

**Title: How Good is Fake Snow STEM Challenge**

**Estimated Time: 1-2 periods**

**Core Ideas (GSE Standard and elements):**

**SKP1. Obtain, evaluate, and communicate information to describe objects in terms of the materials they are made of and their physical attributes.**

- a. Ask questions to compare and sort objects made of different materials. (Common materials include clay, cloth, plastic, wood, paper, and metal.)
- b. Use senses and science tools to classify common objects, such as buttons or swatches of cloth, according to their physical attributes (color, size, shape, weight, and texture).

**S2P1. Obtain, evaluate, and communicate information about the properties of matter and changes that occur in objects.**

- a. Ask questions to describe and classify different objects according to their physical properties.

**S8P1. Obtain, evaluate, and communicate information about the structure and properties of matter.**

- a. Develop and use a model to compare and contrast pure substances (elements and compounds) and mixtures.
- c. Plan and carry out investigations to compare and contrast chemical (i.e., reactivity, combustibility) and physical (i.e., density, melting point, boiling point) properties of matter.

**Literacy Connections: Books**

The Snowy Day, Ezra Keats  
Axel Annie, Robin Pulver

**Literacy Connections: Close Reads**

Does Fake Snow Really Grow CR ES  
Does Fake Snow Really Grow CR MS

**Science and Engineering Practices:**

**Planning and Carrying Out Investigations:**

Conduct an investigation and/or evaluate and/or revise the experimental design to produce data to serve as the basis for evidence that meet the goals of the investigation.

**Constructing Explanations and Designing Solutions:**

Apply scientific ideas or principles to design, construct, and/or test a design of an object, tool, process or system.

**Crosscutting Concepts:**

**Structure and Function:**

The way an object is structured/designed determines many of its properties and functions.

**Stability and Change:**

For designed systems, conditions that affect stability and factors that control rates of change are critical to consider and understand.

**STEM Challenge**

So in this STEM Challenge, the students' primary task to test the quality of a sample of fake snow and determine if it is good enough to use. For older or more advance students, they should also determine how much the snow powder expands in volume when it is mixed with water.

<b>Ask</b>	<p><b>Ask</b> your students if they know what snow is made of. Discuss their ideas. Ask them if they think it would be possible for a machine to make snow. Show this one minute video of a snow machine in a man’s backyard.  <a href="https://www.youtube.com/watch?v=hrxxUcs5j6I">https://www.youtube.com/watch?v=hrxxUcs5j6I</a>  (the video calls it fake snow but it is really man-made real snow).  Briefly discuss their ideas and questions about the video.</p> <p><b>Ask</b> your students if they’ve ever heard of fake snow that was invented by scientists. Mention that a few types of fake (artificial) snow have been invented. Ask them to consider how they could test the fake snow to see how it compares to real snow.</p>
<b>Imagine/Brainstorm</b>	<p>Students <b>brainstorm</b> ideas for how they could test the fake snow to determine how it compares to real snow. They should consider the attributes (properties) of real snow while they think of ways to test the fake snow.</p>
<b>Plan/Design</b>	<p>In order to learn more about the topic, have them read (or read to them) the <i><b>Does Fake Snow Really Grow</b></i> article and discuss <b>mixtures, materials, and superabsorbers</b>.</p> <p>Next, have students <b>plan</b> and <b>design</b> how they will test the quality of their fake snow. As needed, discuss some of the physical attributes (characteristics) of that might be important for them to test. As part of this process, it might be good for them to draw a data table to record their results.</p> <p>Older students can also <b>plan</b> and <b>design</b> how they could measure the change in volume that occurs when the two substances are mixed together.</p>
<b>Create/Test</b>	<p>To start with, students should create a sample of fake snow by adding together the two parts of the mixture. They should measure out 1 teaspoon of snow powder (5ml) and 2 ounces of water (60 ml). On top of a plastic bin or paper plate, place the teaspoon of snow powder into a 2 ounce plastic cup (or any similar cup) and then quickly pour the water on top of the powder. Observe closely as the mixture combines to form the fake snow (the fake snow will expand and spill out over the cup).</p> <p>Students should then <b>test</b> the characteristics of their fake snow as planned. They should record which characteristics that they tested and write down their observations.</p>
<b>Improve</b>	<p>After discussing and evaluating their results, students <b>improve</b> their method for testing the snow. If time permits, let them re-test their snow.</p>

**Teacher Notes:**

This is a super fun STEM Challenge that kids really love. The challenge is easy to set up and fake snow is safe, amazing, and inexpensive. While safety goggles aren’t required for this activity, it is always a good idea to have kids wear them while using chemicals.

Scientists have learned how to make fake snow in a few different ways. The most popular type of fake snow is actually a **mixture** of two **materials**. The first material is an **engineered** polymer in the form of a solid powder. While this white powder looks very ordinary, it has an amazing ability to absorb water. It is so good at absorbing water that they call it a **superabsorber**. This particular super absorber is called

Insta-snow Powder. It is made from a chemical called sodium polyacrylate that was invented by scientists about 40 years ago. This chemical has the amazing ability to absorb hundreds of times its own weight in water and it's used in diapers, pull-ups, and a variety of water absorbing products. While the original sodium polyacrylate absorbs water and forms a gel-like substance, Insta-snow Powder has been modified to absorb water differently forming soft and fluffy flakes.

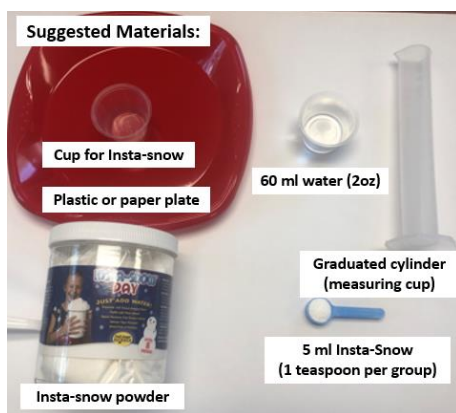
While being able to absorb water like this is impressive, it doesn't mean that it that it makes high quality fake snow. For example, if I'm a movie director filming a winter scene in Atlanta, I need to know how well it substitutes for the real thing. In other words, does it have similar **physical attributes** like color, size of particles, smell, and texture?

So one key objective of this STEM Challenge is for students to consider the importance of the physical attributes, or characteristics, that something (in this case fake snow) possesses. In comparing fake snow to real snow, they should try to measure the attributes that they think are most important. Encourage them to be creative and thorough. During their exploration, students discover that the fake snow is remarkably similar to real snow – at least in many ways. In fact, this fake snow is so realistic that it is often used in movies and indoor snowboarding parks. That said, detail oriented observers will notice some of the key differences too (temperature, melting point, etc.)

Since this STEM Challenge it pretty quick, we always encourage them to make one possible improvement to their fake snow and then we let them make a second and hopefully better batch. As needed, you can provide some suggestions like adding something (food coloring, glitter, sand, etc.), using a different liquid, or using cold or warm water.

With advanced elementary or middle school students, you can also **plan** and **design** how they could measure the change in volume that occurs when the two substances are mixed. You can let them use measuring cups or, even better, challenge them to measure the change in non-standard ways using Dixie cups, snap-cubes, bottle tops or something similar. Expansion calculations can easily be tweaked to incorporate some form of cost-benefit analysis. When you add 5ml (teaspoon) of snow powder and 60 ml of water the mixture expands to take up about 250 ml of space. So the 65 ml of starting substances expands to take roughly four times the volume (the makers of Insta-snow don't take the volume of the water into account then they advertise an increase in volume of 50-100 times).

Insta-snow is reuseable if you lay it out flat in a thin layer and allow the water to evaporate. The process takes several days though and mold and/or fungus can sometimes start to grow on it. You can also dispose of it in the trash. It is non-toxic and environmentally safe.



Vocabulary Cards:

**mixture**

a blend of things



**material**

the stuff things are made of



**attribute**

a feature of something



**texture**

the feel of something



**color**

the tint of something



**engineered**

skillfully planned and  
constructed

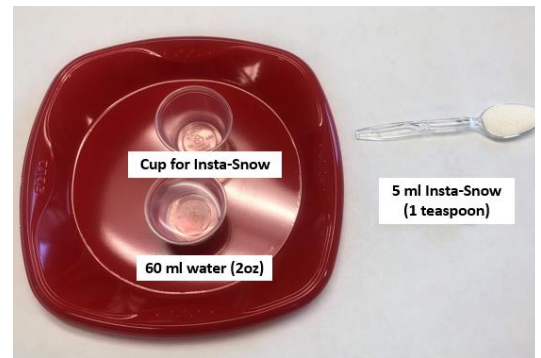


## Fake Snow STEM Challenge:

In this STEM Challenge, your first task is to test the quality of a sample of fake snow and determine if it is good enough to use in a movie set. Your second task is to make at least one possible improvement to the fake snow mixture and then test and evaluate your improvement.

### Task One:

1. After learning about fake snow, **make** a batch of it by adding 60 ml of water to 5 ml of Insta-snow powder.
2. Carefully **observe** the changes that occur. Use as many senses as possible in your observations.
3. **Record** your observations for at least four different attributes of the snow.
4. **Evaluate** the overall quality of the snow and explain your rating.



### Task Two:

5. **Plan** and **design** one simple improvement that you think will enhance the quality of the snow.
6. Using the materials provided and your plan, **construct** another batch using the improvement that you have added.
7. **Evaluate** the overall quality of the second batch of snow and explain your new rating.

