

# It's OK to be a Clod

[http://oceanexplorer.noaa.gov/explorations/03bump/background/edu/media/03cb\\_clod.pdf](http://oceanexplorer.noaa.gov/explorations/03bump/background/edu/media/03cb_clod.pdf)

## Focus on Inquiry

The student will collect and analyze data while investigating the effects of salinity and water flow on the dissolution rate of plaster-of-paris.

## Lesson Overview



The activity is designed to introduce students to the use of clod cards for measuring water flow, as well as to acquaint students with some of the physical factors that affect solubility of many other chemical substances. They will investigate the effects of salinity and water flow on the dissolution rate of plaster-of-paris. Students will understand how information on the solubility of a substance can be used to measure water currents.

<b>Duration</b> 2 -45 minute periods	<b>Setting</b> Classroom	<b>Grouping</b> Cooperative groups of 4-6	<b>PTI Inquiry Subskills</b> <b>3.1, 3.2, 3.7, 4.4, 5.2, 5.3</b>
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Lesson Components	Estimated Time	Inquiry Subskills Used	Technology Used	Level of Student Engagement	Brief Description
<b>Engage</b>	5 min	None	None	2	Students are engaged in a discussion of the Charleston Bump and the 2001 & 2003 Ocean Exploration expeditions to the area.
<b>Explore</b>	35 min for activity 30 min for research	3.1, 3.2, 3.7, 4.4	None	3	Students investigate the effects of salinity and water flow on the dissolution rate of plaster-of-paris.
<b>Explain</b>	10 min	5.2	None	23	Students summarize their results in one or more matrices and discuss findings.
<b>Expand</b>	10 min	5.3	None	23	Students discuss the effect of temperature on the dissolution rate of plaster-of-paris.
<b>Evaluate</b>	Varies	None	None	3	Written reports student

### Level of Student Engagement

1	Low	Listen to lecture, observe the teacher, individual reading, teacher demonstration, teacher-centered instruction
2	Moderate	Raise questions, lecture with discussion, record data, make predictions, technology interaction with assistance
3	High	Hands-on activity or inquiry; critique others, draw conclusions, make connections, problem-solve, student-centered

<p><b>National Science Education Standards – Inquiry</b> Use appropriate tools and techniques to gather, analyze, and interpret data. Develop descriptions, explanations, predictions, and models using evidence.</p> 
<p><b>National Science Education Standards – Earth Science</b> Water, which covers the majority of the earth's surface, circulates through the crust, oceans, and atmosphere in what is known as the "water cycle."</p>
<p><b>Louisiana Grade Level Expectations – Inquiry</b> Gr. 8, Inquiry GLE#6 – Select and use appropriate equipment, technology, tools, and metric system units of measurement to make observations (SI-M-A3) Gr. 8, Inquiry GLE#7 – Record observations using methods that complement investigations (e.g., journals, tables, charts) (SI-M-A3) Gr. 8, Inquiry GLE#12 – Use data and information gathered to develop an explanation of experimental results (SI-M-A4) Gr. 8, Inquiry GLE#16 – Use evidence to make inferences and predict trends (SI-M-A5)</p> 
<p><b>Louisiana Grade Level Expectations Earth Science</b> Gr. 8, GLE#24 – Investigate and explain how given factors affect the rate of water movement in the water cycle (e.g., climate, type of rock, ground cover) (ESS-M-A10)</p>

### **Materials List (per group)**

- Aquarium heater (optional)
- Plaster-of-paris, one pound or more, depending upon the number of factor combinations investigated
- Plastic ice trays or other molds
- Small plastic sheets, slightly larger than the size of the molds, approximately 3 mm thick
- Silicone adhesive
- Permanent markers
- Balance accurate to 0.1 gram
- 19-liter (5 gallon) glass or plastic containers, one or more for each student group
- Plastic or rubber tubing to construct a siphon, one or more for each student group
- Plastic trays or basins large enough so that a plaster block will be completely covered when the tray is filled, one or more for each student group
- Flow-control clamps, one for each siphon
- System for collecting or disposing of water flowing out of the trays
- 50 ml graduated cylinder
- Sodium chloride (table salt), at least 3 kg (this is adequate to for the basic six-cell experimental matrix described in Learning Procedure)

### **Advance Preparation**

1. Obtain materials listed in the materials list.
2. Preview information on websites provided in the activity lesson.

### **Other Information**

#### **Learning Objective**

The learner will...

- Describe factors that affect the solubility of a chemical substance in seawater.
- Explain how information on the solubility of a substance can be used to measure water currents.

#### **Prior Knowledge Needed by the Students**

- Students should be familiar with the background information given on the activity website.

#### **Procedure**

##### ***Engage***

1. Procedure 1 of activity. Lead an introductory discussion of the Charleston Bump and the 2001 and 2003 Ocean Exploration expeditions to the area.

##### ***Explore***

1. Procedures 2-5 of activity. Explain that students are to investigate the effects of salinity and water flow on the dissolution rate of plaster-of-paris. Have each of your six student groups complete the activity based on their assigned combination of salinity and water flow rate.

##### ***Explain***

1. Procedure 6 of activity in which students pool their results on one or more matrices. Students look for patterns and trends in their class data and discuss their results as a class.

##### ***Expand***

1. Procedure 6 of activity has students discuss the effect of temperature on dissolution rate of plaster. They also predict which factors might have the greatest influence on water flow studies on the Charleston Bump and what additional measurements scientists could make to compensate for these factors.



**Evaluate**

1. Provided under the Evaluation section on the activity website: use student data and reports as evidence of their learning.

**Blackline Master**

None

**Supplementary Resources**

**Project Oceanica website**

<http://oceanica.cofc.edu/activities.htm>

A variety of resources on ocean exploration topics can be found here.

**U.S. Geological Survey**

<http://pubs.usgs.gov/of/of01-154/index.htm>

Open-File Report 01-154 "Sea-Floor Photography from the Continental Margin Program"

**NOAA Ocean Explorer website**

[http://oceanexplorer.noaa.gov/explorations/islands01/log/sab\\_summary/sab\\_summary.html](http://oceanexplorer.noaa.gov/explorations/islands01/log/sab_summary/sab_summary.html)

Summary report of the 2001 Islands in the Stream Expedition

**Animal Network**

<http://www.animalnetwork.com/fish2/aqfm/1998/aug/features/1/default.asp>

Discussion of the clod card technique, and how it can be used to study turbulent flows in aquarium tanks.