

## Summary

In this activity, students will learn that solids and liquids are phases, and terms such as fluid and rigid can describe qualities and are not necessarily related to a single phase. Students will handle a mystery substance that has qualities of both a solid and a liquid. The students will manipulate the substance and record any observations they experience. Students will also answer questions related to their observations of the mystery ooze.

## Learning Goals

Students will learn about the mystery substance by observing and manipulating it. Students will be able to experience a solid that acts like a liquid or a liquid that can behave like a solid. Students should be able to identify how the material is different from a typical solid and liquid. Students can think about other substances or materials that behave like the mystery substance, like how rocks can be both in a solid form and a liquid magma form. By doing this inquiry activity, they will be able to understand theories about what causes plate tectonics. Students will be able to relate the properties of the substance to the fluid layer of the earth's mantle called the asthenosphere. Geologists have hypothesized that this layer can help explain the theory of plate tectonics. While the students are mixing the materials explain to them their mixing hand will represent one of the earth's many tectonic plates and as that plate slowly moves deeper into the mixture, this will represent a subduction zone where one tectonic plate moves slowly beneath another tectonic plate. Next have the student try the same movement again only quickly. If these two plates are forced together quickly the plate won't subduct and the energy released from this collision can trigger an earthquake.

## Context for Use

This activity is mainly intended for middle school aged classrooms. This can be used as an engagement or exploring activity at the beginning of an earth science lesson when discussing the different layers of the earth.

## Description and Teaching Materials

### Materials

Cornstarch  
Newspapers  
Measuring cups  
Large bowl, pan, or container  
Water  
Spoons  
Food coloring (optional)

### Students will

1. Cover table top with newspaper to avoid too much of a mess.

2. Mix cornstarch and water into a bowl, pan or container (food color optional).  
Use 2 parts cornstarch for every 1 part water. Slowly add water and mix with spoon until all of the powder becomes wet.
3. Add more water until the material feels like a liquid.  
If the material is too powdery then add more water, if the material is too watery add more cornstarch.
4. Students will observe and manipulate material. (if it dries out slowly add water, if it gets too watery slowly add more cornstarch)

### **Things students can do and the questions they can answer during their observation:**

1. Pick up a handful and squeeze it. What does it feel like?
2. After squeezing it let go. What happens to the ooze?
3. Tap the surface of the ooze with your finger. Tap it with a spoon. What does it feel and look like? How is this different than if you tapped water?
4. Pick up a handful and roll between your hands. Stop rolling and observe. What happens?
5. Push your fingers slowly through until you touch the bottom of the bowl. What do you observe?
6. Try to quickly punch your fingers through until you touch the bottom of the bowl. What do you observe?
7. How is this mystery substance different from a typical liquid?

### **Discussion questions or assignment questions**

1. Describe ways the ooze acted like a solid.
2. Describe ways the ooze acted like a liquid.
3. Is it more like a solid or a liquid? Why?

### **If done as part of an earth science lesson:**

4. As the student mixes the cornstarch mixture have them think about this mixture representing the mantle layer of the earth.
5. How can you relate this to layers of the earth and plate tectonics?
6. How can knowing that solids are not always hard or rigid explain plate tectonics?
7. Have the students identify a tectonic plate boundary that has a subduction zone.

## **Teaching Notes and Tips**

This activity will be messy, make sure work areas are covered. Students will enjoy working with the material, which will turn watery or flaky over time. Make sure students slowly mix water and cornstarch. Adding too much water at one time will make it too watery. Students may need help answering some of the questions related to plate tectonics. Having students answer questions and drawing pictures of the layers of earth with this activity may help reinforce the material.

## **Assessment**

Students can record and share their observations with their class/teacher. This is more of an exploration activity and concepts observed could be translated into other class discussions and assignments.