

The Change of a River

High School



OBJECTIVES

Students will describe the changes that have affected the Missouri River over the past 200 years by identifying transformations in this area's atmosphere, biosphere, hydrosphere, and lithosphere.



CLASS TIME

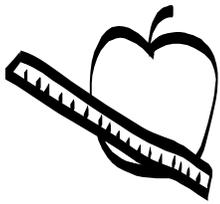
Five 45- to 60-minute sessions



NATIONAL STANDARDS

This lesson plan reflects some of the national standards of learning as defined by the National Research Council, the National Council for the Social Studies (NCSS), the National Council of Teachers of English (NCTE), and the International Society for Technology in Education (ISTE). These standards are listed below:

- Science: Unifying Concepts and Processes
- Science: Science as Inquiry
- Science: Physical Science
- Science: Science and Technology
- Science: Science in Personal and Social Perspectives
- Social Studies: Time, Continuity, and Change
- Social Studies: People, Places, and Environments
- Social Studies: Power, Authority, and Governance
- Social Studies: Science, Technology, and Society
- Language Arts: Students read a wide range of print and non-print texts to build an understanding of texts, of themselves, and of the cultures of the United States and the world; to acquire new information; to respond to the needs and demands of society and the workplace; and for personal fulfillment. Among these texts are fiction and nonfiction, classic and contemporary works.
- Language Arts: Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- Language Arts: Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and non-print texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience.



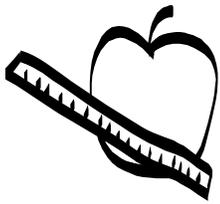
The Change of a River

- Language Arts: Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.
- Technology: Basic Operations and Concepts
- Technology: Technology Communication Tools
- Technology: Technology Research Tools



MATERIALS

- 1 overhead projector
- 1 overhead transparency of each of the following:
 - Peace Medal Nickel reverse from the Resource Guide
 - Keelboat Nickel reverse from the Resource Guide
- Copies of each of the following:
 - Multiple journal entries in which Lewis and Clark describe the river's state in the early 1800s, such as those written on June 14, 1804, and May 11, 1805
 - "Changes in Our Environment" assignment sheet
 - "Individual Research Journal Rubric"
 - "Presentation Rubric"
 - "Research Teams" sheet
 - "Atmosphere Team Guide"
 - "Biosphere Team Guide"
 - "Hydrosphere Team Guide"
 - "Lithosphere Team Guide"
- Small notebooks or journals (1 per student)
- 1 copy of the "Research Teams" sheet
- A reserved computer lab with Internet access and a computer presentation program
- A reserved section of the school library (optional)
- Web sites that include basic information on the Corps of Discovery's impression of the Missouri River structure and ecosystem, such as:
 - www.pbs.org/lewisandclark/archive/idx_jou.html
 - www.conservation.state.mo.us/conmag/2004/01/20.htm
 - www.lewisandclarkeducationcenter.com/



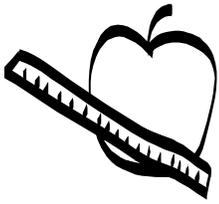
The Change of a River

- Web sites that include basic information on the current Missouri River structure and ecosystem, such as:
 - nd.water.usgs.gov/lewisandclark/dams.html
 - www.nwd.usace.army.mil/pa/missouri2003aop.asp
 - <http://www.epa.gov/msbasin/missouri.htm>
 - <http://www.conservation.state.mo.us/conmag/2004/01/20.htm>
 - <http://news-info.wustl.edu/tips/page/normal/840.html>
 - <http://www.northern.edu/natsource/HABITATS/Missio1.htm>
 - <http://www.wildmontana.org/missouririverbreaks.html>
 - <http://mdc.mo.gov/kids/out-in/2003/01/2.htm>
 - <http://wrc.iewatershed.com/watershed-national-10.php>
- Poster board or butcher paper (1 sheet per group)
- Markers and/or colored pencils
- 1 computer projector
- 1 projection screen



PREPARATIONS

- Make an overhead transparency of each of the following:
 - Peace Medal Nickel reverse from the Resource Guide.
 - Keelboat Nickel reverse from the Resource Guide.
- Locate copies of journal entries in which Lewis and Clark describe the river's state in the early 1800s (see examples under "Materials").
- Make copies of each of the following:
 - "Changes in Our Environment" assignment sheet (1 per student).
 - "Individual Research Journal Rubric" (1 per student).
 - "Presentation Rubric" (1 per student).
 - "Atmosphere Team Guide" (1 per atmosphere team).
 - "Biosphere Team Guide" (1 per biosphere team).
 - "Hydrosphere Team Guide" (1 per hydrosphere team).
 - "Lithosphere Team Guide" (1 per lithosphere team).
- Make one copy of "Research Teams" and cut it along the dotted lines.
- Arrange to use the school computer lab for four class sessions.
- Arrange to use the school library for three class sessions (optional).
- Bookmark appropriate Internet sites.



The Change of a River



GROUPINGS

- Whole group
- Pairs
- Small groups
- Independent work



TERMS AND CONCEPTS

Obverse (heads)	Reverse (tails)	Reservoir	Lewis and Clark
Corps of Discovery	Sandbar	Keelboat	Peace medal
Ecosystem	Atmosphere	Biosphere	Hydrosphere
Lithosphere	Pro	Con	



BACKGROUND KNOWLEDGE

Students should have a basic knowledge of:

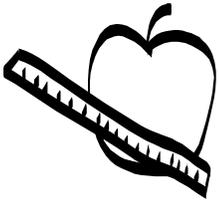
- The Corps of Discovery
- Waterways
- Computer presentation program functionality



STEPS

Session 1

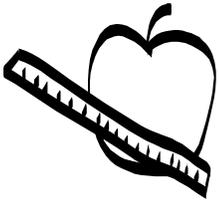
1. Display the overhead transparencies of the Peace Medal Nickel reverse and the Keelboat Nickel reverse. Direct the students to inspect the images on the transparencies. Ask the students what they know about these two images and what they represent.
2. Explain that, starting in 2004 and continuing through 2005, our nation is changing its nickels to tell the story of the Louisiana Purchase and Lewis and Clark's exploration of the American West 200 years ago. Inform students that these are the reverse designs that appear on the 2004 nickels.
3. Ask students to recall some basic historical information about the Louisiana Purchase and the Corps of Discovery's expedition. They should remember that Captains Meriwether Lewis and William Clark led the Corps of Discovery up the Missouri River in an effort to find a Northwest Passage to the Pacific Ocean, which would eventually assist with the nation's abilities to conduct trade. Along their journey, they developed relations with many groups of American Indians and conducted scientific studies of the animals, plants, land, and water in this region.
4. Make connections between these missions and the new nickels by noting that the Corps of Discovery members rowed, poled, and pulled a keelboat like the one pictured on the



The Change of a River

Keelboat Nickel. Also explain that the explorers gave peace medals that had an image on them like the image on the Peace Medal Nickel reverse to the American Indians as a sign of good will.

5. Conduct a Think-Pair-Share activity in which the students, first individually and then with a partner, brainstorm ideas about the important role that the Missouri River played in the journey of the Corps of Discovery. Once the students have discussed their ideas with their partners, conduct a class discussion in which these ideas are shared.
6. Explain to the students that the Corps, including the captains, kept journals of their experiences during the trip. The journals were full of descriptions of the wild, winding, turbulent, unrestricted Missouri River. Provide students with a sample of one or two journal entries that describe the river's state in the early 1800s.
7. Explain that they are going to conduct their own exploration of the Missouri River and its role in modern society as a class. Distribute a "Changes in Our Environment" assignment sheet to each student. Direct a student to read it aloud to the class.
8. Distribute one small notebook or journal to each student. Inform them that, during this investigation, each student must maintain a journal, which will be assessed at the end of the lesson.
9. Distribute a copy of the "Individual Research Journal Rubric" to each student. Review the rubric with the students and inform them that these are charts of what they have to accomplish in their individual research journals for various degrees of achievement (in other words, this is how they'll be graded).
10. Direct the students to take a moment at this time and write a journal entry in which they describe what they currently know about the state of the Missouri River in 1803. They should also hypothesize about what changes they believe may have occurred on the river since that time, and the possible causes for the changes.
11. Re-read the "Changes in Our Environment" assignment sheet and introduce the students to the core of their "jigsaw" research project. Explain that the students will be divided into groups that will explore the impact of changes that have been made to the Missouri River.
12. Direct the students to assemble themselves into four groups. Place the cut-outs from the "Research Teams" page into a hat and have a member of each group draw one team research assignment. This will inform the group of their duties for the first part of this project. Distribute the appropriate "Team Guide" to each group based on the team description they selected from the hat.
13. Ask the students to share their earlier journal entries with their research team, noting in their journals their peers' ideas as they are discussed. They should discuss what effects the changes they noted would have on their research area as well as on society.

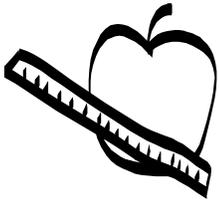


The Change of a River

14. Tell the students to discuss within their research teams what they need to know about the river and their sphere of expertise for this project. These questions and issues will guide their research. They should list these in their journals.
15. Direct the students to develop a plan for finding what they need to know. This plan should include an outline of individual investigative responsibilities. Each student must write their individual research plan (i.e. questions to answer and resources to use) in their journal.
16. Direct the students to complete their individual research plans for homework if they did not finish them during this class session.

Session 2

1. Explain that the students must now implement the independent research plans they described in their journals. They should record their findings, sources, and any new questions in their journals. Explain that they may use the Internet or library resources to investigate the Missouri River's structure and ecosystem two hundred years ago through the eyes of the Corps of Discovery. They should investigate the river's structure and ecosystem today by reviewing current research and information on the Internet. If appropriate, guide your students to the Web sites suggested in the Materials section of this lesson plan.
2. Accompany your students to either a school computer lab or the school library and allow them about fifteen minutes to begin their investigation. Observe what the students are researching. If necessary, step in with guiding questions such as the ones on the sphere team guides to keep students on the right investigatory path.
3. When the majority of the students are finished with their initial investigation plan, ask them to reassemble in their research teams to discuss their findings. In their teams, the students should develop new questions based on the information the team gathered, and they should note these questions in their journals.
4. Direct the students to adjust their individual research plans based on their group discussion. Any adjustments or new questions should be recorded in their research journal.
5. Allow the students to research any new questions that have arisen.
6. Repeat steps 4 through 6 as many times as necessary until students have at least touched on the learning issues listed in the sphere team guides.
7. Now that students are "experts" on their area of research, direct them to assemble into new teams that contain representatives from each of the spheres. In these groups, the students should discuss their findings and begin to formulate their group's presentation.
8. Based on the group's discussion, direct the students to independently write a journal entry in which they hypothesize about the future of the Missouri River. They should focus primarily on their sphere of expertise, but should also touch upon each of the other spheres.



The Change of a River

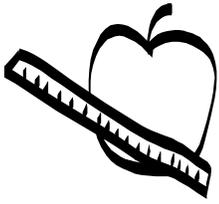
9. Once more, display the overhead transparencies of the Peace Medal Nickel reverse and the Keelboat Nickel reverse. Based on their research, for homework, require each student to design a new nickel reverse that commemorates the role of the Missouri River over the past 200 years. This drawing and an explanation of their design should be added to each student's journal.

Sessions 3 and 4

1. Allow the students to complete any individual research that may remain from the previous sessions.
2. Direct the students to reassemble into their groups from the previous session.
3. Distribute a copy of the "Presentation Rubric" to each student. Review the rubric with the students and explain that the presentations should include information on the river's past and present structure and ecosystem with emphasis on how changes in the structure over the past 200 years have affected the land, air, water, and living things in the Missouri River ecosystem. Through the inclusion of scientific facts, the presentations should explain the positive and negative effects of these changes on society. Explain that, in groups, each individual will take on a research role. Explain, too, that all of the research will be combined to form the group presentation.
4. Direct the students to design and create their group presentations, which are to be 15 minutes in length. The students should develop a plan for the actual creation of this presentation, so that all students can participate. The students should also share and discuss their last journal entries and individual thoughts on the future of the Missouri River, as this will be incorporated into the group presentation.
5. Distribute a piece of poster board or butcher paper to each group. Direct the students to share their individual nickel designs and combine ideas in order to develop a group nickel design. This design should be included in their presentation.
6. Explain that the groups will share their presentations during the next session, so any incomplete work must be completed as homework.
7. Ten minutes before the end of the session, have the students take a moment to write a journal entry describing how they feel about the changes that have taken place on the Missouri River over the past 200 years, based on the research they've conducted and their group discussions.

Session 5

1. Direct each group to give their 15-minute presentations.
2. After each presentation, allow five minutes for your questions as well as those from other students.
3. Ten minutes before the end of the session, direct the students to write a journal entry describing how they feel about the changes that have taken place on the Missouri River



The Change of a River

over the past 200 years now that they've heard from the other groups. Has their view changed since their last journal entry? Why or why not?

4. Collect the individual research journals.



ASSESSMENT

- Take anecdotal notes about the students' ability to work as a team, to complete independent research, and to meet all the other project objectives.
- During the presentations, note the students' performance in each of the categories outlined in the "Presentation Rubric." Assess their work accordingly.
- Read the individual research journals and assess them using the "Individual Research Journal Rubric."



ENRICHMENTS/EXTENSIONS

- Direct the students to investigate and present research relating to local environmental changes.
- Provide students with the opportunity to contact local, state, or federal policymakers regarding environmental issues.



DIFFERENTIATED LEARNING OPTIONS

- Allow the students to work in pairs to conduct their initial sphere research.
- Assign research team roles according to learning styles. For example, someone who excels at writing could be the research team recorder; someone who is artistic could design the group coin.



Changes in Our Environment

Our nation is currently celebrating the bicentennial of Lewis and Clark's Corps of Discovery. The Westward Journey Nickel Series™ commemorates this event. The reverse side of each of these coins symbolizes an important aspect of the Corps' journey.

So far, the United States Mint has created the Keelboat Nickel, which depicts the great vessel the Corps used, and a Peace Medal Nickel, which shows the medal the explorers gave to the American Indians they met.

Groups of re-enactors are celebrating this bicentennial as well by following the Corps' trail up the Missouri River, though their course will be slightly different from Lewis and Clark's. In the past two hundred years, the Missouri River has changed greatly.

When Lewis and Clark went up the river, they found many riffles and sandbars with wetland vegetation. There were shallow areas and large pools. There was always something different around the next bend.

Over the past 200 years, however, many changes have occurred that have had an impact on the flow of this river and its surrounding environment.

Our class will join the bicentennial commemoration by working in teams to investigate the changes in the Missouri River's structure and ecosystem in the last 200 years. Consider the following questions.

- What changes have occurred over the

past 200 years that have affected the Missouri River and its surrounding environment?

- What were the needs of society that led to these changes?
- How have the atmosphere, biosphere, hydrosphere, and lithosphere surrounding the river been affected?
- How do past and future changes in each sphere affect the other spheres?

Each team will prepare a fifteen-minute computer presentation describing the changes that have affected the Missouri River over the past 200 years.

Each team will examine the needs of society that led to these changes, and will explore the impact that these changes have had on the region's surrounding environment.

Each team will analyze the positive and negative results of these changes on society.

Based on their research, each team will also develop a theory about the future of the Missouri River and its surrounding areas—if no further development were to occur in this area, what would it be like 100 to 200 years from now?

Based on its research, each group will also design a new nickel reverse that commemorates the role that the Missouri River has played over the past 200 years. The design will be included in the group's presentation to the class.

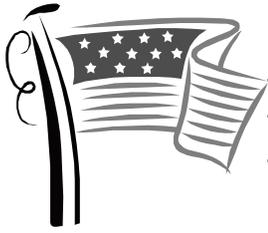


NAME _____

DATE _____

Individual Research Journal Rubric

	RATING			
CATEGORY	4	3	2	1
Completeness of journal	Includes all required journal entries. Each entry restates the journal prompt and includes a complete and thorough response.	Includes most required entries. Most entries restate the journal prompt and responses are mostly complete.	Includes some required journal entries. Some entries restate the journal prompt and include at least a partial response.	Includes few required entries. Entries do not restate the journal prompt; they include incomplete responses.
Quality of research plan and supporting research	Topic questions and theories are extensive; sources for data collection plan include electronic and non-electronic; Research is complete and thoroughly answers all questions in plan, all cited properly.	Includes several topical questions and theories. Plan sources are electronic and/or non-electronic; research is mostly complete and answers all plan questions; all is cited.	Includes some topical questions and theories; sources are electronic or non-electronic; research is partial and answers most questions in plan; some is cited.	Few topical questions or theories; collection of information not in plan; research incomplete and answers few of planned questions; no citations.
Scientific/historic support for all speculative entries	Journal entries contain extensive information to support all speculative journal entries; all conclusions are detailed and are based on the support offered.	Journal entries contain some information to support all speculative journal entries. Most conclusions are somewhat detailed and are based on the support offered.	Journal entries contain little information to support the speculative journal entries. Conclusions contain some details but are not based on the support offered.	Journal entries contain little or no information to support the speculative journal entries. Conclusions contain few details and are not based on the support offered.
Design of Missouri River nickel	The nickel design is a detailed drawing with a complete and detailed explanation.	The nickel design is a detailed drawing with a simple explanation.	The nickel design is poor or incomplete with a simple or incomplete explanation.	The nickel design is poor or incomplete without an explanation.
Overall quality of journal	The journal is neatly presented, well written, and organized.	The journal is neat with a few grammatical errors. It is somewhat organized.	The journal is sloppy and contains some/many grammatical errors. The journal shows evidence of some organization plan.	The journal is sloppy and disorganized. It contains many grammatical errors.



Research Teams

Atmosphere Team

This team will study the air in and around the Missouri River over the past 200 years. They will explore the changes that have occurred on and along the river during this time. They will investigate the reasons and needs of society that led to these changes. After explaining the impact that these changes have had on the quality of air in this region, this team will describe how the changes in the atmosphere have affected the other spheres: the biosphere, hydrosphere, and lithosphere. Finally, this team will speculate about the ways in which these changes will impact the Missouri in the future.

Biosphere Team

This team will study the living things in and around the Missouri River over the past 200 years. They will explore the changes that have occurred on and along the river during this time. They will investigate the reasons and needs of society that led to these changes. After explaining the impact that these changes have had on the living organisms in this region, this team will describe how the changes in the biosphere have affected the other spheres: the atmosphere, hydrosphere, and lithosphere. Finally, this team will speculate about the ways in which these changes will impact the Missouri in the future.

Hydrosphere Team

This team will study the water in and around the Missouri River over the past 200 years. They will explore the changes that have occurred on and along the river during this time. They will investigate the reasons and needs of society that led to these changes. After explaining the impact that these changes have had on the water in this region, this team will describe how the changes in the hydrosphere have affected the other spheres: the atmosphere, biosphere, and lithosphere. Finally, this team will speculate about the ways in which these changes will impact the Missouri in the future.

Lithosphere Team

This team will study the land in and around the Missouri River over the past 200 years. They will explore the changes that have occurred on and along the river during this time. They will investigate the reasons and needs of society that led to these changes. After explaining the impact that these changes have had on the land in this region, this team will describe how the changes in the lithosphere have affected the other spheres: the atmosphere, biosphere, and hydrosphere. Finally, this team will speculate about the ways in which these changes will impact the Missouri in the future.



Atmosphere Team Guide

Directions: Use these questions, the research rubric, and the presentation rubric to guide your research. There may be other questions you need to answer in order to complete your research, but these questions are a good starting point.

1. What is the atmosphere?
2. What was the atmosphere in and around the Missouri River like 200 years ago when the Corps of Discovery explored it?
3. How did the biosphere, hydrosphere and lithosphere in and around the Missouri River 200 years ago affect the atmosphere?
4. What is the atmosphere in and around the Missouri River like today?
5. How do the biosphere, hydrosphere and lithosphere in and around the Missouri River today affect the atmosphere?
6. How has the atmosphere in and around the Missouri River changed in the past 200 years?
7. What has caused changes in the atmosphere in and around the Missouri River?
8. How have changes in the atmosphere affected the biosphere, hydrosphere and lithosphere in and around the Missouri River in the past 200 years?



Biosphere Team Guide

Directions: Use these questions, the research rubric, and the presentation rubric to guide your research. There may be other questions you need to answer in order to complete your research, but these questions are a good starting point.

1. What is the biosphere? [Note: Some resources class humans in the “anthrosphere”; for this exercise, consider humans part of the biosphere.]
2. What existed in the biosphere in and around the Missouri River 200 years ago when the Corps of Discovery explored it?
3. How did the atmosphere, hydrosphere, lithosphere, and other living things such as prey/predators in and around the Missouri River 200 years ago affect the biosphere?
4. What exists in the biosphere in and around the Missouri River today?
5. How do the atmosphere, hydrosphere, lithosphere, and other living things such as prey/predators in and around the Missouri River today affect the biosphere?
6. How has the biosphere in and around the Missouri River changed in the past 200 years? What species have become endangered, threatened, or of special concern? What species have moved into the area?
7. What has caused changes in the biosphere in and around the Missouri River?
8. How have changes in the biosphere affected the atmosphere, hydrosphere, lithosphere, and other living things such as prey/predators in and around the Missouri River in the past 200 years?



Hydrosphere Team Guide

Directions: Use these questions, the research rubric, and the presentation rubric to guide your research. There may be other questions you need to answer in order to complete your research, but these questions are a good starting point.

1. What is the hydrosphere?
2. What was the hydrosphere in and around the Missouri River like 200 years ago when the Corps of Discovery explored it?
3. How did the atmosphere, biosphere, and lithosphere in and around the Missouri River 200 years ago affect the hydrosphere?
4. What is the hydrosphere in and around the Missouri River like today?
5. How do the atmosphere, biosphere, and lithosphere in and around the Missouri River today affect the hydrosphere?
6. How has the hydrosphere in and around the Missouri River changed in the past 200 years?
7. What has caused changes in the hydrosphere in and around the Missouri River?
8. How have changes in the hydrosphere affected the atmosphere, biosphere, and lithosphere in and around the Missouri River in the past 200 years?



Lithosphere Team Guide

Directions: Use these questions, the research rubric, and the presentation rubric to guide your research. There may be other questions you need to answer in order to complete your research, but these questions are a good starting point.

1. What is the lithosphere?
2. What was the lithosphere in and around the Missouri River like 200 years ago when the Corps of Discovery explored it?
3. How did the atmosphere, biosphere, and hydrosphere in and around the Missouri River 200 years ago affect the lithosphere?
4. What is the lithosphere in and around the Missouri River like today?
5. How do the atmosphere, biosphere, and hydrosphere in and around the Missouri River today affect the lithosphere?
6. How has the lithosphere in and around the Missouri River changed in the past 200 years?
7. What has caused changes in the lithosphere in and around the Missouri River?
8. How have changes in the lithosphere affected the atmosphere, biosphere, and hydrosphere in and around the Missouri River in the past 200 years?



NAMES _____

DATE _____

Presentation Rubric

CATEGORY	RATING			
	4	3	2	1
Organization	Students present information in logical, interesting sequence which audience can follow.	Students present information in logical sequence which audience can follow.	Audience has difficulty following because sequence of presentation is not logical.	Audience cannot follow presentation because it is not sequential.
Completeness and accuracy	Students accurately describe the historical and current status of the Missouri River and many reasons for its changes; the changes and their effects on each of the four spheres are covered, with a scientifically supported hypothesis about the river's future.	Students partially but accurately describe the historical and current state of the river, some reasons for its change, and their effects on the four spheres, with a partially supported hypothesis about the river's future.	Students inaccurately and incompletely describe the river's past and present state, its changes, the reasons for them, and their effects on at least two spheres with a far-fetched or unsupported hypothesis about its future.	Students inaccurately describe the river's past and present, its changes, and reasons for them, and do not relate them to the four spheres or hypothesize about the river's future.
Content knowledge	Students demonstrate full knowledge (more than required) with explanations and elaboration.	Students are at ease with content, but fail to elaborate.	Students are uncomfortable with information and are able to answer only rudimentary questions.	Students do not have grasp of information; students cannot answer questions about subject.
Use of appropriate technology	Students design an interesting and effective computer presentation that incorporates all necessary information.	Students use a computer presentation program to help them share most of their information. The design of the presentation is somewhat interesting and/or effective.	Students use a computer presentation program to help them share some of their information. The design of the presentation is somewhat interesting or effective.	Students do not use a computer presentation program to share their information.
Delivery	Students use clear voices and correct, precise pronunciation of terms.	Students voices are clear. Students pronounce most words correctly.	Students pronounce terms incorrectly; audience has difficulty hearing presentation.	Presenters speak softly and indistinctly and mispronounce terms.
Cooperative learning	Each worked well independently, shared all findings with the group; each took part in the report's development and production.	Each worked well independently, shared some findings; most took part in development and production.	Some worked well alone, shared some findings; only two members took part in development and production.	Few worked well alone, shared few findings; only one member developed and produced the report.
Design of nickel	Design is a detailed drawing with a complete and detailed explanation.	Design is a detailed drawing with a simple explanation.	Design is poor or incomplete with a simple or incomplete explanation.	Design is poor or incomplete without an explanation.