

Day 4 & Day 5 Collecting Data (2 Days)

Teacher: Prof. Migdalia Sanabria	Date: August 7th, 2025
Class Type: ICT	Grade: 6th Grade
Time Frame: 90 minutes (2- 45-minute periods)	

Essential Question - How do Newton's Third Law and force interactions help explain police-reported e-bike crashes in New York City during a specific time (year(s))?

Lesson Overview
Unit/ Overarching Focus of Lesson: Students will explore the intersection of urban design, transportation safety, and data science by examining Streetscapes research and human interactions to learn to co-exist safely.
Objectives/Aims: Students will demonstrate understanding/learning around the following Big Ideas: - The goal is for students to identify spatial and environmental factors that may contribute to crash hotspots and propose data-informed recommendations for safer streets - By conducting hands-on investigations using NYC Open Data, students will analyze patterns in e-bike crash data across New York City. https://data.cityofnewyork.us/d/h9gi-nx95/visualization - Students will be able to select their Independent variable and the Dependent Variable is to measure the #of e-bike crashes - Through this unit, students will strengthen their skills in research, critical thinking, and civic responsibility, while gaining firsthand experience in using public data to solve real-world urban issues.
Aligned Standards (New York State Standards): Standard 4: The Physical Setting Key Idea 5: Energy and matter interact through forces that result in changes in motion. Performance Indicator 5.1: Describe different patterns of motion of objects. Major Understanding 5.1c: The motion of an object is always determined by the net force acting on it. Major Understanding 5.1d: For every action, there is an equal and opposite reaction (Newton's 3rd Law). (Next Gen Science Standards): MS-PS2-1-Apply Newton's Third Law to design a solution to a problem involving the

motion of two colliding objects

Science and Engineering Practice #4: Analyzing and Interpreting Data

Involves collecting data, organizing it into tables or graphs, and interpreting what it shows about the problem (e.g., injury rates, crash types, or location hotspots).

- **MS-ETS1-3:** Analyze data from tests to identify the best features of solutions.

([Common Core State Standards](#)):

- **Math- 6.SP.B.4:** Display numerical data in plots (bar graphs, line plots).
- **ELA- W.6.1 & W.6.2:** Write arguments and explanations.

Key Vocabulary and Concepts:

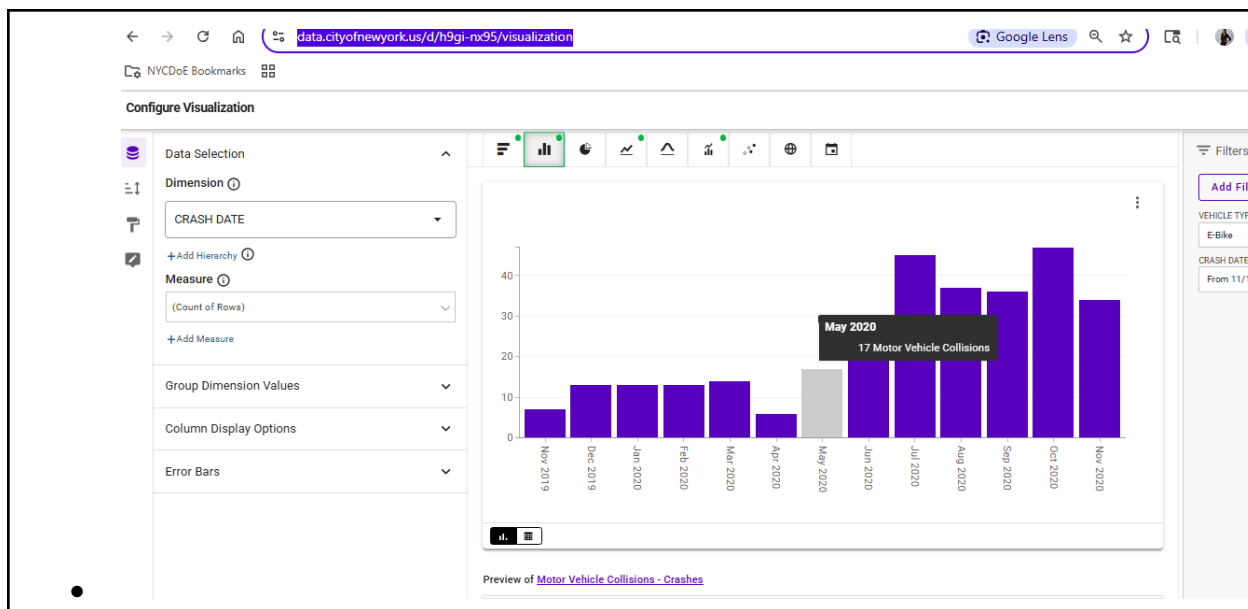
- Independent variable
- Dependent Variable
- Force
- Equal and opposite force
- Reliable data
- Validity in your study
- Incidence

Spanish Vocabulary & Concepts

- Variable independiente
- Variable Dependiente
- Fuerza
- Fuerza igual y opuesta
- Datos fiables
- Validez en su estudio
- Incidencia

Materials & Resources:

- You Tube Intro Video <https://www.youtube.com/watch?v=-IJ0H7VeqKA>
- Procedure - <https://docs.google.com/document/d/1X39THt8RGEwfqZW9tpa9Tw1SnmjDcBEH0Lt4xPiyAF4/edit?usp=sharing>
- NYC Open Data link <https://data.cityofnewyork.us/d/h9gi-nx95/visualization>
- Data Sheet https://docs.google.com/document/d/1TBmYa_FPgiNXNe1XITYrPXqd2ITLUG5QW-WIFvVcEw0/edit?usp=sharing
- More Data on ebikes <https://www.peopleforbikes.org/statistics/electric-bikes>
- Great ebike article https://www.bikeanchorage.org/all_about_ebikes



Safety Practices:

- Students should walk carefully with their laptops
- All backpacks must be under the table
- Students should not push or rush to their seat

Preparation for Teaching Diverse Students:

- Worksheets are in PDF format to upload to Yandex to translate into over 100 languages <https://translate.yandex.com/en/dictionary/English-Spanish/translate>
- Large magnifying glass for students with visual needs
- I will use a microphone for all students to hear my lesson, and for the students who are hearing impaired
- Timed activities to allow students to work effectively on their specific tasks (work on time management)
- Implement breaks for students who might feel overwhelmed
- Clear goals will be set
- A video will be displayed at the beginning of the lesson for visual and audio learners
- I will also make a video tutorial on Lom for students to use if they are confused about how to use NYC open data
- Tasks will be available in the smartboard for students to use as a reference for task assignments

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

- I will be a facilitator and walk around to support students who might not raise their hand for help or whom I see through informal assessments need more support.

Students can analyze world data of crashes on the World Health Organization (WHO)- It is interactive, and they can find calculated deaths by car, motorcycle, and bicycle. https://extranet.who.int/roadsafety/death-on-the-roads/#deaths	
Prior Knowledge: - Newton's 3rd Law: <i>For every action, there is an equal and opposite reaction.</i> - Newton's Laws and bicycle https://www.youtube.com/watch?v=JGO_zDWmkvk&pp=0gcJCdgAo7VqN5tD - Newtons 2nd law $F = ma$	
Prior Lesson: Day 2- Background Research	Followup Lesson: Making a bar graph of their data
Lesson Overview/ Abstract: - Students will walk into the classroom already with appropriate seat assignments for the EBike study. They will sit in their research seats, get a laptop, and log on - Students will be given their data sheet template- They will write their independent (IV) and dependent variable (DV) # of crashes - A 3-minute video will provide the students with the correct vocabulary and terms to use to answer questions 1 and 2 in the data sheet - Students will then use the website NYC Open Data- of reported E-bike crashes in 4 boroughs over a specific time (year(s)) - The teacher will collect the student worksheet to be distributed the next day	

Lesson Activities			
Time	Activity	Materials	Rationale
5 min	Class Norms as they walk in. Go to your Ebike Team, be sure that everyone has completed the Independent Variable (IV) and Dependent Variable (DV)	Data Sheet	Students will have a data table to organize their collection of data
3:30	Do Now- Watch the Ted Talk Bicycles and Forces	https://www.youtube.com/watch?v=JGO_zDWmkvk&pp=0gcJCdgAo7VqN5tD	To review Newton's 3rd law and to stimulate the audio learners

5 min.	Task #1-	Have students complete questions: 1-What does Newton's 3rd Law of Motion say? 2-How can this law explain what happens during an e-bike crash?	This allows the students to make the connection of the reason why accidents are occurring is because there
35 min	Task #2- Collect Data	Data Sheet	Students will collect the data either individually or as a group to promote student agency
5 min	End of class organization	Q& A- Students must log off the laptops & Collecting Data sheets (place all the worksheets in a ZipLoc bag)	Students can ask clarifying questions. Students must log off because this prevents other students from doing mischievous things on another user. The teacher will collect all the data sheets, because students lack executive functioning skills- it will help if the teacher has the class data, and it will be easier to redistribute the next day to finish collecting their data.

Lesson Assessments	
Follow-Up Assignment: - Day 4- Students continue to gather data or - Students will make a bar graph or a pie graph of their data.	
Additional Accommodations for Students: Extra time to continue collecting the data	
Methods of Assessment: - Formative Assessments:- completion of data sheet - Informal assessment- The teacher will have all the students /Team. Independent	

variable- She will check that the students are setting up the filters correctly

- Summative Assessments:- Students will use this data sheet to make a bar graph. Student will write a typed lab report of their findings. Then they will make a Public Service Announcement as a TikTok video, poem, parody of a song, Brochure, or Poster

Bibliography

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<https://www.sciencebuddies.org/science-fair-projects/science-fair/writing-a-science-fair-project-research-plan>
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- Hammond, Z. (2015). *Culturally responsive teaching and the brain: Promoting authentic engagement and rigor among culturally and linguistically diverse students*. Corwin.
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