

Virtual River (Part 2): River Flooding

Lesson source: Geology Labs On-Line at

<http://nemo.sciencecourseware.org/VirtualRiver/Flooding/index.html>

Focus on Inquiry

The student will understand the concept of a “flood stage” by making observations, measurements, and calculations about river data through an on-line river lab on flooding.

Lesson Overview

This is the second in a series of three interactive exercises designed to help the student learn about river processes such as discharge, flooding, erosion, and deposition. **NOTE: This lesson requires good geography skills, an ability to read word problems and math skills. It is at an advanced level.**

Duration 2-3 hours	Setting classroom	Grouping 3-4	PTI Inquiry Subskills 3.1, 3.2, 3.5, 3.6, 3.7, 3.8, 4.2, 4.3, 4.4, 5.2, 5.3, 7.2
------------------------------	-----------------------------	------------------------	---

Lesson Components	Estimated Time	Inquiry Subskills Used	Technology Used	Level of Student Engagement	Brief Description
Engage	15 min.		Computer with internet access	2	Students will discuss the question: What is flooding? There are 10 preliminary questions given at the beginning of the activity.
Explore	90	3.1, 3.2, 3.5, 3.6, 3.7, 3.8, 4.2, 4.3, 4.4	Computer with internet access: Simulation	3	Students will complete charts, graphs and questions with each activity as they explore the flooding of various rivers.
Explain	30	5.2, 5.3, 7.2	Computer with internet access: Simulation	3	The groups should follow up with a brainstorm activity and discussion on the different aspects of flooding.
Expand	60	3.1, 3.7, 5.3, 7.2	Computer with internet access	3	Optional: The groups should research the watershed in their area and determine the probability of flooding.
Evaluate	varies				There is not a rubric provided for this activity but the questions, charts and graphs that are provided may be used as part of an evaluation.

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

National Science Education Standards – Inquiry

Design and conduct a scientific investigation.
Use appropriate tools and techniques to gather analyze, and interpret data.
Develop descriptions, explanations, predictions and models using evidence.



National Science Education Standards – Earth Science

Water circulates through the crust, oceans, and atmosphere in what is known as the “water cycle.”

Louisiana Grade Level Expectations – Inquiry

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 (SI-M-A3)
Gr. 8, Inquiry GLE#8 – Use consistency and precision in data collection, analysis, and reporting (SI-M-A3)
Gr. 8, Inquiry GLE#9 – Use computers and/or calculators to analyze and interpret quantitative data (SI-M-A3)
Gr. 8, Inquiry GLE#11 – Construct, use, and interpret appropriate graphical representations to collect, record, and report data (e.g., tables, charts, circle graphs, bar and line graphs, diagrams, scatter plots, symbols) (SI-M-A4)
Gr. 8, Inquiry GLE#12 – Use data and information gathered to develop an explanation of experimental results (SI-M-A4)



Gr. 8, Inquiry GLE#13 – Identify patterns in data to explain natural events (SI-M-A4)
 Gr. 8, Inquiry GLE#16 – Use evidence to make inferences and predict trends (SI-M-A5)
 Gr. 8, Inquiry GLE#22 – Use evidence and observations to explain and communicate the results of investigations (SI-M-A7)

Louisiana Grade Level Expectations Earth Science

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)

Materials List (per group)

- Computers with internet access
- Calculator (optional)

Advance Preparation

1. This virtual lab is suitable for only advanced students in geology.
2. Review the technical considerations and system requirements for running the activities on the website (<http://nemo.sciencecourseware.org/tester/index.php?app=vr>). Install any hardware or software necessary.
3. Review the demonstration version of the activity at the website.
4. Determine whether students will work individually or in small groups to complete the website activities.
5. It may be helpful to go through the activities first to review and record the correct answers. Students will not be able to advance without entering correct answers, so you can have the correct answers available to help them if the need arises.
6. Review with students the concept of river discharge and how this parameter is measured. It is recommended that students complete the Virtual River (Part 1): River Discharge, at Geology Labs On-Line at <http://nemo.sciencecourseware.org/VirtualRiver/Files/page01a.html>. This is PTI Activity E13.

Other Information

Learning Objective

The student will learn about river processes such as discharge, flooding, erosion, and deposition.

Prior Knowledge Needed by the Student:

Students should have completed PTI Activity E13, “Virtual River (Part 1): River Discharge” found at <http://nemo.sciencecourseware.org/VirtualRiver/Files/page01a.html>. **NOTE: This lesson requires good geography skills, an ability to read word problems and math skills. It is at an advanced level.**

Procedure

Engage

1. Using the website <http://nemo.sciencecourseware.org/VirtualRiver/Flooding/index.html>, students will discover the explanation of a flood when there is an excessive amount of water that a watershed can hold. Students will discuss the question: What is flooding?
2. Ten preliminary questions are given to showcase what the students will learn throughout this activity. Hints are offered to help with the answers.

Explore

3. Students will then determine the area of the drainage basin of a stream after an introduction to the “grid system”.
4. Students will then view the location of various rivers associated with the activity. They will complete a table of each river's watershed in square miles and answer the questions.
5. Next, the total discharge of the river will be calculated in cfs (cubic feet/second).
6. The students will estimate the stream discharge at various stages of flow: high flow, low flow and flood stage.



7. Using a graph and a table of the Stage and Discharge data from a Gage House along the Gunnison River in central Colorado, the students will make a graph from this data forming the basis of a Rating Curve.
8. Students will complete a graph using a diagram containing the rating curves for 6 different American rivers. Each rating curve is interactive so that the student can click on the graph and drag to a particular stage value and the associated discharge will be displayed.
9. Groups will construct a hydrograph from a data in the table for the Russian river, near Guernerville, California, in early 1994.
10. The hydrograph of several streams will be created using the interactive graph and data.

Explain

11. The groups will then brainstorm: "*How frequently does a river overflow its banks and cause a flood?*"(called a stream reoccurrence interval). This will determine the rivers flooding probability.
12. In the end a final problem and a series of questions will be proposed for the students to answer.

Expand (optional)

13. In their groups, have students research and explain the watershed in their area. They should also research and determine the probability of flooding in their area.

Evaluate

14. As a reward for the completion of this activity, each student will receive a certificate.
15. If the Expand section was completed, teachers can use the essay as assessment.

Blackline Master

Only a certificate of completion is available at the completion of the activity.

Supplementary Resources**United Streaming**

<http://streaming.discoveryeducation.com/index.cfm>

United Streaming has a video "Enviro-Tacklebox: Module 4: Forces in the Environment: Force of Floods". You can locate it by typing the title of the video in the search box. Be sure to search within full videos.

United States Geological Survey's Natural Hazards

<http://www.usgs.gov/hazards/floods/>

This website contains information about flood hazards. A Flood Hazards National Threat fact sheet can be downloaded from this website.