

## STEM AT HOME ACTIVITY GUIDE: Moon Dough Lab



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## STEM AT HOME GUIDE: Moon Dough Lab

### Background Knowledge

**Aim:** Experiment with different states of matter to create your own out of this world sensory space dough.

**Problem & Career Focus:** Chemistry is a branch of science that uses the properties of matter (solids, liquids, and gases) and the interactions in our everyday lives, especially in the kitchen. In this experiment you will explore properties of matter mixing solids and liquids to create moldable fun. Using the scientific method, your task is to work with your team of scientists: aerospace engineer, materials engineer, and geochemist to explore emulsifiers.

**Educational Standards Correlations:** Matter, Life Science, Chemistry

**Scientific Method:** Scientists use the scientific method to guide their experimentation with different materials! With your team: ask questions, discuss what you observe, and use your problem-solving skills as you create your potions. Use the scientific method steps to guide your exploration during the Moon Dough Lab.

#### Investigating Questions

- How does mixing different solids and liquids create a substance that can be moldable?
- What materials do you observe change the physical properties of your moon dough?
- What different combinations created changes in the states of matter (from a solid to a liquid, liquid to gas, etc.)?

#### Materials

- ½ cup Potato Starch
- ½ cup Flour
- 2 tablespoons Coconut Oil
- Polysorbate 80
- Food Coloring
- Glitter (optional)
- Large bowl
- Microwave safe cup
- Spoon
- Measuring Cups

#### OBSERVE

Make observations

#### QUESTION

Ask a question or identify a problem

#### RESEARCH

Search for existing answers or solutions

#### HYPOTHESIZE

Formulate Hypothesis

#### EXPERIMENT

Design and perform an experiment

#### TEST HYPOTHESIS

Accept or reject hypothesis

#### DRAW CONCLUSIONS

Make conclusions based on hypothesis

#### REPORT

Share your results

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### Background Knowledge

#### Vocabulary:

**Matter:** Everything around you! It's anything that has mass and takes up space (it has volume). 3 states of matter: solid, liquid, and gas.

**Solid:** State of matter that keeps its shape; molecules are closely packed together.

**Liquid:** State of matter that's a fluid and takes the shape of the container it's in.

**Emulsifying agent:** Molecules that make it possible for water and oil to combine.

#### STEM Career Connections:

##### Aerospace Engineer

An engineer that evaluates designs to make sure products meet engineering principles.

**They create:** designs for aircrafts, satellites, missiles, they create and test prototypes to make sure they work.

##### Materials Engineer

Are engineers that work with metals, ceramics, and plastics to make new materials.

**They create:** computer chips, aircraft wings, golf clubs, biomedical devices, and more.

##### Geochemist

A scientist that studies the different chemical elements in rocks and minerals, as well as the movement of these elements into soil and water systems.

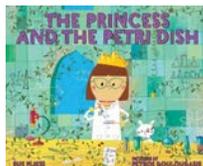
**They create:** research studies to investigate chemistry in the real world.

#### Literacy Connections:

##### Moon! Earth's Best Friend by Stacy McAnulty



##### The Princess and the Petri Dish by Sue Fliess



##### If You Were the Moon by Laura Purdie Salas



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## STEM AT HOME GUIDE: Moon Dough Lab

### Background Knowledge

#### Real World Applications

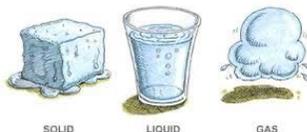
Chemistry and the states of matter are a BIG part of our everyday life, even in outer space! Matter is all around us, and everything has mass. Mass determines the strength of gravity to other things. The reason for the Moon's shape is a result of its mass being great enough so that gravity pulls all of its matter toward the center equally. The Earth weighs 81 times more than the moon!

#### How Can Sensory Dough Be Used for Science?

Sensory dough lends itself to scientific discoveries and concepts quite easily. Just the directions itself is a science experiment, let alone the discoveries that can be made. In this experiment, your team will experiment with the **physical changes** of matter.



**Matter** is anything that occupies space and has mass. All physical objects are composed of matter, and an easily observed property of matter is its state or phase. The main states of matter are solid, liquid, and gas.



#### Everyday Science: The Moon!

Everything around us is made of matter, from the air we breathe to the water we drink- even our own bodies! Planet Earth is made up of matter, and so are all the stars, planets, and moons in the universe. All matter is made up of tiny particles called atoms.

The Moon is the Earth's only natural satellite, meaning it orbits or moves around us! Our Moon is the fifth largest in the Solar System. The distance between the Moon and Earth is 238, 857 miles! This is about 30 Earth's away.

#### Interesting Facts About the Moon:

- The surface is covered in craters and pits
- The reason we can still see the damage on the Moon is that it has no atmosphere (so we can see what still happened billions of years ago!
- We can only see one side of the Moon
- The Moon's surface is actually dark
- The Moon was created when a rock smashed into Earth,

#### Check out these video links!

##### The Moon for Kids

<https://www.youtube.com/watch?v=B-b4XvuQo1Y>

##### Bill Nye the Science Guy- The Moon

[https://www.youtube.com/results?search\\_query=moon+for+kids](https://www.youtube.com/results?search_query=moon+for+kids)

##### All About the Moon

<https://www.youtube.com/watch?v=JM21GBJecx>

## STEM AT HOME GUIDE: Moon Dough Lab

### Activity Directions

**Aim:** Experiment with different states of matter to create your own out of this world sensory space dough.

#### Investigating Questions

- How does mixing different solids and liquids create a substance that can be moldable?
- What materials do you observe change the physical properties of your moon dough?
- What different combinations created changes in the states of matter (from a solid to a liquid, liquid to gas, etc.)?

#### Materials

½ cup Potato Starch  
 2 tablespoons Coconut Oil  
 Food Coloring  
 Large bowl  
 Spoon

½ cup Flour  
 Polysorbate 80  
 Glitter (optional)  
 Microwave safe cup  
 Measuring Cups

#### Instructions

Make sure to perform the experiment as a family team. This activity can get messy, so make sure you have paper towels to clean up messes. This experiment is structured to allow creativity flow. Allow your team to experiment freely with different combinations of solids and liquids to observe the results.

- Start by creating a hypothesis with your group about which materials will change the dough from liquid to solid, etc.
- Add ½ cup of potato starch and ½ cup of flour to a large bowl.
- Now melt 2 tablespoons of coconut oil in the microwave. Heat just until it turns into a liquid. Then add your choice of food coloring.
- Make observations of how the colors form little beads in the oil. Stir.
- Add 2 drops of Polysorbate 80 and stir again.
- Pour the mixture into a bowl with the potato starch and flour.
- Mix with a spoon or your hands. Work it together until the mixture is completely blended and starts to mold, holding shape like wet sand!
- Add stars and glitter to create an outer space sensation!

**OBSERVE**

Make observations

**QUESTION**

Ask a question or identify a problem

**RESEARCH**

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[PTA.org/STEM](http://PTA.org/STEM)

- Draw conclusions and discuss with your team what you observed throughout the experiment!
- DO NOT EAT!

**Extra Challenge:**

-Who can create the tallest tower with their Moon Dough?

-Use cookie cutters or ice cream scooper to create shape

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## STEM AT HOME GUIDE: Moon Dough Lab

### Photo Guide



Step 1: Add ½ cup of potato starch and ½ cup of flour to a large bowl.



Step 2: Stir with a spoon.



Step 3: Melt 2 tablespoons of coconut oil in the microwave. Heat just until it turns into a liquid. Add your choice of food coloring.



Step 4: Make observations of how the colors form little beads in the oil. Stir.



Step 5: Add 2 drops of Polysorbate 80 and stir again.

Photo's Courtesy of: STEAM Powered Family

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Step 6: Pour the mixture into a bowl with the potato starch and flour.



Step 7: Mix with a spoon or your hands. Work it together until the mixture is completely blended and starts to mold, holding shape like wet sand!



Step 8: Add stars, glitter, or other ingredients to your own Moon Dough!

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## STEM AT HOME GUIDE: Moon Dough Lab Extension Activity

### Fruit Volcano Chemistry

#### Materials:

Citrus fruit (lemons, oranges, limes, etc.)  
 Large plastic bin  
 Dish soap  
 Baking soda

Knife  
 Craft sticks  
 Food coloring  
 Lemon juice (optional)

#### Instructions

An adult should assist with using the knife in this experiment. **WARNING-** this activity can get messy! It's great for sunny days outside!

- Begin by cutting the tops off of the citrus fruit. Place the cut fruit in the large plastic bin.
- Take a craft stick and mash up the inside of the fruit. This will help to get some of the citrus juices out.
- Pour some dish soap on the fruit,
- Then add your choice of food coloring.
- Pour baking soda on top and watch the volcano begin to erupt!
- Discuss what you observe together! What ingredient created the chemical reaction?
- The bubbles should start going, but if they don't you can use the stick to stir things up or pour some lemon juice on top.
- The soap will make the eruption foamy, so dig your hands in and explore!
- What color combinations can you make?



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