

Magma Meltdown (or Up)

Concept Development

Challenge: How can a lava lamp be a model for tectonic plate movement?

Materials: lava lamp

Watch Out! Lava lamps become very hot quickly.

Let's Dig In:

- A lava lamp is displayed in the room. Observe the lamp and describe what is occurring as the teacher turns on the lamp and continuing watching and recording what you observe for about 5minutes. Be sure to note where the lava is located before the lamp is switched on and as the light bulb heats up the lava note what happens to it. Record your observations on a separate sheet of paper.
- Keep your eye on one piece of the lava. If you see glitter in the lava, then focus on one piece of glitter. Describe the movement of the glitter in the lava.
- The moving lava you just described is called **convection currents**. Imagine a tectonic plate on the top of the moving lava. The moving lava would push or pull the tectonic plate sideways. This is the cause the movement of the tectonic plates on the earth.

Go Figure:

1. What interior structure of earth does the lava in the lamp represent?
2. Which structure on the lava lamp is represented by radioactive elements that give off heat?
3. Explain why heated lava becomes less dense?
4. If two tectonic plates were moved by the lava, describe at least two interactions that would be possible between the two tectonic plates?
5. Write a paragraph to fully explain the mechanism of plate tectonics in your own words. Use the list of words below in your explanation.

density (dense), convection currents, rises, sinks, molecules, magma,
heat(-ing, -ed), cool(-ing, -ed), move

Teacher Notes
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GEOMES Topic: Plate Tectonics

Lab setup:	<u>none</u>	easy	moderate	difficult
Reasoning level:	easy	moderate	<u>difficult</u>	
Time required:	<u>20-40 minutes</u>	40-60 minutes	60-90 minutes	
Process skills:	<u>observing</u> <u>utilizing models</u>	<u>collecting data</u>	<u>communicating</u>	

Objectives: Students will be able to explain how convection currents occur in the Earth and how this moves the tectonic plates on the surface.

National Science Education Standards

Unifying Concept and Processes: Evidence, models, and explanation
Content Standard: Earth and Space Science - Energy in the earth system
Science as Inquiry: Abilities necessary to do scientific inquiry

Materials: Lava lamp

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Teaching Strategies:

This activity should be teacher directed. The aim is to develop the concept of plate movement driven by earth's internal movements by providing students with a visual model. Consider **not** copying the student page since the procedural instructions could easily be given verbally by the teacher. This activity should result in a rich large group discussion.

When looking to purchase a lava lamp, inexpensive glitter lava lamps work best. They contain wax that heats up quickly and the glitter can be observed easily moving in a convection current. You may want to have the students emulate the movement of the lava in the lamp with their hands and arms at their desks. The older lava lamps take too long to heat up the material and do not work the best for this activity.

Sample Data and Observations:

The "lava" is located on the bottom of the lamp and when it is switched on, the lava first has some bubbles in it. Gradually, more of the lava moves upward, against gravity. After a few minutes, the lava reaches the top of the lamp and then moves down to the bottom again. In watching a single piece of glitter, the lava moves up to the top of the lamp in the middle and sinks down to the bottom on the outsides of the glass.

Sample Responses to Go Figure:

1. The interior part of the Earth is the asthenosphere or upper mantle.
2. The light bulb is the heat source represented by radioactive elements.
3. The density of the lava when heated goes down since the speed of the molecules of lava moves faster and farther apart.
4. Two tectonic plates could collide, they could move apart, or they could move sideways in different directions. One plate could get pushed down with the moving lava if more dense than the other tectonic plate.
5. As the heat from the radioactive elements causes the magma to heat up, the molecules move faster and rise up. As the rising magma gets to the underneath side of the tectonic plates it is forced sideways and carries the plate with it. The magma cools when in contact with the solid tectonic plate, causing the molecules to slow down, causing the hot mass to become more dense and sink. When the magma reaches the radioactive elements again the cycle repeats. This circulation of magma is called convection currents.