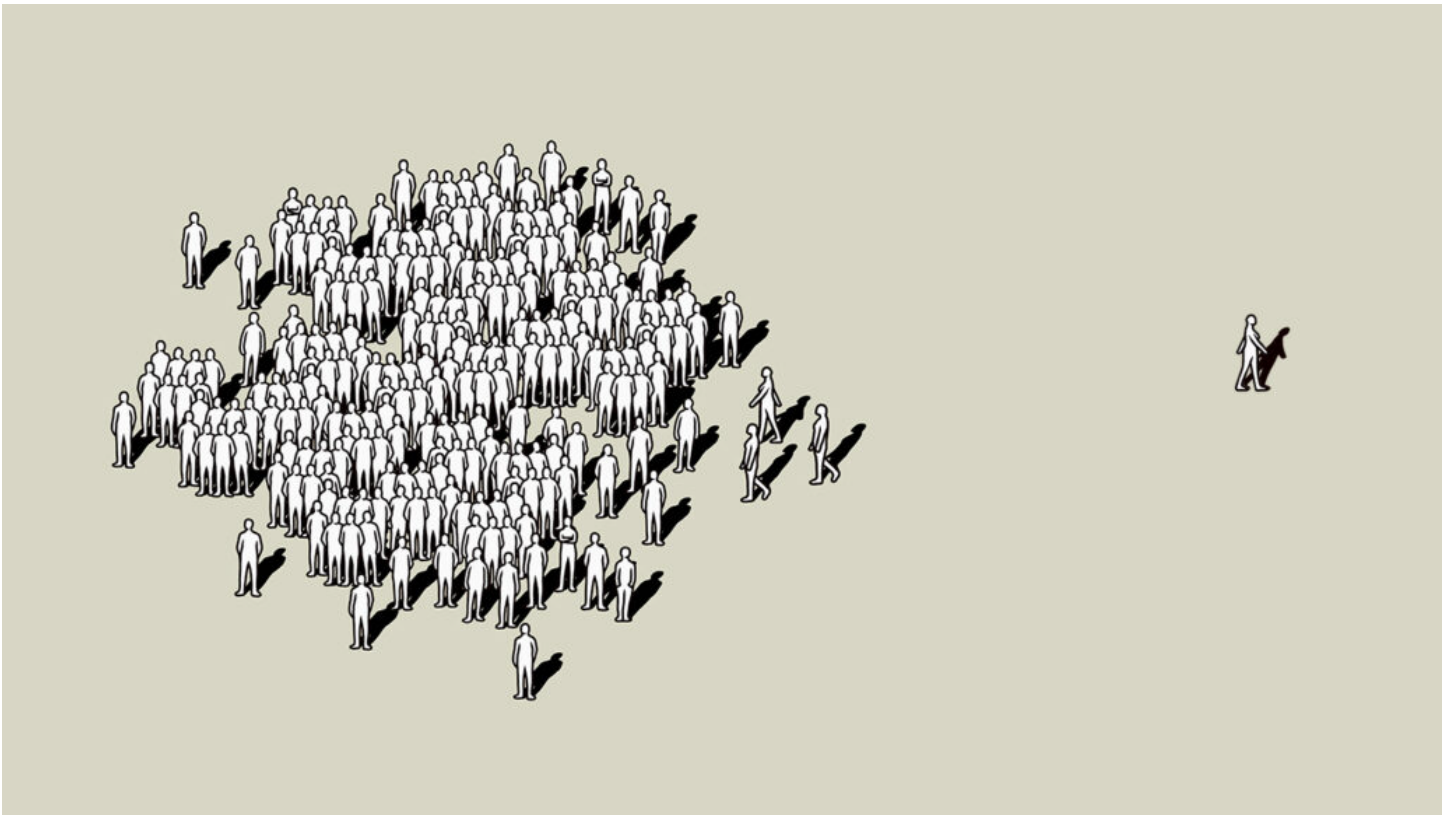


ScienceNews

EDUCATOR GUIDE



HERMANN MUELLER/GETTY IMAGES, ADAPTED BY E. OTWELL

February 26, 2022
Look to the Outliers



About this Guide

In this Guide, based on the online *Science News* article "[Why do some people succeed when others fail? Outliers provide clues](#)," students will learn about outliers and why some social scientists study them in an effort to improve people's lives.

This Guide includes:

Article-based Comprehension Q&A — Students will answer questions about the online *Science News* article "[Why do some people succeed when others fail? Outliers provide clues](#)," which describes how research into communities that defy expectations can reveal ways to help others. A version of the article, "Look to the outliers," appears in the February 26, 2022 issue of *Science News*. Related standards include NGSS-DCI: HS-ETS1; HS-ESS3; HS-LS2.

Student Comprehension Worksheet — These questions are formatted so it's easy to print them out as a worksheet.

Cross-curricular Discussion Q&A — Students will define what an outlier is and discuss why outliers occur, how to identify them and how they can be useful for science and society. Related standards include NGSS-DCI: HS-ETS1; HS-ESS3; HS-LS2.

Student Discussion Worksheet — These questions are formatted so it's easy to print them out as a worksheet.

Article-based Comprehension, Q&A

Directions for teachers: Ask students to read the online *Science News* article "[Why do some people succeed when others fail? Outliers provide clues](#)," which describes how research into communities that defy expectations can reveal ways to help others, and answer the following questions. A version of the article, "Look to the outliers," appears in the February 26, 2022 issue of *Science News*.

1. Why are Somali villages with sustainable grazing considered outliers? Based on your answer, how would you define an outlier?

The few Somali villages with sustainable grazing are considered outliers because they have been able to maintain healthy rangeland despite years of severe drought, unlike the majority of villages. An outlier is a single data point, individual or community that exists far from the average or outside a cluster of data points.

2. What is "business as usual" for outliers in data analysis? What problem does this pose for social science researchers?

Removing outliers from data is considered business as usual. But that practice contributes to an overreliance on averages, which could obscure vital information and lead to overlooking certain groups of people.

3. How and why are some social scientists using outliers in their research? What is this approach called?

Some scientists are searching datasets for outliers that hold useful information about why some people or communities succeed when others fail. Understanding what sets the successful outliers, or positive deviants, apart could then be used to help other people or communities succeed. This approach is called "positive deviance."

Rebels among us

4. How did researchers use positive deviance to help malnourished children in Vietnam in the 1990s? What was the long-term result of the researchers' intervention?

Researchers found that some families kept their children well-nourished by feeding them what was considered taboo or unhealthy food (tiny shrimp and crabs) and by feeding their kids three to four meals per day instead of the typical two meals. These families were considered positive deviants or outliers. The team then established cooking sessions taught by village women where families of malnourished children could see for themselves that the taboo foods made the children healthier, not sicker. A year after the intervention, more than a thousand children were no longer malnourished.

5. Name one drawback of the approach.

It would have been unethical to expose families that were breaking social norms, so finding a way to get more families to feed their children “taboo” foods was difficult.

Going bigger

6. Compare development researcher Basma Albanna’s positive deviance approach with the approach used by researchers in Vietnam. What makes the approaches different?

The methods of collecting data to find the positive deviants were different between the approaches. The positive deviance approach used in Vietnam required researchers to gather data from individual people to find positive outliers. Albanna’s approach relies mostly on existing population-level datasets.

7. What is “big data” and what benefits does it offer to researchers using positive deviance?

Big data refers to datasets that are exceedingly large and diverse. The benefits of big data in positive deviance research can include less labor-intensive data collection since the datasets already exist, reduced privacy concerns since data is collected at the village or neighborhood level instead of at the individual level, and an increased likelihood of finding positive outliers since the datasets are so large.

8. Summarize how Albanna and colleagues used positive deviance to study Somali villages in Africa. Make sure your summary identifies what the positive outliers were and what they revealed about how villages might be able to survive periods of severe drought.

Albanna’s team looked at rainfall, land cover and vegetation data for more than 300 villages over a five-year period and found 13 villages that were able to maintain healthy vegetation despite a severe drought. An analysis of satellite images as well as interviews with villagers revealed certain practices that were unique to the positive outliers. Examples include shrub barriers to mitigate erosion, carved basins to retain water and policies to prevent people from privatizing land.

Targeted interventions

9. What are nudges? Who do nudge interventions typically focus on?

Nudges are policies or incentives aimed at guiding people toward making better decisions. Nudge interventions typically focus on people who are in the middle class and above.

10. How might a focus on outliers and positive deviance influence the effect of nudge interventions?

Focusing on outliers may make nudge interventions more powerful and effective for people who fall outside the average and who could benefit from nudges the most.

11. What is the next step for Albanna's team in the research of Somali villages?

The team is now investigating how the practices used by the successful villages can be used to develop nudge interventions.

Student Comprehension Worksheet

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- 1. Why are Somali villages with sustainable grazing considered outliers? Based on your answer, how would you define an outlier?**
- 2. What is "business as usual" for outliers in data analysis? What problem does this pose for social science researchers?**
- 3. How and why are some social scientists using outliers in their research? What is this approach called?**

Rebels among us

- 4. How did researchers use positive deviance to help malnourished children in Vietnam in the 1990s? What was the long-term result of the researchers' intervention?**
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Going bigger

- 6. Compare development researcher Basma Albanna's positive deviance approach with the approach used by researchers in Vietnam. What makes the approaches different?**
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Cross-curricular Discussion, Q&A

Directions for teachers:

Ask students to discuss the first set of questions with a partner, then read the online *Science News* article "[Why do some people succeed and other fail? Outliers provide clues](#)" before discussing the second set of questions as a class. A version of the article, "Look to the Outliers," appears in the February 26, 2022 issue of *Science News*.

Want to make it a virtual lesson? Post the online *Science News* article to your virtual classroom. Discuss the article and questions with your class on your virtual platform.

Outlining outliers

1. Draw a picture or diagram that describes the meaning of an outlier.

Student answers will vary but may include a grouping of data with a point or two lying outside of the grouping. On a graph, outliers appear far away from other clustered points. On a distribution curve, outliers occur at the tail ends of the curve due to their low probability of occurrence. Students may use box plots or scatter diagrams if they have learned about them in the past.

2. Describe what an outlier is in words. How would you tailor your definition to apply to math or science?

An outlier exists outside of what is considered normal or average for a population. In math or science, outliers are anomalous data points within a dataset.

3. Why do outliers occur? Name as many reasons as you can.

Outliers can occur from sampling errors, data entry errors, measurement errors or other procedural mistakes. They can also occur from natural variation.

4. What are some techniques used to identify outliers in math and science datasets?

If the dataset is small, you might be able to detect outliers by in the data by eye. Otherwise, you would have to either use a graph or other data visualization or a statistical test to determine whether outliers exist. Common statistical tests include box plots, Z-score and inner quartile ranges. Scatter plots and distribution curves can also be useful ways of identifying outliers.

5. In what ways can outliers impact data analysis? Should outliers always be removed from a dataset? Explain.

Averages, standard deviations, correlations and related statistics are highly sensitive to outliers. Including outliers when analyzing data increases data variability and decreases statistical power. Excluding outliers decreases data variability and increases statistical power, possibly giving the false appearance of statistical significance. An outlier should be discarded if it was known to be the result of an erroneous measurement. But in most cases, outliers may provide important insights about individuals within the study population and so should not be discarded.

Positive deviance

1. Explain the positive deviance approach that is described in the *Science News* article. How can positive deviance be useful for solving societal problems?

The positive deviance approach is the process of looking at groups or individuals that qualify as outliers within a dataset to try to gain important insight about why they exist as outliers. Looking at the behaviors of outliers that led to positive outcomes may point to solutions for people or communities that are struggling.

2. Choose an example of positive deviance from the article and explain it.

Somali villages that have sustainable grazing are outliers because most of the region's grazing lands have been destroyed by years of drought. Researchers investigated these outliers, or deviants, to determine how the villages maintained healthy vegetation and to see if the practices could be replicated elsewhere.

3. Revisit your answer to question No. 5 in the previous set of questions. Would you change or modify your original answer after reading the article? Explain why or why not.

Student answers will vary, but they should mention that not all outliers should be thrown away.

4. Brainstorm your own example of positive deviance. What is a study that could be done in which investigating the outliers might lead to important insights or information?

Student answers will vary. A study of teenagers' time spent on social media over the course of a week could create an opportunity for positive deviance. If most teens spend a lot of time on social media, the outliers may be able to provide insights into alternative engagement opportunities for teens.

Student Discussion Worksheet

Directions: Discuss the first set of questions with a partner. Then read the online *Science News* article [“Why do some people succeed and other fail? Outliers provide clues”](#) and discuss the second set of questions as instructed by your teacher. A version of the article, “Look to the Outliers,” appears in the February 26, 2022 issue of *Science News*.

Outlining outliers

1. Draw a picture or diagram that describes the meaning of an outlier.
2. Describe what an outlier is in words. How would you tailor your definition to apply to math or science?
3. Why do outliers occur? Name as many reasons as you can.
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