



The Art of Data

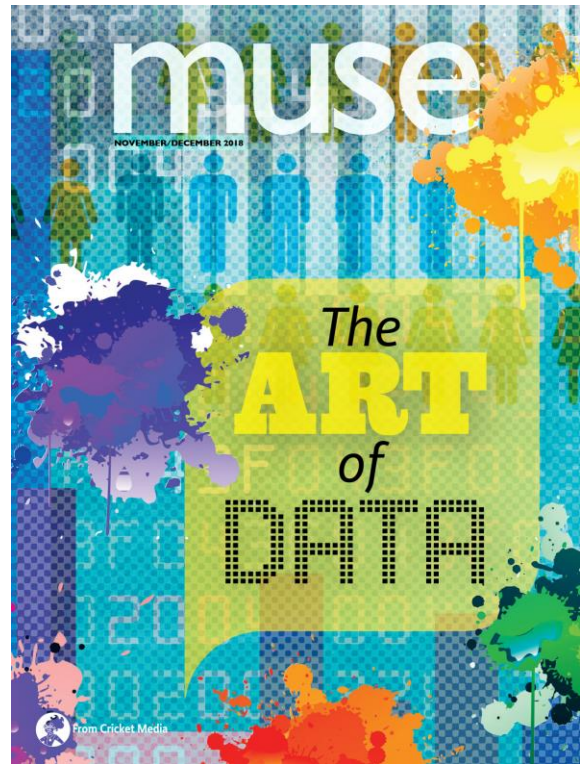
The often quoted idiom, 'seeing is believing' can be applied to the human ability to more quickly and easily comprehend information through graphic images. This issue of MUSE will teach young readers how to gain an accurate understanding of a visually represented data set, as well as how to detect faulty infographics.

CONVERSATION QUESTION

What are the advantages of displaying data in a visual format?

TEACHING OBJECTIVES

- Students will learn how data visualization simplifies and enhances information.
- Students will learn how facts can be manipulated using data visualizations.
- Students will learn how advancements in digital technology are helping to protect our wildlife.
- Students will analyze and interpret graphic data.
- Students will compare and contrast the same data represented with two different objectives.
- Students will identify the structure and function of studied technology.
- Students will represent a non-fiction text using a data visualization format.
- Students will create an alternate graph that represents given data.
- Students will research and study a given geographical location on a map.



In addition to supplemental materials focused on core STEM skills, this flexible teaching tool offers vocabulary-building activities, questions for discussion, and cross-curricular activities.

SELECTIONS

- **Making Facts Plain to See**
Expository Nonfiction, ~750L
- **Deceptive Data and Cheating Charts**
Expository Nonfiction, ~750L
- **Here There Be Jaguars**
Expository Nonfiction, ~1150L

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Making Facts Plain to See

pp. 12–13, Expository Nonfiction

Students will take a ride on the information superhighway to explore the fascinating ways that the brain most easily interprets data. Students will learn how properly formatted data visualization can cross language barriers, persuade people to take action, and effectively share facts.



RESOURCES

- The Art of Data

OBJECTIVES

- Students will learn how data visualization simplifies and enhances information.
- Students will collect and interpret graphic data.
- Students will represent a nonfiction text using a data visualization format.

KEY VOCABULARY

- **byte** (p. 12) a unit used to measure data
- **processing** (p. 12) operating by means of a program
- **track** (p. 12) to follow the course or trail of someone or something, typically to note their location

ENGAGE

Conversation Question: What are the advantages of displaying data in a visual format?

Pose the question, “How do you get most of your information?” Generate a discussion and guide the students to consider factors such as the accuracy, sources, and ease of obtaining data. Distribute the article for reading.

INTRODUCE VOCABULARY

Post the key vocabulary terms and definitions on the board. Have the students use resources to define them and then post the given definitions. Reveal the title of the article and have the class predict the content of the text. Read the article and then revisit predictions.

READ & DISCUSS

Divide the class into five groups and assign them each a different question to discuss. Reconvene and have each group share the main points of their discussion. The class should be taking notes so that after each group has shared, the students will have thorough answers to each question.

- Explain how too much data can be a problem.
- How does data visualization make information easier to understand?
- Why can images relay data more quickly than words?
- Explain the benefits of “infographics.”
- How are artists utilizing data visualization?

CONCEPT/SKILL FOCUS: Collecting and Interpreting Data

INSTRUCT: Review the main idea of the article. (Facts are both more easily and more quickly understood through the use of data visualization.) Have the students use a copy of this magazine (or previous issues) and instruct them to use only the graphic images, such as charts, graphs, photos, etc. to collect data. Give the class a copy of the graphic organizer, *The Art of Data*, to record their findings and to answer the final question.

ASSESS: Circulate and assist students as they are completing The Art of Data. Collect the completed organizers to determine who may need remediation in analyzing and interpreting data.

EXTEND

Language Arts Distribute a nonfiction piece of writing (or have students choose), and instruct the class to represent the information in the text using a data visualization format. Guide them to focus on ease, clarity, and a visually pleasing finished product. Restrict any wording to a title, captions, and/or labels.

The Art of Data

Using ONLY the graphic images throughout this issue of MUSE, interpret and record the facts that you can collect. (Resist the temptation to read the articles!)

Page #	Form of Data Visualization (Chart, graph, etc.)	Information (What facts did you gather?)

Were you able to collect a large amount of information by only using the data visualizations? **YES **NO**

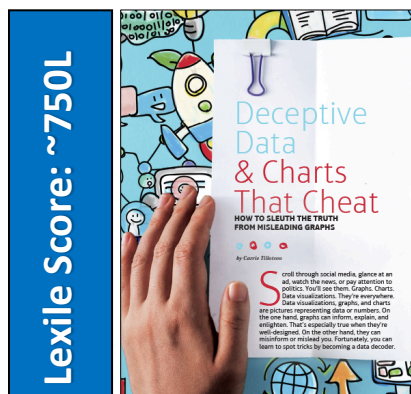
Use the back of this sheet of paper to explain your answer.

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Deceptive Data and Charts That Cheat

pp. 18–23, Expository Nonfiction

This article will reveal various ways that data can be manipulated to produce a desired response. Students will learn to “sleuth the truth” so that they are less vulnerable to the effects of deceptive data.



RESOURCES

- Goofy Graphing

OBJECTIVES

- Students will learn how facts can be manipulated using data visualizations.
- Students will compare and contrast the same data represented with two different objectives.
- Students will create an alternate graph that represents given data.

KEY VOCABULARY

- **horizontal axis (p. 21)** the x-axis, a line of figures arranged from left to right along the bottom of a graph
- **interval (p. 21)** the space between two points or values
- **range (p. 21)** the amount of variation between upper and lower limits on a particular scale
- **vertical axis (p. 19)** the y-axis, a line of figures arranged from top to bottom at the side of a graph

ENGAGE

Conversation Question: What are the advantages of displaying data in a visual format?

Present Figures 1, 3, and 5 to the class. Instruct students to briefly interpret the meaning of each graph. Distribute the article and guide students to now notice Figures 2, 4, 6, and 8. They will undoubtedly have a different interpretation of the information represented. Tell the class you will read the article to discover how “charts can cheat.”

INTRODUCE VOCABULARY

Post the key vocabulary terms on the board. Have the students write the words in their notebooks and then provide an illustration that demonstrates the meaning of each term.

READ & DISCUSS

Pose the following questions to the students to facilitate meaningful discussion.

- How can data visualizations mislead the reader?
- Explain how the axis, baseline, and spacing can each dramatically affect the information represented on a chart or graph.
- What is “cherry-picking” and how does it apply to chart design?
- What are the best strategies for exposing misleading graphs and becoming less vulnerable to “bad data”?

CONCEPT/SKILL FOCUS: Compare and Contrast

INSTRUCT: Students will compare and contrast the data represented on graphs throughout this article. Instruct them to use Figures 1 and 2, 3 and 4, 5 and 6, and 7 and 8 to complete the graphic organizer, *Goofy Graphing*. Instruct them to reread the text if they need clarification on why “cheating charts” are fabricated.

ASSESS: Collect the *Goofy Graphing* worksheet and review. Be sure students met the objective to correctly compare/contrast the graphs, as well as to express reasons WHY data would be purposely misrepresented.

EXTEND

Mathematics Have students peruse newspapers and magazines to search for graphs. Instruct students to decide if the graph represents the data set fairly or has been skewed for a particular purpose. (Remind them to look for techniques discussed in the article.) Challenge students to create a second graph using the same data to alter the appearance, and therefore the reaction, to the data. If the original graph was done accurately, they will create a faulty graph. If the original graph is flawed, they will create a more accurate representation.

Goofy Graphing

Study Figures 1–8 in the article, “Deceptive Data and Charts That Cheat.” Record how they are similar and how they are different. In the last column write a sentence telling WHY the data are represented differently.

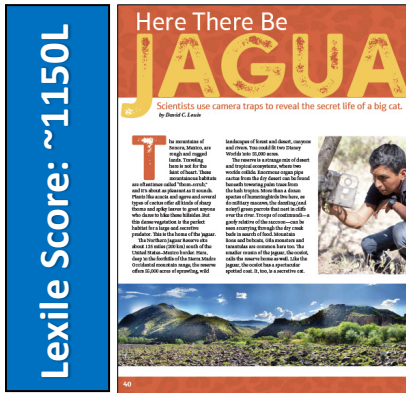
Graphs	How are they alike? (Compare)	How are they different? (Contrast)	Purpose for misrepresenting the data
Figures 1 and 2			
Figures 3 and 4			
Figures 5 and 6			
Figures 7 and 8			

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Here There Be Jaguars

pp. 40–43, Expository Nonfiction

Travel to the Northern Jaguar Reserve and discover a land that is a strange mix of desert and tropical ecosystems. Students will learn how scientists are using modern technology to study and protect our wildlife.



RESOURCES

- “Spot-On” Scientific Systems

OBJECTIVES

- Students will learn how advancements in digital technology are helping to protect our wildlife.
- Students will identify the structure and function of studied technology.
- Students will research and study a given geographical location on a map.

KEY VOCABULARY

- **dense** (p. 40) closely compacted, crowded
- **ecosystem** (p. 40) a biological community of interacting organisms and their physical environment
- **elusive** (p. 43) difficult to find or catch
- **reserve** (p. 40) a protected area for wildlife

ENGAGE

Conversation Question: What are the advantages of displaying data in a visual format?

Use the internet or books to show the class photographs of wildlife taken over 50 years ago, as well as photographs and videos taken within the last few years. Guide students to notice the differences and discuss how technology has played a role in learning more about our wildlife. Distribute the article and read.

INTRODUCE VOCABULARY

Post the key vocabulary terms and have students use their resources to attain definitions. Have them note that two of the words are adjectives and two are nouns. Challenge students to make a connection between all of the words.

READ & DISCUSS

Reinforce comprehension of the concepts in this article by using the following prompts to direct discussion.

- Describe the mix of desert and tropical ecosystems that exist on the Northern Jaguar Reserve.
- What is the purpose of the Northern Jaguar Project?
- How are biologists making use of advanced digital technology?
- What are the advantages of camera traps?

CONCEPT/SKILL FOCUS: Structure and Function

INSTRUCT: Review the technology and systems that scientists utilize to study and protect our wildlife. Present the “Spot-On” Scientific Systems graphic organizer and tell the class that they will be using information from the article to record the function of the two components listed. They may complete the chart with a partner, but instruct them to complete the written paragraph independently.

ASSESS: Collect the graphic organizer to determine if students were able to accurately determine structure and function. Evaluate understanding by reviewing independent answers to the final question.

EXTEND

Social Studies Use resources (books/internet) to locate the Northern Jaguar Reserve on a map. (200 km south of the United States-Mexico border) Study the Madre Occidental mountain range and its various landscapes. Research the plant and animal life, as well as the terrain. Divide the class into groups to more intensively research the different (animals, plants, geographical features, climate) elements. Encourage groups to share their work upon completion.

“Spot-On” Scientific Systems

Refer to the article, “Here There Be Jaguars,” to study the elements that help the Northern Jaguar Reserve to flourish. Record answers on the chart and then answer the final question.

Structure	Description	Function(s)
Camera traps		
Geographic Information Systems (GIS)		

How do biologists use a combination of camera traps and GIS technology to help protect wildlife at the Northern Jaguar Reserve?
