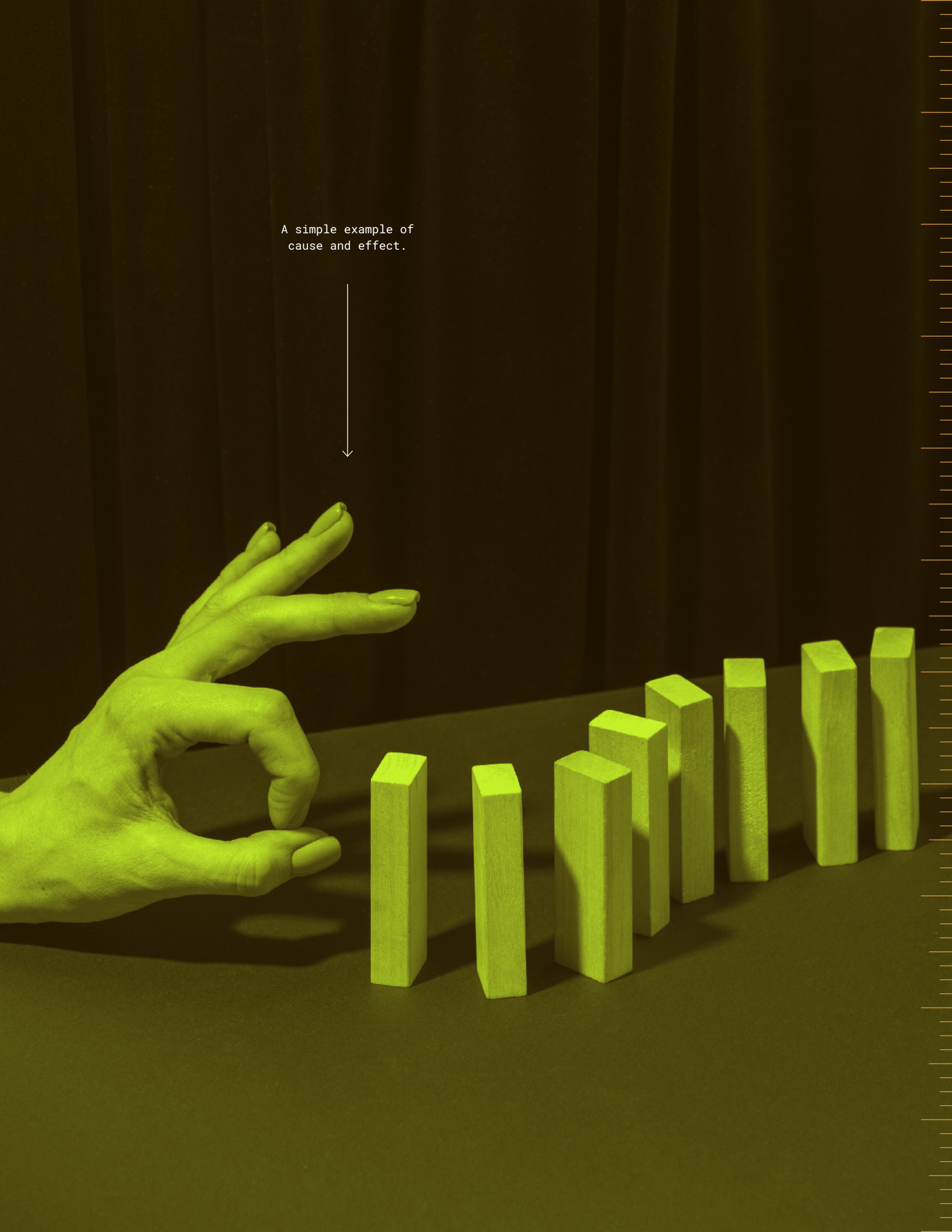
ACTIVITY 1

Cause-and-Effect Claims

INVESTIGATION


A simple example of
cause and effect.

1 : CAUSE-AND-EFFECT CLAIMS

GUIDING QUESTION

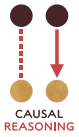
Why is it important to identify possible cause-and-effect relationships?

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.

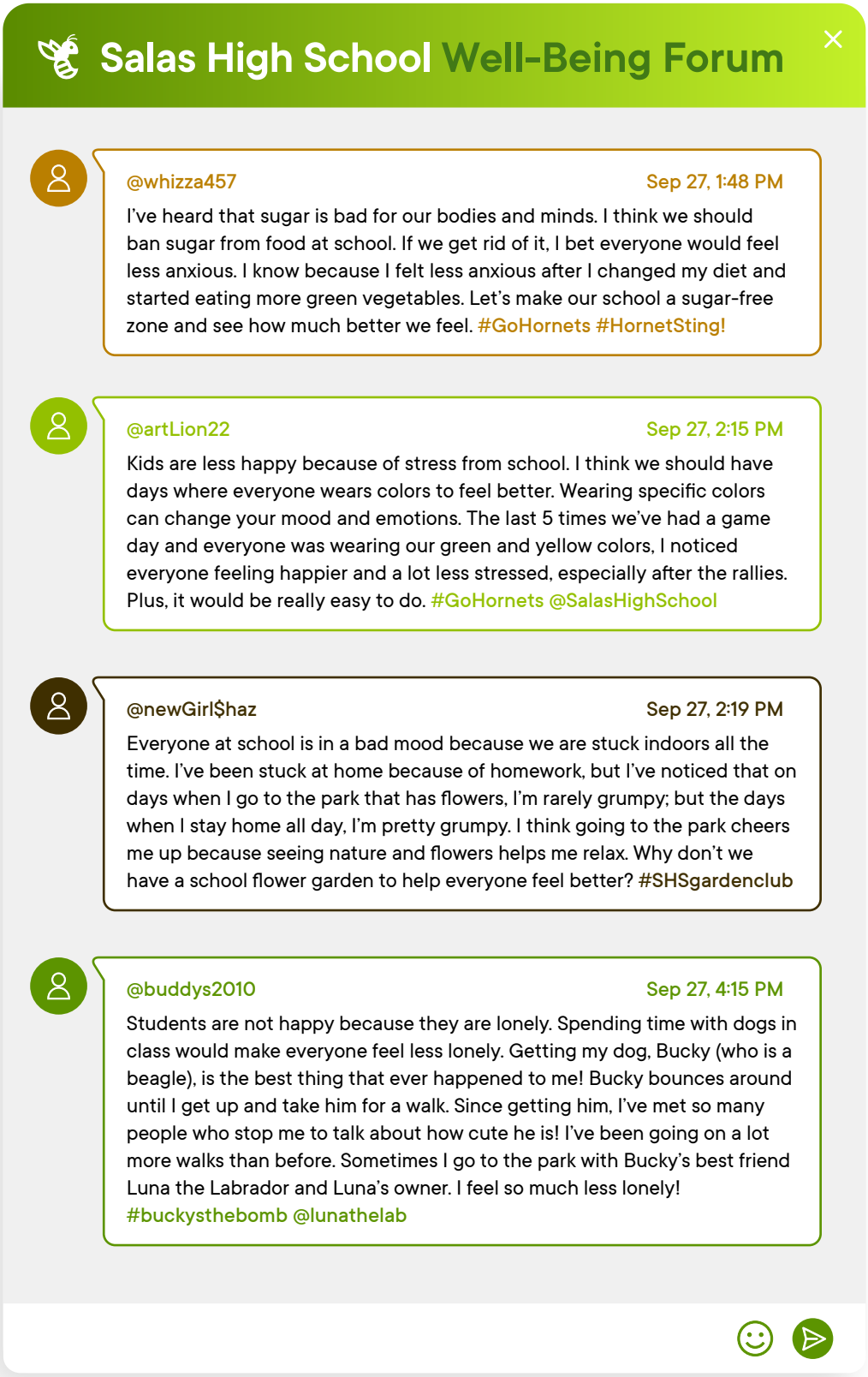
PROCEDURE

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 every-day 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:



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

Gratitude Writing

A way for students to express gratitude through writing such as keeping a journal, writing a letter to someone, sharing thank-you notes, or another form of written expression.

Pet Therapy

A way for students to interact with animals such as helping at an animal shelter, visiting with a therapy animal, or providing time to spend with a dog at school.

Green Spaces

A way for students to spend more time in natural places such as tending a school garden, regular visits to a park, adding more plants around campus, or another way to bring nature into their routine.

Quality Sleep

A way to help students get more and better sleep such as starting school later, teaching about healthy sleep habits, or some other way of helping students get better rest.

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.

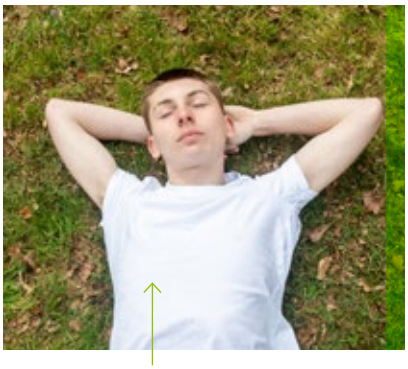
BUILD UNDERSTANDING

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