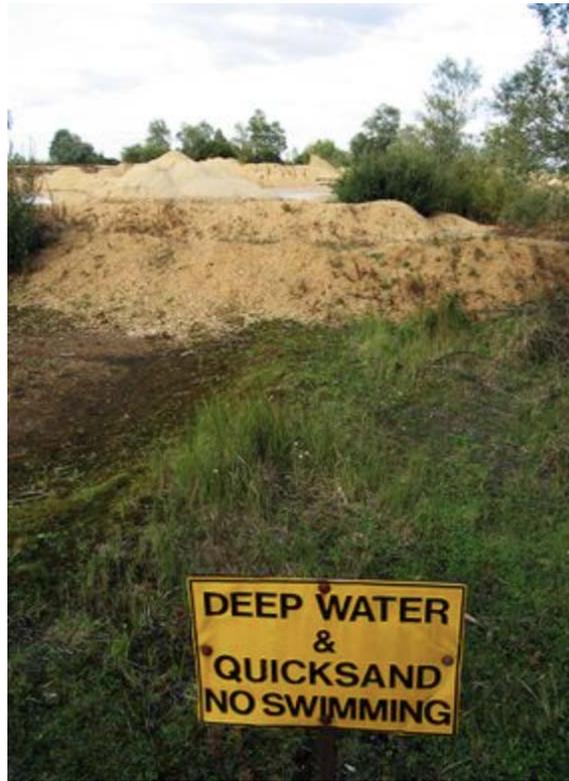


STEM AT HOME ACTIVITY GUIDE:

Quicksand Experiment



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STEM AT HOME GUIDE: Quicksand Experiment

Background Knowledge

Aim: Experiment with Earth systems to explore the fascinating interaction of quicksand safely in your own home.

Problem & Career Focus: Earth's systems are the applications of systems science on Earth. They are the interactions of the physical, chemical, and biological processes that consist of the land, oceans, atmospheres, cycles, and poles on Earth. In this experiment you will learn more about how several Earth's systems interact. Using the scientific method, your task is to work with your team of scientists: geologists, atmospheric scientists, and oceanographers to explore the effects and properties of quicksand.

Educational Standards Correlations: Earth's systems

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 Quicksand Experiment.

OBSERVE
 Make observations

QUESTION
 Ask a question or identify a problem

RESEARCH
 Search for existing answers or solutions

HYPOTHEZIZE
 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

Investigating Questions

- What properties cause the quicksand to turn into its "liquid" form?
- What materials will sink or float in the quicksand?
- How can materials sink into the quicksand?

Materials

- Sand
- Cornstarch
- Water
- Measuring Cups
- Large bowl or container that can be used to mix and explore the quicksand
- Toy animals (*optional*)

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STEM AT HOME GUIDE: Quicksand Experiment Background Knowledge

Vocabulary:

Earth's systems: interacting physical, chemical, and biological processes (consists of land, oceans, atmospheres, and poles).

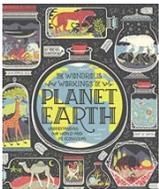
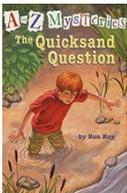
Density: the relationship of the mass of a substance and how much space it takes up.

Non-Newtonian Fluid: a fluid that does not follow Newton's law of viscosity; these fluids change when under force to either a more liquid or solid substance.

STEM Career Connections:

<p>Geologist</p> <p>Are scientists that study the solid, liquid, and gaseous matter of the Earth and other terrestrial planets.</p> <p>They: have knowledge of geology, physics, chemistry, biology, and other sciences.</p>	<p>Wildlife Biologist</p> <p>Are scientists that study how animals and wildlife interact within ecosystems</p> <p>They: study the physical characteristics of animals, animal behaviors, and the impacts of humans on habitats.</p>	<p>Atmospheric Scientist</p> <p>Are scientists who study the scientific and mathematical aspects of the Earth's atmosphere, climate, and weather</p> <p>They: use mathematical calculations to forecast the weather and properties of the atmosphere.</p>
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Literacy Connections:

<p>Wondrous Workings of Planet Earth by Rachel Ignotofsky</p> 	<p>Solving the Puzzle Under the Sea: Marie Tharp Maps the Ocean Floor by Robert Burleigh</p> 	<p>The Quicksand Question (A to Z Mysteries) by Ron Roy</p> 
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STEM AT HOME GUIDE: Quicksand Experiment

Background Knowledge

Real World Applications

The five systems of Earth (geosphere, biosphere, cryosphere, hydrosphere, and atmosphere) interact to produce the environments we are familiar with. For example, many birds (biosphere) fly through the air (atmosphere), while water (hydrosphere) often flows through the soil (geosphere). In fact, the spheres are so closely connected that a change in one sphere often results in a change in one or more of the other spheres.

Earth Systems for Kids: Quicksand

Quicksand is a mixture of water and sand or silt. It has the characteristic of thixotropy: it looks solid, but when pressure is applied it liquifies (acts like a liquid). If animals or people stand on it, they sink into it. However, a person does not drown in quicksand. A human or animal does not sink entirely into quicksand due to the higher density of the fluid. It can be difficult to get out: that is the real problem. Quicksand may be escaped by slow movement of the legs in order to reduce viscosity of the fluid and rotating the body so as to float on one's back (supine).



Properties of Quicksand

Quicksand is a non-Newtonian fluid: when undisturbed it often seems to be solid ("gel" form), but a small (less than 1%) change in the stress on the quicksand causes it to turn liquid ("sol" form). Under weight, the person then sinks into the sol (liquidized sand). The viscosity of the quicksand seems to increase suddenly. It is now a gel. In order to move within the quicksand, a person or object must apply sufficient pressure on the compacted sand to re-introduce enough water to liquify it. The forces required to this are quite large: to remove a food from quicksand at a speed of one centimeter per second would require the same amount of force as "that needed to lift a medium-sized car".

Everyday Science: Quicksand

Quicksand is usually found in hollows at the mouths of large rivers or along flat stretches of streams or **beaches** where pools of water become partially filled with sand and an underlying layer of stiff clay or other dense material prevents drainage. The truth is **quicksand** is very real and can be found in many parts of the **U.S.**, including New Jersey, the coast of North Carolina, and many areas in the Southeast, particularly Florida. In general, **quicksand** can appear when two conditions are present: sand and a source of rising water.



Interesting Facts About Quicksand:

- It's true that struggling in quicksand- or just about any quick movement- causes you to sink more. Slow movements are much more effective.
- In an animated TV show from 1969, Batman and Robin escape from quicksand using rockets in their boots.
- Most quicksand is only a few inches deep.

Check out these video links!

Can You Survive Quicksand?

<https://www.youtube.com/watch?v=a2VJqud3Ls8>

Bear Grylls Sahara Quicksand

<https://www.youtube.com/watch?v=yg88Tw8oAbk>

Earth Systems Interact

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

STEM AT HOME GUIDE: Quicksand Experiment Activity Directions

Aim: Experiment with Earth systems to explore the fascinating interaction of quicksand safely in your own home.

Investigating Questions

- What properties cause the quicksand to turn into its “liquid” form?
- What materials will sink or float in the quicksand?
- How can materials sink into the quicksand?

Materials

Sand	Cornstarch
Water	Measuring Cups
Toy Animals	Large bowl or container
Large Spoon	

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. Or, if it’s a nice day, enjoy the experiment outside. *This experiment is structured to allow creativity flow.*

- Start by creating a hypothesis with your group about what will happen when you add all the materials together.
- Add 2 cups of cornstarch to a large bowl
- Add 1 cup of water to the cornstarch, stir well to combine. Make a prediction of what will happen when the water mixes with the cornstarch.
- Add 1 to 2 cups of sand to the mixture. Stir well to combine.
- Drop toy animals into your quicksand and watch them slowly sink.
- Experiment and investigate the density of the quicksand with the toy animals.
- Draw conclusions and discuss with your team what you observed throughout the experiment.

OBSERVE
 Make observations

QUESTION
 Ask a question or identify a problem

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STEM AT HOME GUIDE: Quicksand Experiment

Photo Guide



Step 1: Gather all materials. Create a hypothesis with your group about what will happen when you add all the materials together.



Step 2: Add 2 cups of cornstarch to a large bowl. Add 1 cup of water to the cornstarch, stir well to combine. Make a prediction of what will happen when the water mixes with the cornstarch.



Step 3: Add 1 to 2 cups of sand to the mixture. Stir well to combine.



Step 4: Drop toy animals into your quicksand and watch them slowly sink. Experiment and investigate the density of the quicksand with the toy animals.

Photo's courtesy of: Premeditated Leftovers

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STEM AT HOME GUIDE: Quicksand Experiment Extension Activity

Ocean Zone Density Jar

Materials:

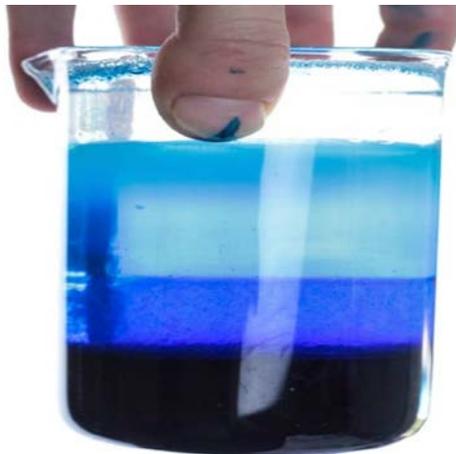
Mason jar
 Rubbing alcohol
 Baby oil
 Blue food coloring

Corn syrup
 Water
 Dish soap
 3-4 small bowls



Instructions:

An adult should assist with using the materials in this experiment. The ocean zones are sunlit zone, twilight zone, midnight zone, abyss, and trenches. The sunlit zone receives a lot of sunlight and is where plants and most ocean animals live. If you've swam in the ocean, you were in the sunlit zone. The twilight zone doesn't get a lot of sunlight, so no plants grow there. The animals that live in that zone make their own light, which is called bioluminescence. The midnight zone receives no sunlight and is completely dark. This area is also very cold with temperatures near freezing. Human submarines have gone as deep as seven miles under the ocean, which is all the way to the top of the trench layer. But a human diver without a submarine has only been able to dive as deep as 1090 feet, which still doesn't reach the bottom of the twilight zone.



- Let your creativity flow- as a team make predictions on each ocean zone.
- Start by pouring equal amounts of each liquid into the bowls.
- Depending on the size of your mason jar, start with $\frac{1}{2}$ cup of each liquid in each bowl.
- Arrange the liquids from the densest to least dense and pour them in the jar in the following order: corn syrup, dish soap, water, rubbing alcohol, and oil. Make predictions which liquid "sinks" and which "floats" at the top of the surface of the jar.
- Each color liquid represents a different layer of ocean zones.

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