Activity 1.2
Racing M&M colors

Do some M&M colors dissolve in water faster than others?

Students often want to know whether the coatings of certain colored M&M's dissolve in water faster than others. In order to investigate this, students will have to design a fair race. As students discuss how to compare the speed at which each colored coating dissolves in water, they will begin to identify possible variables and suggest ways to control them. Once the races are complete, students should compare results and decide whether they are conclusive enough to answer the question.

Materials needed for each group

6 Different colors of M&M's

6 White plastic or foam dessert plates

Room-temperature water

Round film canister lid or a quarter

1 Plastic cup, 3½ ounces

Crayons or colored pencils

Permanent marker

Bucket or large bowl

Paper towels

Notes about the materials

- **Be sure you and the students wear properly fitting goggles**.

Preparing materials

- You may wish to draw concentric circles in the center of plates ahead of time. Or students can draw them as part of the activity. The procedure for drawing these is described on p. 30.

Activity sheet

Copy *Activity sheet 1.2—Racing M&M colors*, p. 32, and distribute one per student when specified in the activity.

Assessment

An assessment rubric for evaluating student progress during this activity is on pp. 52–53. For this formative assessment, check a box beside each aspect of the activity to indicate the level of student progress. Evaluate overall progress for the activity by circling either "Good", "Satisfactory", or "Needs Improvement".

Activity 1.2
Racing M&M colors

Question to investigate

Do some M&M colors dissolve in water faster than others?

1. Ask students how they might design an experiment to answer the question.

Distribute *Activity sheet 1.2—Racing M&M colors.* In groups, have students plan how they might investigate the question. As you go around to groups and listen to their discussions, ask students what they are doing to keep the experiment as fair as possible. Students should have a plan to control variables such as type of plate, amount of water, temperature of water, how and where the M&M's are placed on the plate, when the M&M's are placed in water, and the amount of time the M&M's are in the water. Students should record their plans along with possible variables and ideas of how they will control them on the activity sheet.

As a whole class, share group plans, drawing attention to methods of controlling variables. Tell students that for a scientific investigation to be valid or fair, all variables need to be kept the same except for the one being tested: In this case, it is the color of the M&M.

Once the groups develop their experimental designs, you may choose to have them follow their own procedures. If you would like to give groups more guidance, you could have a whole class discussion to develop a procedure that all groups will follow.

2. Have students compare how fast different color M&M coatings dissolve in water.

The following procedure is an example of one way students can investigate whether color affects the rate at which an M&M coating dissolves in water. Because student suggestions are incorporated as they plan the procedure that they will follow, procedures will vary. The following procedure is one example of an experimental design that investigates the question.

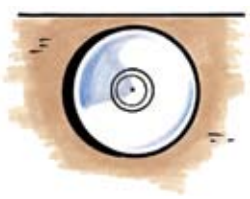
Procedure

1. Draw two concentric circles and a dot on each plate so that you can better compare how fast the coating from each color M&M dissolves in water. You will need one targeted plate for each color M&M you plan to race.

    - Use a permanent marker to trace around the top of a 3½-ounce cup to draw a circle in the center of a plate.

    - Place a quarter, film canister lid, or other similar-sized circular object in the center of the circle you just drew. Trace this object with a permanent marker.

    - Make a dot in the center of the circles on each plate.



2. Pour enough water into each plate so that the bottom of the plate is completely covered.

3. With the help of your lab partners, place a different-colored M&M in the center of each plate at the same time. Observe for 1 minute.

4. On *Activity sheet 1.2*, describe the way you set up your experiment, what you did to make it a fair test, and what you observed.

3. Have students share their observations.

Ask students questions such as the following:

- Does one color seem to move faster/slower than the others?
- Did other groups have similar results?
- Is there enough evidence from your experiments to conclude that a particular color of M&M moves faster in water than the others?

Point out to students the importance of replicating experiments. If students conclude that a certain color coating dissolves faster than others, ask them whether repeating the experiment and getting the same result might make the results more convincing. If all groups had the same result they could be more certain that the result was valid. In this activity, results may be inconsistent and students may not be able to definitively conclude that a particular color moves faster or slower than others.

***Expected results*: When racing M&M's, our results have been inconclusive. The colors seem to move at similar rates with no definitive fastest dissolver. It is possible that you and your students observe that certain colors dissolve faster or slower than the others.**

When discussing their results, help students review the variables they tried to control so that the experiment was as fair as possible. Were there any variables that may not have been controlled? For example: Were all the plates level? Was each M&M placed in the center of each plate at exactly the same time? It could be possible that the experimental design is not sensitive enough to discern the differences in the rate of dissolving. Perhaps the experiment would need to be redone with more-precisely marked plates. Students need not try the activity over and over, but discussing the validity of their experiments and ways to possibly create an even fairer test is an excellent exercise.