

Authors

Lacey Williams

Lynn Brown

SUBJECT/GRADE LEVEL

Science & Mathematics

Grades 6-9

Materials

- Computer with internet access
- Graph paper
- Anchor chart paper
- Rulers
- Color pencils
- Misleading graph slide-**Attached**
- Bar, Line, and Scatter Plot graph examples slide-**Attached**
- Research topic supplemental data links slide-**Attached**
- Plan for a class of 30 students.
- [Slides](#)

STANDARDS

Next Generation Science Standards

- MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem
- MS-LS2-2 Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems
- MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations

Mathematics Standards | Common Core State Standards

- 6.SP.B.4: Display a single set of numerical data using dot plots(line), box, pie, stem, and bar graph.
- 6.SP.B.5A: Report number of observations
- 8.SP.A.1: Construct and interpret scatter plots

- 8.SP.A.2: Know that straight lines are widely used to model relationships between two quantities. For Scatter Plots, know linear association and line of best fit.

English Language Arts Standards | Common Core State

- 6.W.RBPK.8: Integrate relevant and credible information from print and digital sources; quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.
- 7.W.RBPK.8: Same as 6.W.RBPK.8, but includes “following a standard format for citation.”
- 8.W.RBPK.8: Use search terms effectively; integrate relevant and credible information from print and digital sources; quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
- 7.SL.PKI.5: Include multimedia components and visual displays to clarify claims and findings and to emphasize major points. * **Each grade level 6-9 has standards that integrate using multimedia components to display data.**

LESSON OBJECTIVE(S)

Students will research how the introduction or the absence of a species affects an ecosystem using a case study approach and determine, construct, and justify the best graphical representation to display data. (Bar, line, or scatter plots.)

CAREER CONNECTION(S)

Mentor Background: Dr. Bertrand Lemasson

Dr. Lemasson is a research ecologist in the Environmental Laboratory of the U.S. Army’s Research & Development Center (EL-ERDC). He is stationed at the Hatfield Marine Science Center (HMSC), which is part of Oregon State University and hosts several state and federal agencies. His research centers on discovering the variety of ways that ecological and anthropogenic processes influence how organisms move through their environment and where we find them. He began his career as a field biologist for Rutgers University, where he was tasked with dragging nets through various estuaries in New Jersey and Delaware to help scientists learn how changing marsh characteristics influenced regional patterns in fish abundance. Dr. Lemasson then went on to graduate school at Utah State University to help model how fish can navigate their way past artificial barriers in our rivers. During his studies he also became captivated with how interactions among individuals influence their movement decisions, which afforded him the opportunity to model collective behavior at the University of Washington’s School of Aquatic and Fishery and Sciences. In his current position at EL-ERDC he is fortunate enough to integrate his past experiences to pursue questions in both basic and applied ecology. He uses a variety of statistical and computational tools to address questions and, when he’s lucky, he manages to run some laboratory experiments or help collect field data. “Each day I learn what I was getting wrong the day before and how to improve moving forward, one step at a time. I love being a scientist.”

STEM Careers: Field Ecologist, Park Naturalist, Marine Biologist, Environmental Consultant, Environmental Protection Specialist, Natural Resource Manager .

CENTRAL FOCUS

This lesson is taught as part of a PBL with the science lesson “Restoring Ecosystems”. The topic of “how the introduction or the absence of a species affects an ecosystem” will be discussed and students will be tasked with picking from 2 different case scenarios where this has happened. They will complete their research during science class.

This mathematical standards aligned lesson focuses on students finding and using relevant data, specific to their research. Students will examine the components of graphs, including what could make a graph misleading, in order to create an accurate graphical representation of their research data.

Student’s data will be topic specific and align with the approach to their research. Most will be focused on “how a population has changed over time”. However, the focus of this lesson will not be to require specific data, but to guide students on how to correctly display relevant research data.

ENGAGEMENT

Brief Description: Students will be presented with similar graphs, one misleading, the other not. Students will discuss, as a class and then as groups, which graphs they feel are correct/incorrect and why. Class will then conclude with a “test your knowledge” quizizz.

Procedures:

Share the attached first 3 slides with your students through Google classroom or you may project these. The first 2 slides display sets of 2 graphs. One graph is displayed correctly, the other is not. Instruct students to focus on slide 1, ask a series of questions to start the discussion. “ Which graph is more appealing?” “Which graph represents the data in a true way?” “How are the graphs similar/different?” Etc... After class discussion, show slide 2. Have students start the discussion for these graphs. After about 5-10 minute discussion over graphs, present slide 3 graphs. This slide contains 4 graphs, 3 correct and 1 misleading. Have students spend 5-8 minutes discussing, with 2-3 neighbors, which graphs display the data in the most accurate way and which one “doesn’t belong.” Students can then write their response on anchor charts around the room. Have students then visit other groups and make comments on their responses. Pull the class back together. Spend 8-10 minutes as a class defending the graph of choice. Students will play quizizz

<https://quizizz.com/admin/quiz/5ce2f8d6165190001a1ada76/misleading-graphs-and-data>, (if time permits, if not continue next day) to test their knowledge about misleading graphs.

EXPLORATION

Brief Description: Students will watch a short video to reiterate the previous day’s misleading graphs discussion. Students will examine 3 types of graphs that they will use in their research presentation.

Students will share thoughts with partners. 45-50 minutes

Procedures:

Class will start with a 5 minute discussion of the previous day's topic. Students will then watch a short video that goes more in depth about misleading graphs and information that needs to be included on graphs. You may project this on the overhead projector or post in Google Classroom.

https://www.ted.com/talks/lea_gaslowitz_how_to_spot_a_misleading_graph?language=en. Once students have watched the video, have them take 5 minutes to identify a misleading component of a graph that they may not have noticed before. Take 5-8 minutes to discuss these. When students are preparing to display their data from their research, they will present this data in either a bar graph, line graph or scatter plot (8-9 grades). At this part of the lesson, show students (attached) slides 4,5, and 6, by either projecting or attaching in Google Classroom. Have the students partner with a neighbor to examine the 3 types of graphs. Give the students 10-12 minutes to write down what they notice and what they wonder about the different graphical representations.

Students should be aware at this point that they should be looking at data they would want to use to build a graph for their research.

EXPLANATION

Brief Description: Students will continue to work with a partner analyzing the bar, line and scatter plot graphs. Class and individual discussions over the pros and cons of using each graph. 45-50 minutes

Procedures:

After students have had a chance to write their notice and wonder. Have an anchor chart for notice and wonder, have student pairs write on at least one of these charts. 5-10 minutes. Discuss these as a class. 5-8 minutes. Then have students think about the advantages and disadvantages of using each of these graphs to display their research data. Have students consider how many variables they are comparing, which graph will visually represent their data accurately. Would they use pictures, how would they label their axis? 15-20 minutes. Teachers should circulate during this time to clarify misconceptions. Teachers should listen to the reasoning of students as they circulate. Have several students share their thoughts on advantages and disadvantages. 5-8 minutes. Have students, between the end of class and before next class, decide on the type of graph they want to use to display research data.

ELABORATION

Brief Description: Students will use collected research data to choose and construct a graph. Students should correctly name and identify all parts of the graph as well as justify their reasoning for using graph type. 45-50 minutes

Procedures:

Students have been simultaneously working on research in science class. "Restoring Ecosystems" science lesson has provided students with numerous links for research information. Students have also

been provided several links within this lesson. Students should, at this point, have information on the data they would like to use. HAVE STUDENTS PROPERLY CITE SOURCES.

Students will be using the data they have collected. The role of the teacher during this lesson is to facilitate and guide students as they attempt to organize their data into their graph. Students may be comparing population numbers of one species as another species's population increases/decreases, a species population over time, etc. The teacher should make sure their data is relevant to what they are studying. Students should create a rough draft on graph paper. 1 class period

This portion of the project will vary depending on grade level. Grades 8-9 should have students that will use scatter plot graphs.

Extension: If students use scatter plots, encourage students to determine if there is a linear correlation. If so, determine the line of best fit and include the function in their presentation.

EVALUATION

Brief Description: Students will incorporate their graphs and justification into their research presentation. 45-50 minutes

Procedures:

Students will work on finalizing their rough draft graphs. Students will begin to work on their final, revised graph. Students can either create a graph on paper (screenshot if they need to put in a PPT), desmos, Gitmind, or other software that will assist in creating a digital presentation. Students should have a named graph, correctly named x/y axis, and used representative starting and ending points. This will be one slide in their presentation. Students should also have another slide where they discuss the reasons for using the graph type and any other clarifying information about their graph. Students will email these slides to their teacher as well as put in the final science presentation.

REFERENCES

- Nat Geo Wolves in Yellowstone

https://web.kamihq.com/web/viewer.html?source=extension_pdfhandler&extension_handler=webrequest_1_autoload_true_user_127735&file=https%3A%2F%2Fd43fweuh3sq51.cloudfront.net%2Fmedia%2Fmedia_files%2FWolves_of_Yellowstone_Teacher_Guide_UPLOAD.pdf&filename=Wolves_of_Yellowstone_Teacher_Guide_UPLOAD.pdf&referrer=https%3A%2F%2Fwww.google.com%2F

Beavers Bear Bison

<https://phys.org/news/2022-02-reintroducing-large-mammals-world-ecosystems.html>

20 mammals to reintroduce

<https://www.bloomberg.com/news/articles/2022-02-04/how-reintroducing-these-20-animals-could-boost-biodiversity-stabilize-climate>

Reintroducing elk in smoky mountains

<https://smokymountains.com/park/blog/story-elk-great-smoky-mountains/>

Pythons taking over the everglades

<https://www.history.com/.amp/news/burmese-python-invasion-florida-everglades>

<https://ohiostate.pressbooks.pub/sciencebitesvolume2/chapter/1-4-invasive-species-burmese-python-python-bivittatus-and-its-effect-in-florida/>

<https://www.nature.org/en-us/get-involved/how-to-help/animals-we-protect/black-footed-ferret/>

Ash borer beetle destroying Ash trees

<https://inspection.canada.ca/plant-health/invasive-species/insects/emerald-ash-borer/identification/eng/1449632962119/1449632962930>

<https://www.treehugger.com/invasive-plant-swallowing-us-rate-baseball-fields-year-4858740>