

2nd Grade - Lesson 3.1

Dissolving Is a Property

Objective

Students will develop an understanding that whether and how much a substance dissolves in a liquid is a property of that substance. Students will be able to plan and carry out an investigation to compare the dissolving of two substances.

Key Concepts

- Whether and how much a substance dissolves is a property of that substance.
- To compare the dissolving of different substances, they need to be tested in the same way.

NGSS Alignment

- **NGSS 2-PS1-1**
Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

Summary

- Students develop a test to compare how the candy coating from an M&M and a Skittle dissolve in water.
- Students put an M&M and a Skittle in separate cups with the same amount of water at the same temperature and at the same time.
- Students will also see that the inside of the Skittles dissolves but the inside of the M&M does not.
- Students see an animation to help explain why the inside of the Skittles dissolves but the inside of the M&M does not.

Evaluation

Download the [Student Activity Sheet](#) and distribute one per student when specified in the activity. The activity sheet will serve as the Evaluate component of the 5-E lesson plan.

Safety

Make sure you and your students wear properly fitting goggles. Do not eat any of the candies used in this activity.

Allergy Alert-Please be aware that plain M&Ms may contain traces of peanut. Be sure to tell students that the M&Ms are for the science experiment and that they should not eat the M&Ms.

Materials for each group

- 2 clear plastic cups
- 3 or 4 M&Ms
- 3 or 4 Skittles
- Water
- Plastic spoon

ENGAGE

1. Have students help design an investigation to compare the dissolving of an M&M and a Skittle.

Hold up an M&M and a Skittle. Tell students that one of the characteristics or properties of a substance is whether and how much it dissolves in a liquid. Let students know that they will investigate the similarities and differences between the dissolving of an M&M and a Skittle in water. Lead a discussion to get student ideas for how they could design and conduct an investigation to compare the dissolving of an M&M and a Skittle.

Note: Emphasize to students that to compare the way the two candies dissolve, the test needs to be the same for both. The M&M and the Skittle need to be treated in the exact same way to make a valid comparison.



Ask students:

- **How can we compare how well an M&M and a Skittle dissolve?**
Put each candy in separate cups of water and see how much of each dissolves.
- **Should we use the same amount of water in each cup?**
Yes. You wouldn't want to put one in a little bit of water and the other in a lot of water because that wouldn't be a fair test.
- **Should we try to use the same color of M&M and Skittle?**
Yes. Try to be as close as possible because the color might affect the dissolving.
- **Should the water be the same temperature in both cups?**
Yes. It wouldn't be fair to put one in hot water and the other in cold water. The temperature might affect the dissolving so we want to keep the temperature the same for both.
- **Should we put the candies in the water at the same time?**
Yes. The amount of time they are in the water may affect the dissolving. For a fair test, the M&M and the Skittle need to be in the water for the same amount of time.

Give each student an [Activity Sheet](#).

Students will record their observations and answer questions about the activity on the activity sheet.

EXPLORE

2. Have students compare the dissolving of an M&M and a Skittle.

Question to Investigate:

Do M&Ms and Skittles both dissolve the same amount?

Materials for each group

- 2 clear plastic cups
- 3 or 4 M&Ms
- 3 or 4 Skittles
- Water
- Plastic spoon

Procedure

1. Put enough room temperature water in two clear plastic cups to cover an M&M and a Skittle. Put the same amount of water in each cup.
2. Choose an M&M and a Skittle that are about the same color.
3. Place the M&M and Skittle in the cups of water.
4. While keeping the cups on the table, gently swirl the cups. Be careful not to spill water out of the cup.
5. Continue to swirl even after you see the chocolate from the M&M and the inside of the Skittle. Observe both candies closely for 2-3 minutes.



Expected results

The color and sugar come off the M&M and Skittle in a similar way but the color seems to come off the Skittles faster. The inside of the M&M is brown. The inside of the Skittle looks white.

3. Discuss student observations.

Ask students:

- **What do you observe?**
The color seems to come off the Skittle a little faster than from the M&M but the colored coating dissolves from both.
- **Do you think the candy coating on an M&M and Skittles are made from similar ingredients?**
Yes. They are probably both made from sugar and food coloring because they seem to dissolve in a similar way.
- **How about the inside? Does the chocolate in the M&M or the inside of the Skittle seem to be dissolving?**
The chocolate does not seem to be dissolving. The inside of the Skittles might be dissolving but it is hard to tell.

Note: The inside of the Skittle will dissolve but it takes some time. Have students leave the candies in the water as you do the “EXPLAIN” part of the lesson. After the EXPLAIN, have students observe the candies again and do the part of the lesson.

EXPLAIN

4. Explain why chocolate dissolves in your mouth but not in water.

Ask students:

- **If M&M chocolate doesn't dissolve in water why does it dissolve in your mouth?**

The saliva in your mouth has chemicals in it that help break down the chocolate. Also, the warm temperature in your mouth causes the chocolate from the M&M to begin to melt a little. So the chemicals and the warmth in your mouth cause the chocolate to break down and melt and dissolve in your saliva. But room temperature water alone does not do this.



EXTEND

5. Observe the M&M and Skittle again and show an animation to explain why water dissolves the inside of the Skittle but not the inside of the M&M.

Procedure

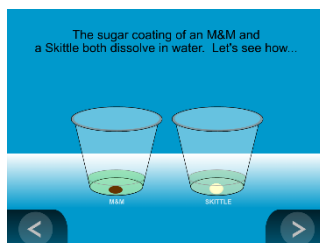
1. Look again at the cups containing the M&M and the Skittle. Gently swirl the cups to see if the inside of the Skittle has dissolved more than the chocolate from the M&M.
2. Use a plastic spoon to remove the remaining chocolate from the water. Do the same to remove the remaining inside of the Skittle.
3. Place a fresh undissolved M&M next to the M&M that was in the water, and place a fresh undissolved Skittle next to the Skittle that was in the water. Compare to see which candy seems to have dissolved more.



Expected results

The inside of the Skittle will be smaller compared to the undissolved Skittle. The inside of the M&M will be similar in size to the undissolved M&M. This indicates that the Skittle dissolved more than the M&M.

Show the animation [Dissolving an M&M and Skittle.](#)



Explain that the inside of the Skittle is mostly sugar, corn syrup (another form of sugar), and a substance called *pectin*, which makes the inside chewy. Water is attracted to the molecules of all these substances. The inside of the M&M is chocolate, which contains molecules of fat. Water molecules are not attracted to fat molecules. That's why water can attract and pull the sugar molecules away from each other and dissolve the inside of the Skittle but cannot dissolve the chocolate inside the M&M.

Note: This animation uses the term “molecule” to help explain why the inside of the M&M and the inside of the Skittle dissolve differently. It is meant to give students exposure to the term and to the idea that the substances around them are made up of tiny particles they cannot see. They are also introduced to the idea that different molecules give substances different characteristics.

Note that in the animation, the atoms in the water molecule are shown but the atoms in the molecules of sugar (sucrose) and fat are not. Water is an easy molecule to model because it is composed of only three atoms. But fat and sucrose molecules have many more atoms, so simple shapes, without showing atoms, are used to model these molecules. Since no atoms are shown in the fat and sugar molecules, a misconception could arise that fat and sugar molecules are not made of atoms. Explain to students that all molecules are made of atoms but that sometimes different types of models are used to represent the molecules that may or may not show the atoms.