



Linking Activity 2 “Mix the Heat” Convection

The “Mix the Heat” activity is an example of heat transfer by convection. The purpose of the activity is for students to understand that heat transfers from a warmer object to a colder object until both reach the same temperature. Students predict what will happen when two equal amounts of water at different temperatures are mixed.

This activity may be done by students in small groups, or as a demonstration.

You will need

- two large graduated beakers for each group of students (or just one pair if you are doing a demonstration)
- a thermometer for each group of students (one thermometer for a demo)

Procedure

1. Half-fill one of each pair of beakers with hot water; fill the other halfway with cold water.
2. Have the students measure and write down the temperature of the water in each beaker. (Have volunteers measure the temperatures if you are doing a demo.)
3. Ask students to predict what the temperature of the water will be after the contents of the beakers are combined. Students should share their prediction with a partner and provide a rationale for their thinking. The teacher should circulate among the students, listening to their explanations.
4. Write down the predictions on pieces of paper, or on the whiteboard.
5. Pour the water from one beaker into the other, and mix.
6. Take the temperature of the combined water and compare it to the predictions.
7. Have students write down an explanation for their observation. This may be a good time to introduce or review the idea of *thermal equilibrium*—objects transfer heat until both objects reach the same temperature.

Example: Say that the temperature of the water in one beaker is 30° C and the temperature of the water in the other beaker is 15° C. Most students may predict that water temperature of the combined beakers will be 15° C, because they think that 15° C water will be subtracted from the 30° C water. Some may think that the temperature of the combined water will be 22.5° C (the average temperature of the water in the two beakers), and a few may think that the combined water temperature will be 45° C (adding the water temperatures).

Sense-Making Discussion: Convection

Lead a discussion about the similarities and differences between what students did in this activity and how convection occurred in the game. Ask the following questions:

- What was your prediction? Why did you make that prediction?



- Were you surprised by the outcome of the experiment? If so, why?
- Why is the temperature of the combined water the average of the two temperatures of the water in the beakers?

Game Connection—Level 10 in *Galactic Gloop Zoo* explores the concept of convection. In this level, Stan the Zookeeper has to transfer heat to the egg with the help of both the Flying Gloop and the Walker Gloop. First, Stan transfers heat to the Flying Gloop, who moves down when its temperature falls below minus ten degrees. The Flying Gloop then transfers heat energy to the Walker Gloop, who, after receiving heat, is able to move across the barrier into the liquid atmosphere. The heat energy from the Walker Gloop is transmitted through convection to the liquid, which in turn warms the egg, enabling it to hatch.

Now is a good time to project **Level 63** on a screen or SmartBoard. Enter the password “teacher feature” to access the level. This level is equivalent to Level 10 in the game, and illustrates convection. Play the level and ask students if they have something new to add to their ideas about the similarities and differences between the activity and the game experience. Use the following questions to guide the conversation:

- Describe how convection takes place in Level 10 of the *Galactic Gloop Zoo* game.
- Did you notice anything new?

Following the sense-making discussion, use the question below as a *Quick Write*. Give students 10–15 minutes to answer the question.

- How is the method of heat transfer in the “Mix the Heat” activity similar to the way heat is transferred in *Galactic Gloop Zoo*?