- Probability
- Variability
- Outlier

Formula:

- **Probability** $= \frac{AI\ Detected\ Bikes}{Total\ Number\ of\ Bikes}$

Differentiations/Supports:

- Graphic Organizer
- Vocabulary
- Step-by-Step Instructions
- Directions Read/Re-read
- Questions Read
- Sentence Starters
- Additional Time
- Probability Formula
- Mean, Median, Mode, Range Models

Student Groupings: Circle

Heterogeneous or Homogeneous

Group 1:
Group 2:
Group 3:
Group 4:
Group 5:
Group 6:

Preparation for Teaching Diverse Students:

- Student will participate in the NYC Biking Program
- Students will create a video vlog of their experience in learning how to ride bikes.
- Students will learn how to find measures of center (median, mode, mean, range, interquartiles, and outliers).

Cultural context within which the lesson will be grounded, and specific ideas/practices to be included in the lesson:

- Seventh grade is a diverse group of students who attend school in West Harlem. Their families are from the US, Africa, the Middle East, and South America. One experience that students share in their seventh grade year is their participation in the NYC Bike Program. Students learn and practice how to ride bikes.
- Students will make connections between their collective experience in the NYC Bike program, their class trip to the Bicycle Center, and what they have learned about interpreting data. Students will be able to access the tasks using prior knowledge with finding the measures of center, constructing data displays and their experience with learning how to ride bicycles. The data provided to students will help them form inferences about the population who are riding bikes in their school community.

Prior Knowledge:

- Students have learned how to find measures of center (median, mode, mean, range, interquartiles, and outliers).
- Students know how to construct and interpret data displays (box plots, or dot plots)

Prior Lesson:

- Using Measures of center to display data sets
- Interpreting measures of center

Followup Lesson:

- Group Presentations

Time	Flow of Lesson	Differentiation	Teacher Moves
5 minutes	**Do Now:** Students will determine how much of each item should be ordered by the cafeteria manager. Students will show their work and write their final answers as percentages in the form of sentences. The table shows the lunch items sold on one day at the middle school cafeteria. Use the given information to help the cafeteria manager complete his food supply order for next week. Lunch Item / Number Sold Turkey Sandwich 43 Hot Dog 51 Veggie Burger 14 Fish Taco 27 How many Turkey Sandwiches, Hot Dogs, Veggie Burgers, & Fish Tacos should the manager order? 	Directions read	Teachers will circle to check for student progress and check for understanding. **Possible Student Responses:** 43/135 = 32% 51/135 = 38 % 14/135 = 10% 27/135 = 20 % The manager's order should consist of 32% turkey sandwiches, 38% hot dogs, 10% veggie burgers, and 20 % fish tacos.
5 minutes	**Instruction:** Students will follow an independent pre-recorded lesson with step by step instruction	- Directions Read - Instructional video played for	Teachers will circle the room to ensure students are on task and answer questions.

<table>
<tr><td></td><td>on how to upload their pre-selected photos into the AI system. Each group will have a different set of photos. (huggingface.co)</td><td>the whole group.
- Use of Google Classroom</td><td>During activities, teachers will meet with groups to ask and answer clarifying questions.</td></tr>
<tr><td>45 minutes</td><td colspan="3">
Activities/Tasks
Task 1:
• Use the step-by-step directions to explore artificial intelligence (AI) in our community. Compare the probability that the AI website used has accurately identified bicycles in each picture.
• Making Predictions: Discuss with your group to predict which picture will have the most bicycles identified by AI. Write your prediction below.
Activity 1 - Each group will be provided with a set of three pictures that include bikes, cars, people and other objects.
• Students will upload their pictures into the AI software (HuggingFace.co).
• Students will calculate the probability of the accurate AI detection of bicycles in their photos.
• Students will compare their findings to determine which photo had the most bicycles accurately detected by the AI model.
• Students will find the probability of accuracy for each photo and write their findings as a percent.
<table>
<tr><th></th><th>Number of Bicycles
(Count the bikes in each picture)</th><th>AI Identified Bicycles
(List the number AI identified)</th><th>Probability of Accurate Detection
(Write as a percent)</th></tr>
<tr><td>Picture A</td><td></td><td></td><td></td></tr>
<tr><td>Picture B</td><td></td><td></td><td></td></tr>
<tr><td>Picture C</td><td></td><td></td><td></td></tr>
</table>
• Students will discuss their findings and respond to the writing prompts.
○ Were your predictions correct? Why or Why not?

Task 2:
Students will establish working norms for their group.
• Students will split up the work and assign jobs.
○ Which students are responsible for determining which measure of center.
○ Which display of data they would like to use.
○ Which students are working on the display of data.
Activity 2
Part 1 - Groups will work to determine the measures of center of the provided Citi Bike data for the stations in their school community.
• Data is separated by groups
○ School Station to School Station
○ School Station to Neighborhood Station
○ School Station to Outside Neighborhood Station
• Students will make inferences based on their findings about the “community” using the bikes from that station.
Part 2 - Groups will display their findings on a chosen data display. (Box Plot, Histogram, Dot Plot).
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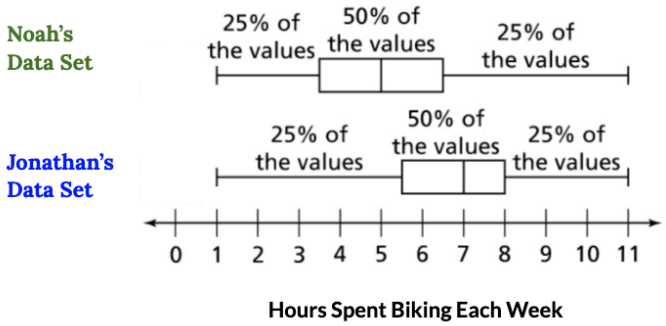
- Students will respond to the reflection questions.
  - What possible conclusions can be made about the people using the bikes in the data set?
  - What inferences can be made about the data set?
  - Explain how your group determined which data display to use? What key information helped in making the decision?

Activity 3 - Students will complete the additional problem.

1. Noah and Johnathan analyze the measures of center and variability of the data they collected.

	First Quartile	Median	Third Quartile	Interquartile Range
Noah's Data Set	$3\frac{1}{2}$	5	$6\frac{1}{2}$	3
Johnathan's Data Set	$5\frac{1}{2}$	7	8	$2\frac{1}{2}$



   a. Noah noticed that the box for his data set is longer than the box for Johnathan's data set and concluded that his data set has greater variability. Do these measures support that assessment?

Activity 4 - Groups will create Google Slides presentations of their findings.

- Presentations - no more than four slides
  - Presentations to include pictures and video of students completing projects and the NYC Bicycle Program
  - Presentations will include chosen data display
  - Presentations will include student calculations and inferences.

Assessments
Follow-Up Assignment: • Students will continue to work on their group presentations. • Students will present their findings.
Methods of Assessment:

- Formative Assessments:
    - Students will be assessed using a rubric on accurate calculations of finding the measures of center of the provided data set.
- Summative Assessments:
    - Students will be assessed with a rubric on their final presentations.