

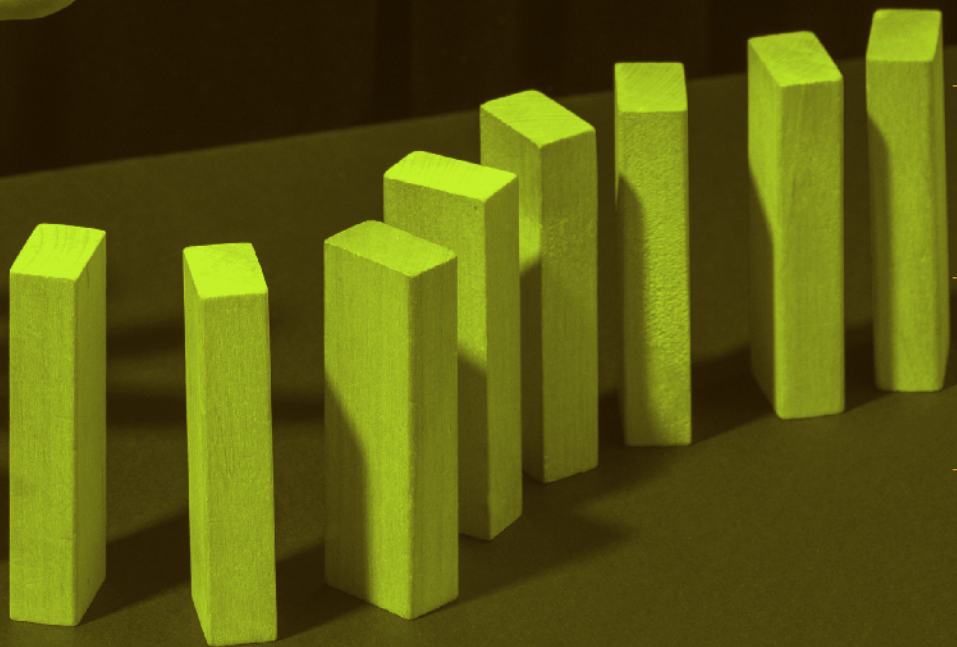


ACTIVITY 1

Cause-and-Effect Claims

INVESTIGATION

A simple example of
cause and effect.





1 : CAUSE-AND-EFFECT CLAIMS

GUIDING QUESTION

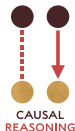
Why is it important to identify possible cause-and-effect relationships?

INTRODUCTION

One of Yale University's most popular courses is a class for teenagers on happiness. Psychology professor Laurie Santos developed the free online course to help high school students improve their overall well-being. **Well-being** is a combination of a person's mental, physical, emotional, and social health, both short-term and long-term. A person's well-being is related to someone's mood, health, attitudes, and relationships with others. By studying potential causes of unhappiness, researchers like Dr. Santos hope to discover and share useful strategies for improving people's well-being.

Throughout this unit, you will use causal reasoning to evaluate strategies to improve well-being. **Causal reasoning** is the use of observation and logic to identify cause-and-effect relationships. Causal reasoning is a powerful tool that helps evaluate problems and potential solutions for individuals and communities. In this activity, you will begin to use causal reasoning to evaluate possible strategies for increasing well-being.

CONCEPTUAL
TOOLS



If you need to review the concept of scientific variables, you will find a Science Review at the end of this activity.

MATERIALS LIST

FOR EACH STUDENT

- STUDENT SHEET 1.1
"Evaluating Salas High
School Forum Posts"



Dr. Laurie Santos teaches research-backed methods for increasing well-being to high school and college students.

PROCEDURE

- 1 As a class, read the following fictional scenario:



The staff at Salas High School wants to improve the well-being of their student population. They hope to identify strategies that students can use to better cope with everyday stress in order to improve their well-being. The school created a Well-Being Task Force made up of students with the goal of recommending a well-being strategy for Salas High School. The recommendation depends on:


- 1 *strong evidence that the strategy will increase teenage well-being.*
- 2 *a practical way to implement the strategy at Salas High School.*

The task force has begun by collecting suggestions from students and staff for schoolwide strategies to improve well-being.

- 2 In your group, brainstorm at least two well-being strategies that might be effective for students at the school. Discuss what type of information you would want to know about the strategies to decide if they would be successful in a school setting. Record your ideas in your science notebook.

- 3 Six members of the school have submitted suggestions on the Well-Being Task Force social media page. As a group, read the following posts:


 **Salas High School Well-Being Forum** 



@whizza457

Sep 27, 1:48 PM


I've heard that sugar is bad for our bodies and minds. I think we should ban sugar from food at school. If we get rid of it, I bet everyone would feel less anxious. I know because I felt less anxious after I changed my diet and started eating more green vegetables. Let's make our school a sugar-free zone and see how much better we feel. [#GoHornets](#) [#HornetSting!](#)



@artLion22

Sep 27, 2:15 PM


Kids are less happy because of stress from school. I think we should have days where everyone wears colors to feel better. Wearing specific colors can change your mood and emotions. The last 5 times we've had a game day and everyone was wearing our green and yellow colors, I noticed everyone feeling happier and a lot less stressed, especially after the rallies. Plus, it would be really easy to do. [#GoHornets](#) [@SalasHighSchool](#)



@newGirl\$haz

Sep 27, 2:19 PM



Everyone at school is in a bad mood because we are stuck indoors all the time. I've been stuck at home because of homework, but I've noticed that on days when I go to the park that has flowers, I'm rarely grumpy; but the days when I stay home all day, I'm pretty grumpy. I think going to the park cheers me up because seeing nature and flowers helps me relax. Why don't we have a school flower garden to help everyone feel better? [#SHSgardenclub](#)



@buddys2010

Sep 27, 4:15 PM

Students are not happy because they are lonely. Spending time with dogs in class would make everyone feel less lonely. Getting my dog, Bucky (who is a beagle), is the best thing that ever happened to me! Bucky bounces around until I get up and take him for a walk. Since getting him, I've met so many people who stop me to talk about how cute he is! I've been going on a lot more walks than before. Sometimes I go to the park with Bucky's best friend Luna the Labrador and Luna's owner. I feel so much less lonely! [#buckysthebomb](#) [@lunathelab](#)



Salas High School Well-Being Forum



@MrHendrick_SuperTeacher

Sep 27, 4:33 PM

Some students have trouble paying attention in class. They are not doing as well on tests and this makes them unhappy. I think we should try infusing our school water supply with solid quartz crystals. It can improve overall well-being and make people feel more energized, focused, and happy. The quartz resonates in the water, changing the properties of the water molecules so they affect mood and attention centers in the brain. I started a new exercise plan and drank quartz water yesterday, and I already feel great! I think it would make our school a more positive place. #gohornets @SalasHighSchool



@2goBerock

Sep 27, 11:57 PM

Let's make the start time for school later in the morning. This way we could all get more sleep, and that would improve our mood and health. Not enough students (including me) are getting enough sleep because we have to get up so early, and this makes us tired and cranky. If I get a great night's sleep on Friday, I wake up the next morning, on Saturday, feeling great. I've noticed this many times. #HornetSting! #sleepplzzz

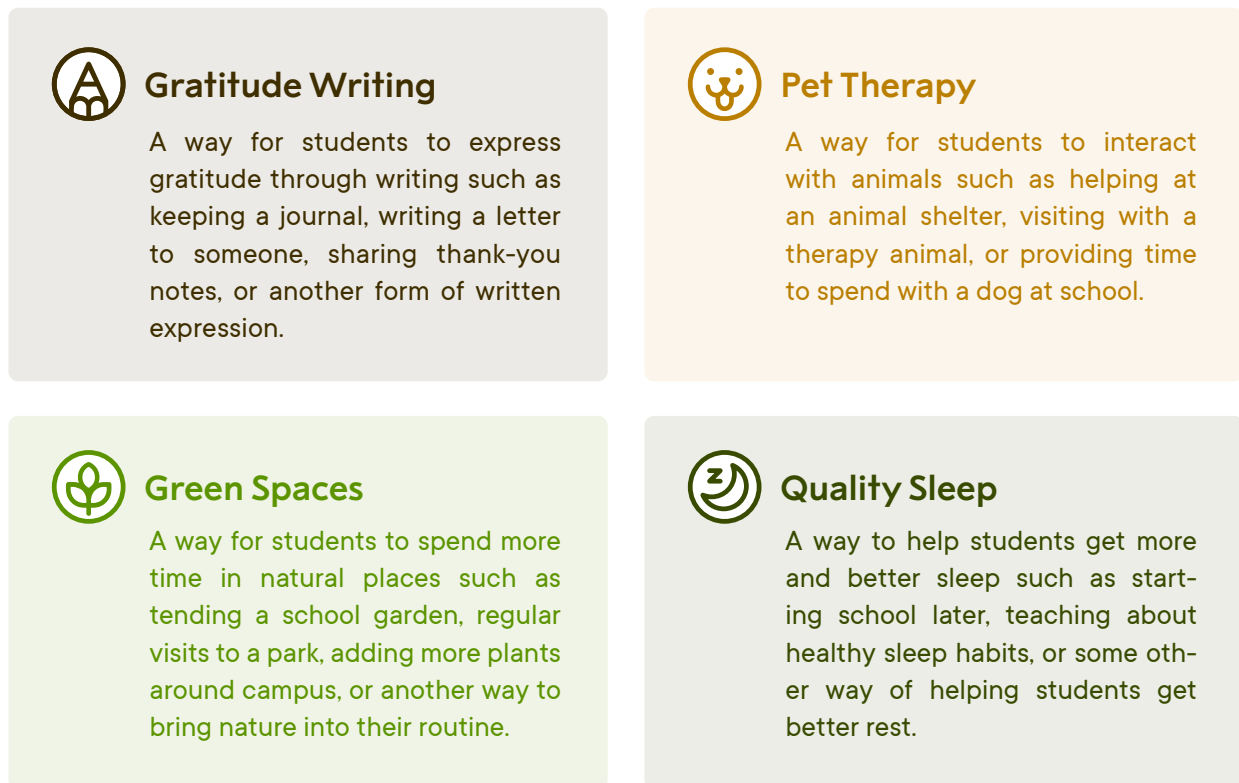


- 4 A problem and its possible solutions can be evaluated by studying causation. **Causation** is when a change in one factor leads to a change in another. Often the changes are simple, such as an increase in the number of cats in a house (a cause) leading to a decrease in the number of mice (an effect). A **cause** is a factor that produces a change in another factor (the effect). An **effect** is a factor that is changed by another factor (the cause).

The relationship between a cause and its effect can be represented as variables X and Y. With your group, use Student Sheet 1.1, "Evaluating Salas High School Forum Posts," to help analyze each post. Use causal reasoning to identify the variable that represents the possible cause (X) and possible effect (Y) for both the problem and the proposed solution for each post. Record your ideas in the appropriate columns on the student sheet.

- 5 Choosing an effective strategy depends on identifying the cause of the problem and evaluating how well the strategy would work to solve the problem. After you have analyzed the proposed solutions suggested in the posts, discuss with your group which strategy you think would be *most effective* and which would be *least effective* in improving well-being. In your science notebook, record:
- a ideas that support your choices, based on your own background knowledge.
 - b the kind of additional evidence you would want to gather.
- Be ready to share your ideas with the rest of the class.
- 6 Based on the suggestions, the Well-Being Task Force has decided on four possible schoolwide well-being strategies to explore further. These are described in Figure 1.1.

FIGURE 1.1
Proposed Well-Being Strategies for Salas High School



With your group, choose one of the four strategies (from Figure 1.1). In your science notebook, record:

- a ideas that support your choice, based on your own background knowledge.
 - b the kind of additional evidence you would want to gather.
- 7 Share your ideas from Steps 5 and 6 with the class.

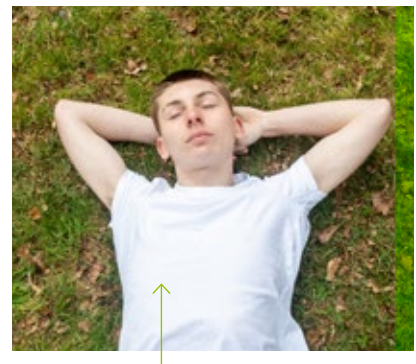
BUILD UNDERSTANDING

- ① Choose one of the well-being strategies that your group brainstormed in Procedure Step 2. Use causal reasoning to:
 - a identify a well-being problem that you think this strategy addresses. Describe the possible cause(s) of that problem.
 - b evaluate how likely it is that the strategy would help to solve the problem. Explain your reasoning, using your own background knowledge, and describe what evidence you would want to gather to be more sure that the strategy would work.

The Build Understanding and Connections to Everyday Life items are intended to guide your understanding. Some of these items may be discussed with a partner, be part of a class discussion, or require an individual written response. Your teacher will guide you as to how these items will be used in your class.

CONNECTIONS TO EVERYDAY LIFE

- ② Which of the following are examples of possible cause-and-effect relationships? For each, use your background knowledge to explain your answer.
 - a The sound of a fire engine siren and cars pulling to the side of the road.
 - b Doing my laundry on Thursday and spilling food on my shirt the next day.
 - c A cat sitting on a windowsill, and a bird flying past the window outside.
 - d Someone swallowing acetaminophen, and the pain in their sprained wrist going away a short time later.
- ③ What do you do in your own life that helps your well-being? Describe any evidence you have that it works.
- ④ Avery struggles to fall asleep at night and thinks their mattress is the problem. They go out and buy a new mattress, but they haven't considered whether staying awake and on their phone could be the cause instead. Explain how this situation shows the importance of investigating cause and effect.



Finding activities that support well-being can improve physical and mental health.

EXTENSION

Explore more well-being strategies and investigate one or two that interest you by using the resources your teacher provides.

KEY SCIENTIFIC TERMS

causal reasoning

causation

cause

effect

well-being

SCIENCE REVIEW

SCIENTIFIC VARIABLES

Independent and Dependent Variables

Although the terms *cause* and *effect* can be used in everyday situations, scientists consider both as variables when they study causation. A *variable* is a feature, factor, or result that can change or vary. The *independent variable* is the variable in an experiment that is manipulated (typically using a treatment) to test its effect on the dependent variable. The *dependent variable* is the variable in an experiment that is measured after the independent variable has been manipulated to see if it changes as a result of the manipulation.

In a research study, the independent variable is the possible cause, and the dependent variable is the possible effect being investigated. For example, if you want to know if the amount of water has an effect on the number of leaves on a plant, you could set up an experiment with three plants that are the same type and size and have other characteristics that are the same. Your independent variable is the amount of water—that's what you will adjust in the experiment—to create a difference between the group you are testing and the comparison group. Your dependent variable is the number of leaves on the plant. You can count the leaves and make comparisons between the plants to see if the number of leaves is affected by the amount of water.

Graphing Variables

One of the purposes of collecting data is to see a trend between the independent variable and the dependent variable. When displaying the data on a graph, scientists use a standard approach that plots the independent variable (X) on the x-axis and the dependent variable (Y) on the y-axis. This is shown in Figure 1.3.

FIGURE 1.3
Graphing Variables

