

Changes of the Mighty Mississippi

Original lesson by Janell Alvarez

Focus on Inquiry

The student will design and conduct a controlled experiment to determine how movement of river sediment affects the earth.

Lesson Overview

In this investigation students will form a hypothesis about how sediments get into the river and how the natural movement of the sediments affects erosion and deposition to change earth's surface. They will design and conduct a controlled experiment to test their hypothesis. In addition, they will learn how humans have changed the natural process of erosion and deposition of the Mississippi River and discuss how these changes have impacted the state of Louisiana and the economy of the United States.

Duration Two – three (52 minute) class periods	Setting Classroom and/or outdoors	Grouping Cooperative groups of four	PTI Inquiry Subskills 1.1, 1.3, 2.1, 2.2, 3.1, 3.2, 3.5, 4.2, 5.2, 5.4, 5.8, 5.9, 7.1, 7.2, 7.3
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Lesson Components	Estimated Time	Inquiry Subskills Used	Technology Used	Level of Student Engagement	Brief Description
Engage	10 min	1.1, 4.2	Internet	2	Students trace the length of the MS River & examine topographic maps and aerial images of sections of the river.
Explore	60-70 min	1.3, 2.1, 2.2, 3.1, 3.2, 3.5, 5.8	None	3	Students develop a hypothesis and design an experiment to understand how the movement of sediments changes the shape of the land where it is deposited.
Explain	40 min	4.2, 5.2, 5.4, 7.1, 7.2, 7.3	PowerPoint (optional)	3	Students present findings to the class using charts, tables, graphs, etc.
Expand	20 min	4.2, 5.9	Internet	3	Students relate their results to the erosion and deposition of the Mississippi River.
Evaluate	varies	None		n/a	Teacher developed rubric for group presentation and student lab sheet.

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

Identify questions that can be answered through scientific investigations.
 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.
 Communicate scientific procedures and explanations.



National Science Education Standards – Earth Science

Land forms are the result of a combination of constructive and destructive forces. Constructive forces include crustal deformation, volcanic eruption, & deposition of sediment, while destructive forces include weathering and erosion.

Louisiana Grade Level Expectations – Inquiry

Gr. 8, Inquiry GLE#1 – Generate testable questions about objects, organisms, and events that can be answered through scientific investigation (SI-M-A1)
 Gr. 8, Inquiry GLE#4 – Design, predict outcomes, and conduct experiments to answer guiding questions (SI-M-A2)
 Gr. 8, Inquiry GLE#12 – Use data & information gathered to develop an explanation of experimental results (SI-M-A4)
 Gr. 8, Inquiry GLE#19 – Communicate ideas in a variety of ways (e.g., symbols, illustrations, graphs, charts, spreadsheets, concept maps, oral and written reports, equations) (SI-M-A7)



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#19 – Determine the results of constructive and destructive forces upon landform development with the aid of geologic maps of Louisiana (ESS-M-A7)

Gr. 8, GLE#20 – Describe how humans’ actions and natural processes have modified coastal regions in Louisiana and other locations (ESS-M-A8)

Materials List (per group)

- Sand of various colors (available at Wal-Mart crafts department)
- Clay
- Gravel
- Potting soil
- Sod
- Stream table or large tray (1 per group)
- Water
- Measuring beakers
- Food coloring
- Funnels
- Stopwatch

Materials List (per class)

- United States map
- Topographic maps of the Mississippi River throughout various states including Louisiana
- Aerial photographs of the Mississippi River
- Internet
- Digital camera or video camera (optional)

Advance Preparation

1. Download and print free aerial and topographic maps of the Mississippi River can be downloaded from TerraServer USA: <http://terraserver-usa.com/>
2. Copy Blackline Master 1 – one copy per student.
3. Preview movie clips that show Mississippi River erosion and deposition (see resource list for suggestions and URLs).

Other Information

Prior Knowledge Needed by the Students

1. Students should understand the scientific process and the importance of conducting a controlled experiment.

Procedure

Engage

1. Show students a map of the United States. Have a student trace the Mississippi River with his/her finger starting from Lake Itasca down to the Gulf of Mexico. Have students name the states the Mississippi River flows through starting from Minnesota to Louisiana. Students can view the online Louisiana State Museum Historical Map Collection: **Changes in Channel of the Mississippi River from Cairo [Illinois] to Gulf of Mexico, 1830-1930** (see resource list for URL) for a close up view of changes in the rivers course.
2. Show students UnitedStreaming video segment “The Mississippi River” (see resource list for URL, or similar video).
3. Show students topographic and aerial photographs of various areas of the Mississippi River, and discuss the changes of the river’s size and shape throughout its 2,500-mile journey.
4. Have students view aerial photographs of south Louisiana. Discuss how the Mississippi River has changed course throughout the centuries and deposited silt and sediment at the mouth to form the majority of the land in south Louisiana.
5. Ask students the following questions:
 - a. How does sediment get into the river and how does the river transport sediments?
 - b. Why do some rivers have more sediment than others?
 - c. How have people contributed to the changes of the Mississippi?
 Have the class discuss their thoughts and record their answers on the board.

Explore

1. Divide students into groups of four and have each group come up with a hypothesis as to how the movement of sediments in a river changes the shape of the land on Earth, and how people have contributed to these changes.
2. Inform students that they will design and conduct a controlled experiment to test one of their hypotheses. Show them the materials available to conduct their investigations. Give them a lab sheet (**Blackline Master 1**) for recording their testable question, hypothesis, materials used, experimental procedures, data, observations, and conclusion describing whether their experiments proved or disproved their hypothesis.

Possible questions for students to test.

- How does the size of the sediment affect the distance the sediment can be carried into a pond?
- How does the elevation of the land affect the amount of sediment transported by the river?
- How does water volume affect the amount of sediment that is carried by the river?
- How does the size and shape of the sediment in a river affect the transporting capacity of the river?
- How do levees affect the rate of sediment deposition at the mouth of the river?
- How do dams affect the water velocity and sediment transporting capacity of a river?
- How does the flow of rivers affect the amount of pollutants deposited in an area?

The following example of a sample procedure and sample data table is for illustrative purposes only.

Question: How does the speed of the water affect the distance of the sediment it can be carried into a pond?

Designated independent variable: size of sediment (fine sand, course sand, gravel)

Designated dependent variable: distance leading edge of sediment has moved by 60 seconds

Variables to be held constant: speed of water, inclination of the stream table, flow rate of water.

Sample Data table:

Sediment size	Distance leading edge of sediment has moved at the end of 60 seconds (in mm)			Average distance of movement
	Trial 1	Trial 2	Trial 3	
Fine sand				
Course sand				
Gravel				

Explain

1. Upon completion of their investigation, each group will prepare a presentation to discuss the findings of their investigation to the class. Each group must explain their investigation and use charts, tables, graphs, pictures, models etc to show how their findings prove or disprove their hypothesis. They may also present their investigation and findings using a PowerPoint presentation (optional).

Expand

1. Students will explain how the results of their investigation relate to erosion and deposition of the Mississippi River. Students can view the online Louisiana State Museum Historical Map Collection: **Changes in Channel of the Mississippi River from Cairo [Illinois] to Gulf of Mexico, 1830-1930** (see resource list for URL) and identify places along the Mississippi River that showed similar depositional and erosional patterns to the student stream table results.
2. View UnitedStreaming video “The Mississippi Delta” (see resource list for URL). Another video that you might want to show is DiscoverySchool.com’s “Mississippi River” (see resource list for URL).
3. Discuss the positive and negative impacts of the Mississippi River on the various states through which it flows. Discuss the positive and negative impacts of the levees built along the river. Be sure to include the impacts of coastal land loss in Louisiana and how this loss greatly impacts the United States economy.



Evaluate

1. Blackline Master #1 and presentation of experimental results can be used as formal assessment.
2. Student explanations of how their investigation relates to erosion and deposition due to the Mississippi River and their discussion of positive and negative impacts of the Mississippi River and the levees surrounding it can be used as informal assessment.

Blackline Master

1. Changes of the Mighty Mississippi

Supplementary Resources

USGS

http://www.umesc.usgs.gov/umesc_about/about_umrs.html

The Mississippi River is more than just a river; it is a unique resource and the best example of a multi-purpose river in the United States. Read all about it on this website.

TerraSera USA

<http://terraserver-usa.com/>

Obtain aerial and topographic maps of any area in the United States.

Louisiana State Museum Historical Map Collection: **Changes in Channel of the Mississippi River from Cairo [Illinois] to Gulf of Mexico, 1830-1930**

http://louisdl.louislibraries.org/cdm4/item_viewer.php?CISOROOT=/LHC&CISOPTR=125&CISOBX=1&REC=2

This online map shows how the Mississippi River shifted its course of a 100 year period. The map is clickable so that viewers can zoom in on areas of interest.

UnitedStreaming “The Mississippi River” and “The Mississippi Delta” videos

<http://www.unitedstreaming.com> (you must have a membership)

Mississippi River Flood 1993 Case Study

<http://www.youtube.com/watch?v=ZIXioecWiJs>

This is a 4:53 minute YouTube video on the Mississippi river flood of 1993 case study.



CHANGES OF THE MIGHTY MISSISSIPPI

Problem: (This should be written as a good testable question.)

Hypothesis: (The proposed answer to your problem.)

Materials: (Be sure to list all materials and the amount of each material used.)

Procedure: (Step-by-step procedures should be clear & precise so that they can be repeated.)



Results: (Create and organized data table of your observations.)

Graph: (Be sure to use the appropriate graph to show your data.)

Conclusion: (This is an analysis of your results. State the answer to your problem and whether your results prove or disprove your hypothesis.)