



NGSS Standard: 2-PS1-4



Adventure Description:

In this adventure, students will think like a chemist and test whether chemical processes can be reversed or not.



Activity

Step One: Background Information (5 minutes)

- Have students watch [Video: Heating and Cooling](#).
- Explain to students that chemists are scientists who learn about what things are made of and what happens when ingredients are mixed together.
- Ask students if they knew that creating candy is a chemical process. Show [Handout: Chemistry and Candy](#). Explain to students that a chemist studies what happens when different ingredients are mixed together and are changed. A chemical process happens when ingredients are changed from their original state.
- Next, tell students that some changes can be reversed, while some cannot. [Handout: Example of Changes](#). Explain that reversing something means to undo it.
- Explain to students that when ingredients are mixed together and heated up, the ingredients can combine together and change. This turns the ingredients into an entirely new thing! For example, milk, butter, and cocoa powder are mixed together then heated up to create chocolate! Creating chocolate is an example of a chemical change that cannot be reversed. Tell students that a popsicle freezing and then melting is an example of a change that can be reversed. When we freeze the juice to make a popsicle, it turns to ice. If it is left out of the freezer, it melts, creating a liquid juice again. However, it will freeze and turn back into a popsicle if we put it in the freezer! This is an example of a reversible change. A reversible change might change how something looks or feels, but it doesn't create something new.
- Explain that chemists do experiments to learn more about chemical changes that can't be reversed or changes that can be reversed. An experiment is a test used to learn more about something.

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- Tell students that they will think like chemists and conduct an experiment to determine which types of changes can be reversed and which cannot!

Step Two: Making a Prediction (5-10 minutes)

- Explain to students that they will be doing an experiment to make changes to pudding. The goal of the experiment is to determine which changes are reversible or irreversible.
- Show [Handout: My Experiment Overview](#). Walk through the handout together as a class.
- Provide students with [Handout: My Pudding Prediction](#). Explain to students that they will predict what happens when they try to change their pudding. Have students draw or write their prediction about what will happen when they perform the changes on the handout.

Step Three: Adding M&Ms (5 minutes)

- Explain to students that they will be adding M&Ms to their pudding.
- Provide students with the following materials:
 - Pudding cup
 - Bag of M&Ms
 - [Handout: My Pudding Observations](#)
- Instruct students to open their pudding cup and set the lid aside.
- Have students write their observations in the “Regular Pudding” box on the handout.
- Instruct students to add M&Ms to the pudding and use a spoon to stir the mixture.
- Have students record their observations in the M&Ms box on their handout.
- Ask students if they think that this change is reversible or irreversible.
 - Teacher note: This change is reversible because it didn’t create a new material. Even though mixing the M&Ms into the pudding changed the way the pudding looks and feels, it didn’t create a new material.
- To demonstrate the point that this change is reversible, have students pick the M&Ms back out of the pudding.

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Step Four: Heating Pudding (10+ minutes)

- Explain to students that you (the teacher) will now heat pudding on a hotplate or in a microwave to see what happens when they melt it. Tell students that adding heat to something will make it melt.
- Add 2-3 pudding cups and half a bag of M&Ms to the pan and turn on the hot plate. Use the spoon to stir the mixture until it bubbles and melts. Tell students that the M&M/pudding mixture is now liquid.
 - If you are using the microwave, put the mixture in for about 20-60 seconds to melt it.
- Have students write their observations on their handout.
- When students have finished writing their observations, ask them if they think that the change is reversible or not reversible.
 - Teacher note: This change is irreversible because it created a new material. The M&Ms melted in with the pudding and we can no longer separate them.

Step Six: Observation and Discussion (5 minutes)

- Ask students the following questions:
 - Did everything inside the mixture melt?
 - Is melting two materials together a reversible change? (No, because it created an entirely new material)
 - Is adding M&Ms to the melted Milky Way reversible or irreversible? (Irreversible)
- Have a concluding class discussion about reversible and irreversible changes. Reversible changes might change the way that a material looks and feels, but they won't change what the material is made of. Melting and freezing are both examples of reversible changes because they can be undone. Irreversible changes can't be undone, because they create an entirely new material, like when M&Ms were added to the pudding.

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Chemist: Heating and Cooling

Materials List

Provided online:

- Handout: Chemistry and Candy
- Handout: Example of Changes
- Handout: My Experiment Overview
- Handout: My Pudding Prediction
- Handout: My Pudding Observations

Not provided (each pair of students needs):

- Hot Plate/Microwave
- Spoon to stir
- Snack-size Pudding cups
- Bag of M&Ms

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