Making Predictions

Although the future is uncertain, readers will learn that by using proven prediction techniques it is possible to forecast events with a good degree of accuracy. This month's issue of MUSE explores how technology and collective thinking are valuable tools for predicting outcomes.

CONVERSATION QUESTION

How are accurate predictions useful?

TEACHING OBJECTIVES

- **Students will learn about the methods and reasons for collecting precipitation.**
- **Students will learn how diverse crowds can make highly accurate predictions.**
- **Students will learn about the catastrophic hurricane of 1900 in Galveston, Texas.**
- **Students will obtain and classify information.**
- **Students will use a data set to determine the accuracy of predictions.**
- **Students will compare and contrast the methods of meteorological forecasting of today with the methods of the early 1900s.**
- **Students will be presented with the opportunity to become citizen scientists with the CoCoRaHS.**
- **Students will practice statistical mathematics: mean, median, mode.**
- **Students will research the island city of Galveston, Texas and create a travel brochure.**

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

• Backyard Weather Watchers
Expository Nonfiction, ~1040L
• Ask a Crowd
Narrative Nonfiction, ~870L
• What Happened in Galveston
Expository Nonfiction, ~1010L

Backyard Weather Watchers

pp. 10–15, Expository Nonfiction
Observing the weather and recording precipitation totals is more than just a hobby—it can save lives. Readers will learn how various collection processes supply scientists with data that can help predict and avert a natural disaster.

Lexile Score: ~1040L

RESOURCES

Classifying Information
Precipitation Participation

OBJECTIVES

- Students will learn about the methods of collecting precipitation and the important reasons that it is done.
- Students will obtain and classify information.
- Students will be presented with the opportunity to become citizen scientists with the CoCoRaHS.

KEY VOCABULARY

- *detect* **(p. 11)** to determine the presence of
- *precipitation* **(p. 11)** any form of water that falls from clouds to the earth
- *observation* **(p. 12)** the process of watching carefully; monitoring
- *meteorologist* **(p. 15)** a scientist who studies and forecasts the weather

ENGAGE

Conversation Question: How are accurate predictions useful?

This hands-on activity will get students motivated to learn about precipitation collection. By creating a rain gauge, they will be able to observe the weather and experience a legitimate collection process.
Materials: Empty two-liter plastic drink bottle, small pebbles, permanent marker, masking tape, and ruler
Procedure: Cut off the top section of the bottle, right where it starts to bend. Place small pebbles in the bottom (for weight) so that they are 2 inches deep. Lay out a long piece of masking tape and use the ruler to accurately mark 0–6 inches. Place it on the side of the bottle, starting the 0 at the top of the pebbles. Turn the top of the bottle upside down and place tightly into the bottom to act as a funnel. Set it outside, wait for rain, then observe and record rainfall amounts.

INTRODUCE VOCABULARY

Post the key terms and discuss the definitions. Instruct students that they will be creating a word search puzzle using those four words, in addition to another 16 weather-related words. Suggest that they highlight topical words as they read for use in the word search. Share the puzzles with another class for use as a prereading exercise for this article.

READ & DISCUSS

Read the article aloud with the class. Have students reread the article in small groups to answer the questions below. Share responses.

1. Why did climatologist Nolan Doesken ask ordinary people to help collect rainfall data?
2. Explain the important work of the CoCoRaHS.
3. What clues did Doesken teach his son to observe when trying to estimate how much rain fell? How did they confirm the actual total?
4. Why is it important to also record days with zero precipitation?

SKILL FOCUS: Obtain and Classify

INSTRUCT: Guide students to obtain information from the text and photos in the article. Remind students that the article was written to teach readers how and why various methods are used to collect precipitation totals. Introduce the *Precipitation Participation* graphic organizer and instruct students to consult the article and to classify the details of each method accurately.

ASSESS: Collect and review the completed worksheets.

EXTEND

Science Enrich your students' learning experience by having them become citizen scientists for the Community Collaborative Rain, Hail, and Snow Network (cocorahs.org). The program offers students the opportunity to observe the weather, track precipitation, and submit findings that help scientists to gather real-time, useful data. Becoming part of this project is free and appropriate for all grade levels.

Precipitation Participation

Obtain and Classify: Find information in the article that pertains to the various precipitation collection methods.

Precipitation Type	Explain the device used for collection.	How is the total calculated using each device?	How is this collection information useful to scientists?
Rain			
Snow			
Hail			

Which type of precipitation is most prevalent in your region? _____

Ask a Crowd

pp. 28–33, Expository Nonfiction

This article explores the "superpower" of crowds when making predictions. Students will learn how a diverse group of people can be as collectively smart as a field of experts—or even smarter.

Lexile Score: ~870L

RESOURCES

Predicting Outcomes
Crowd Control

OBJECTIVES

- Students will learn how diverse crowds can make highly accurate predictions.
- Students will use a data set to determine the accuracy of predictions.
- Students will practice statistical mathematics: mean, median, mode

KEY VOCABULARY

- *prediction* **(p. 30)** an educated guess about the unknown
- *average* **(p. 30)** a number expressing a typical value calculated by dividing a set by the number of items in the set
- *diverse* **(p. 31)** differing from one another

ENGAGE

Conversation Question: How are accurate predictions useful?

Read aloud a portion of the folktale on page 31, "Six Blind Men and an Elephant." Begin with the sentence, "Six blind men approach an elephant" and end with the sentence, "An elephant is like a rope." Do not read aloud the explanation (moral). Have students discuss the meaning of the tale with a partner and invite students to share their thoughts. Instruct students to keep the moral in mind when reading the article, "Ask a Crowd." How does the tale demonstrate the importance of diversity among informational sources?

INTRODUCE VOCABULARY

Post and discuss the key vocabulary words and definitions on the board. Then display the following cloze sentences and have students supply the correct word: The restaurant has a _____ menu that includes entrées from all over the world. / Not many people agree with the government's _____ that the economy will improve. / The _____ weight of a baby at birth is a little over seven pounds.

READ & DISCUSS

Post and discuss the questions prior to reading. Read the article aloud, pausing when answers to the questions are revealed. Encourage students to elaborate.

1. Why can crowds often make better predictions than experts?
2. Why is it important to question a diverse crowd when using responses to cast a prediction?
3. What went wrong with the *Tribune*'s prediction on election night in 1948?
4. How do independent voices affect crowd predictions?
5. How do you calculate absolute error for predictions?

SKILL FOCUS: Predicting Outcomes

INSTRUCT: Have students silently reread the text box on page 33, "Predicting Cookie Sales." Discuss the information that is given, the reasons for the predictions, how the absolute error is calculated, and how diversity played a role. Distribute the *Crowd Control* worksheet and tell students they are to use the data given to make an accurate prediction.

ASSESS: Have students check their work to see that the average and absolute errors were correctly calculated. Have students share what they learned.

EXTEND

Mathematics The article, "Ask a Crowd," contains a multitude of statistical information including the importance of using crowd averages to make a prediction. Review the concepts of mean (average), median (middle value), and mode (most often occurring). Have students use the following data set to calculate mean, median, and mode: 23, 12, 20, 23, 14, 29, 31, 28, 27. (**Answer:** 23 for all.) Will the answer for all always be the same, or is this an unusual occurrence? Why?

Crowd Control

Predicting Outcomes Review page 33, "Predicting Cookie Sales," and apply the same techniques to complete the table below. Fill in the blanks with reasons that support the student's prediction (diverse thinking).

Before the school's Read-a-Thon begins, Mr. Anthony asks the kids to predict how many books the class will be able to read in one month.

- Noah predicts they will read 125 books because his class last year read about that many.

- Maddie predicts they will read 180. She thinks everyone loves reading as much as she does.

- Michael knows that many kids in the class who are on his baseball team will be focusing on their tournament games this month, so he predicts they will read only 80 books.

- Zoey predicts they will read 150 books because _____.

- Sienna predicts they will read 120 books because _____.

- Bailey predicts they will read just 65 books because _____.

Calculate the group's prediction by finding the sum of the six predictions and dividing by 6: _____.

NAME	PREDICTION	ACTUAL = 130	*ABSOLUTE ERROR

*Absolute error is the difference between the predicted and actual number of books read.

Did Noah (the expert) or the group make a better prediction? _____

What does this activity demonstrate about the accuracy of diverse group predictions? _____

_____

What Happened in Galveston

pp. 36–39, Expository Nonfiction

Travel back in time to the year 1900 and learn about one of the nation's most devastating natural disasters. Readers will learn how advancements in meteorology save thousands of lives every year.

Lexile Score: ~1010L

RESOURCES

Compare and Contrast
The Sky Is Falling

OBJECTIVES

- Students will learn about the catastrophic hurricane of 1900 in Galveston, Texas.
- Students will compare and contrast the methods of meteorological forecasting of today with the methods of the early 1900s.
- Students will research the island city of Galveston, TX and create a travel brochure.

KEY VOCABULARY

- *anemometer* **(p. 37)** measures wind speed
- *hygrometer* **(p. 37)** measures moisture in the air
- *barometer* **(p. 30)** measures air pressure

ENGAGE

Conversation Question: How are accurate predictions useful?

Introduce the title of the article, "What Happened in Galveston." Tell students that they will be learning about a devastating hurricane that took place there in 1900 in which over 6,000 people lost their lives. Read aloud the sentence on page 38 that states, "If a storm like the one that hit Galveston in 1900 would strike in our century, very few people would lose their lives." Have students hypothesize why this is the case.

INTRODUCE VOCABULARY

Post the key vocabulary words and definitions. Guide students to notice the common suffix *-ometer* in all of the words. Ask students to state the meaning of this suffix (denotes a noun used to measure something). Ask: "How does knowing the meaning of suffixes help to give meaning to unfamiliar words?" Have students make a list of words with the suffix *-ometer* and share it with a partner.

READ & DISCUSS

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

1. How did meteorologist Isaac Cline collect information about the storm of September 1900?
2. Why is the Galveston hurricane considered to be one of the nation's most profound natural disasters?
3. Why was Cline at such a disadvantage for accurately forecasting large storms?
4. What are the benefits of remote sensing?
5. How does technology play a role in weather forecasting today?

SKILL FOCUS: Compare and Contrast

INSTRUCT: Students will compare and contrast the methods of weather forecasting in the 1900s with the methods of today. Instruct pairs of students to revisit the text and to underline information that will be helpful for this purpose. Introduce the graphic organizer, *The Sky Is Falling,* and have the partners record the data on the chart.

ASSESS: Reconvene and review *The Sky Is Falling* worksheet with the class. Have students use the information they gathered to explain the differences and similarities in paragraph form. This portion of the activity should be done independently. Collect and review.

EXTEND

Social Studies This article informs readers that Galveston, TX is an island city bordering the Gulf of Mexico. It is a region known for its beautiful beaches, historic downtown, and an abundance of plant and animal species. Have students entice others to visit by creating a travel brochure that includes the following: map, demographics, climate, attractions (things to do/see), and fun facts. Use a tri-fold format and enhance with graphics and color.

The Sky Is Falling

Compare and Contrast Use information from the article to compare and contrast how weather was forecast in the past and how it's predicted in present day.

Meteorology	Then (1900s)	Now (2020s)
Forecasting Tools		
Communication Technology		
Warning Systems		
Weather Research		

Think Tank: How do you think weather forecasting will be affected by the innovations of the future? Discuss with your partner.