

## ENGAGE

# Cooperating like a Scientist

## Major Topic

Cooperative learning

## Overview

The Engage activity, *Cooperating like a Scientist*, places students in a situation in which the need for cooperation and communication becomes obvious and sets the stage for the use of cooperative learning throughout the program. It also provides an opportunity for students to get to know one another and for you to begin to build a community of science learners in your classroom.

## Outcomes and Indicators

**Materials** (per class of 30, teams of 4)

- 16 clean blindfolds
- 8 textbooks of any kind
- 8 rulers
- 8 pens or pencils
- different-colored pens or pencils

## of Success

The following indicators allow you to assess the students' level of success with the activity and to assess their process of learning.

By the end of this activity, students should be able to be aware of the need for cooperation and communication when functioning as a team.

They will show their awareness by

- expressing frustration at not being allowed to communicate in the ways they are used to,
- having difficulty accomplishing a task without being able to communicate, and
- discussing the cooperative efforts of some famous scientific teams.

## Preparations

Create pairs of 2. Although not all pairs will get along instantly, try to let them work out their differences rather than offering the easy solution of changing partners. Because you

## ENGAGE

## EXPLORE

## EXPLAIN

## ELABORATE

## EVALUATE

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# Cooperating like a Scientist

Imagine a scientist at work. Do you see a man in a white coat working alone? Scientists come in all shapes and sizes—men and women from all cultures—and they rarely work in isolation. Usually, two or more scientists work cooperatively to make scientific breakthroughs possible. In this Engage activity, *Cooperating like a Scientist*, you will look at the role that cooperation plays in science.

## Materials

items needed to play the radar game  
different-colored pens or pencils

## PROCESS AND PROCEDURES



1. Work with a partner to “brainstorm” a list in response to this question: “What is science?” Write down your best ideas in your science notebook.
2. Exchange lists with another team of 2 and discuss the similarities and differences among your ideas.
3. Join another pair of lab partners as directed by your teacher so that you have a team of 4 together at 1 table. Your new team will play the radar game.
4. Choose 2 people to be “blinds” (persons wearing blindfolds) and 2 people to be “helpers.”
5. Have the 2 students who will be the blinds sit on the same side of the table. Helpers sit on the opposite side of the table.
6. Read the rules for the radar game in the need to know, *Game Rules*. Follow these rules for the rest of the game.
7. Obtain a clean blindfold from your teacher. Helpers blindfold their blinds. Blinds must stay blindfolded and remain seated for the entire activity.



**CAUTION:** Be sure to stay seated anytime you are wearing a blindfold.

8. Follow the instructions given by your teacher, and proceed with the radar game.
9. Participate in a class discussion of your success with the radar game. Answer the following questions.
  - a. How close did you come to accomplishing the task?
  - b. What surprised you about this activity?
  - c. How did you feel during the game?
  - d. Why did you feel the way you did?



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may not know your students well at the beginning of the school year, an occasional pair assignment may be unworkable and need to be altered. Use this strategy as a last resort. Although pairs of students will follow the radar game instructions, each table will have 2 pairs, making a team of 4. These will be the teams referred to throughout this section.

You will need 2 blindfolds for each team of students because each person wearing a blindfold will need a clean, unworn one. Two or 3 days before the activity, ask each student to bring in a clean scarf or handkerchief. Another option is to tear 1 or 2 old but clean bedsheets into long, blindfold-sized strips. Set used blindfolds aside in a pile separate from the unused ones.

## ELL

If you have English language learners, consider pairing them with a bilingual student for this activity.

Also, assign the roles so that a student with a severe hearing impairment does not play the role of the “blind.” If you have visually impaired students, guide the class to be sensitive about the game’s role for the “blinds.” Honor the visually impaired students’ expertise by asking if they want to play a helper role and give their partners experience working without vision. This can be accomplished smoothly by teaching the helper role ahead of time to

## NEED TO KNOW



### Game Rules

1. Helpers may not touch any materials or the blinds. (If a blind drops something, however, helpers may retrieve the material and give it back to the blind.)
  2. Helpers may not talk. They may not talk to the teacher, their blinds, or helpers or blinds from other teams. Helpers may not speak to answer a question even if a blind asks. Helpers pretend that they are completely mute. Helpers cannot make any sounds using their voices.
  3. Helpers and blinds may not use any materials other than those your teacher instructed helpers to get after the blindfolds are in place.
  4. Blinds *may* talk. They may talk to each other, to the teacher, to their helpers, and to helpers and blinds from other teams.
  5. Blinds may touch the materials.
- e. If you could change the rules of the radar game, how would you change them?
- f. How does this game relate to the work that scientists do?
10. Look back at the list you wrote in step 1. Using a different-colored pen or pencil, revise your list to include the role that communication plays in doing science.
- You will frequently be asked to revise what you have written throughout this program. Each time, you will use a different-colored pen or pencil. This process will help you stay aware of how your thinking changes over time, which is an important part of learning.

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any students with visual disabilities or assigning an aide to show them the helper's directions during class time.

## Strategies for Guiding Learners

### Process and Procedures

As a class, read orally or silently all the introductory materials for the activity. Then introduce students to the chapter organizer to help them build connections between concepts and activities. Use the time spent reading to bring the students' attention into focus.

1. Decide on the pairs you will use in the *Engage* section and inform students of their pair assignment.

**Direct students to work with a partner as they write their responses to the question in step 1 in their science notebooks.**

The students likely will provide answers that describe the use of microscopes and other technological advances, or they will mention the use of experimentation and data collection. **Because this is the first task in the book, some students may worry that they have to provide the right answer to this question. This is a good time to set an appropriate tone for the whole program and for Engage activities in particular. Reassure students that you are interested in their ideas and that the point of the program is for them to develop as learners. If they work hard to try to answer questions like this at first and then reflect back on their**

learning as they progress, their learning becomes easier. This description usually helps motivate students.

2. Have each pair of students share its ideas with another pair and discuss the similarities and differences among the ideas. Take this opportunity to get to know your students' preconceptions about the process of science.

**For example, students may not know the difference between explanations for natural phenomena that are based on pseudoscience and those based on scientific inquiry. Do not correct ideas at this point; however, note major preconceptions and address them in later activities of the Engage section.**

3. Direct students to combine 2 pairs to form the team of 4 in which the students will work during the first unit of the program.

**Let the students settle into their teams, preferably around lab tables or 4 desks pushed together to form a pod.**

**Ask them to clear their work spaces completely by putting their books and bags under their tables.**

- 4–5. Explain that in each group, 2 students will be “blinds” and 2 will be “helpers.” Direct the students to follow steps 4 and 5.

**Be sure students understand that the blinds will be blindfolded for the duration of the activity. If you have some teams of 3, have 2 students be the blinds and 1 student be the helper.**

6. Read aloud and explain the rules in the need to know, *Game Rules*.

## Safety



**CAUTION:** Students should remain seated anytime they are wearing a blindfold.

7. Explain that you will give further instructions to the helpers once all the blinds in the class are blindfolded. Pass out a clean blindfold for each blind in the class and have the helpers blindfold the blinds. From this point on, for safety reasons, do not allow the blinds to leave their chairs.
8. Double-check that students understand the rules. Have the

helpers obtain a textbook, pencil or pen, and a ruler to use in the activity. Arrange the example textbook, the pencil or pen, and the ruler into a formation like one of those illustrated in figure TEn.1 or another configuration of your choice.

Now tell the helpers to help the blinds arrange their materials in the same formation while following the rules.

Expect the students to be completely stymied by your request. They will challenge the rules immediately. They will want to know if there is any way around the rules. Some will express extreme frustration and say that completing the task is impossible.

Circulate from team to team, offering advice and encouragement. You can say something like, "It is within your power to do this task. Who can talk here? The blinds? OK, blinds, start talking. Don't ask questions of your helpers. They can't answer. Tell your helpers something. Tell them anything. Tell them how they can help you."

A few of the groups will never get much further than they were when they started. They will simply watch the blinds playing with the materials. Most of the teams, however, after much frustration, probably will come up with a code of some sort, usually using knocks on the table or the clapping of hands by the helpers. For example, the blinds might eventually tell their helpers that 1 knock means yes and 2 means no. The blinds then will proceed to manipulate the materials saying, "Is this right?" "Do we put the ruler in here?" "Do we open the book?" "Are we close?" Then, for each question, the helpers will knock in response.

It is critical that the teams determine their own solutions to the problem. It also is critical that the teams become frustrated and want to talk to each other. If some students become so frustrated that they give up, recruit them to play the role of an observer. They may watch other groups and take notes, but they may not interact with anyone. Ask for their observations in the class discussion during step 9. If you do ask students to play the role of observer, consider

giving them questions to answer, such as, "What seemed to frustrate each of the people on the team?" or "What did you notice that worked well?"

You should allow 10 minutes or so, depending on the success rate of most of the teams in your class, before calling a halt to the activity and asking the blinds to remove their blindfolds.

9. Follow immediately with a class discussion of the questions in step 9.

- a. The teams will tell you how close they came or if, indeed, they accomplished the task.

Acknowledge that most teams accomplished at least 1 component of the task.

- b. Teams will offer examples of how they felt or how they came to a solution.

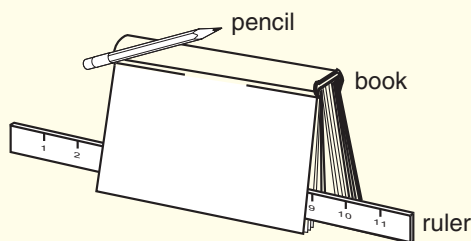
Keep track of their answers in a visible way.

- c. The students will tell you how frustrated they were.
- d. The students will tell you that you did not allow them to communicate.
- e. Allow the students to change the rules without restriction.

Many will say that in their version of the game, they would be allowed to talk.

In response to those who wanted to communicate, probe for deeper understanding: "I saw some of you accomplishing the task, though. How did you do that?"

The students will share the type of code, if any, that they managed to devise.



Probe further by asking the students if their codes were forms of communication.

At this point, the students should discuss what falls under the definition of communication, allowing you to assess their understanding of communication.



Next, ask the students, "What is so important about communicating that you had to figure out a way to do it without talking or touching?"

The students probably will mention that they can't do what you asked them to do without communicating.

If they do not mention that they had to communicate to complete the task, then share this idea.

- f. Scientists often work in teams and accomplish remarkable things that way.

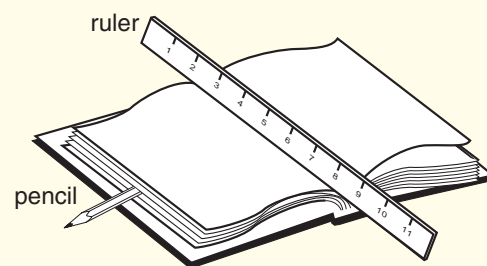
Ask students if they know of any famous teams from the history of science, such as Marie and Pierre Curie, James Watson and Francis Crick, or the scientists involved in the Human Genome Project.

Conclude this discussion by informing students that they also will work in teams this year in science. Mention that each time they work as a team, they will need to communicate.

Some students may not want to work with or even know a particular person, but this should not keep them from accomplishing their tasks.

10. Direct students to follow step 10 individually.

Look for students to mention that science is a collaborative enterprise and that science involves working in teams, sharing ideas, and communicating.



**Figure TEn.1** Possible placements of the ruler, book, and pencil.