

Salt trading in Asia

In this interdisciplinary lesson, students explore the mineral salt from a variety of perspectives — scientific, geographic, and cultural. The lesson incorporates images of salt production in Nepal and Vietnam. It may be used with grade 4 or grade 7.

A lesson plan for grades 4 and 6–7 English Language Arts, Science, and Social Studies

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This interdisciplinary lesson incorporates science, nutrition, geology, social studies, and language arts as students explore the mineral salt. The lesson is designed to be used for grade 4 or grade 7, with modifications given for each grade.

Learning outcomes

Students will learn about the properties of salt and the process by which it is formed naturally, farmed, traded, and used. Students will understand that salt is the only mineral eaten by people, that it has always been sought after by humans and animals, and that regions of the world without natural sources of salt must trade or purchase it. A collection of images will afford students the opportunity to view salt farms in Vietnam and historic salt trade routes to Nepal. Students will use these images to demonstrate their understanding of salt production and trade by putting the images in order and writing a work of fact or fiction to accompany and explain this sequence.

Teacher preparation

TIME REQUIRED FOR LESSON

Teachers should schedule six to nine one-hour class periods as follows:

- One class period for introducing the properties, sources, and uses of salt
- One class period for exploring the process by which salt crystals form (plus brief daily observations for at least five subsequent days). **Seventh grade teachers** should schedule one additional day for this activity, for students to present hypotheses, observations, and conclusions.
- One class period for investigating why the human body needs salt and where salt exists as a natural resource
- Two class periods for researching the LEARN NC multimedia collection to document the process by which salt is “farmed” and traded
- One to two class periods for writing and editing an original work of fact or fiction about the process of farming, transporting, and trading salt.
- Optional: two to three class periods for creating salt dough and using this medium to create a topographical map of Asia.

MATERIALS NEEDED

- Multimedia projector
- Internet connection
- Images of salt production and trade in Nepal and Vietnam from the LEARN NC multimedia collection, with descriptions. (Printed copies of the images and descriptions may be used if there is no access to computers or multimedia projector.)
- Large chart paper or posterboard
- Nutritional content labels from non-perishable canned goods, bags of chips, peanut butter, or other ordinary food items
- Salt magnification materials:
 - Salt (kosher, sea, or table)
 - Black construction paper
 - Hand lens
 - Microscope
 - Slide and coverslip
- **Grade four teachers:** *Optional:* Index cards — one set of fifteen for each group of four to five students, with these words (one word per card):
 - Crystal, salt, dissolve, solvent, solution, solubility, surface, supersaturated, saturated, submerge, evaporate, accumulate, experiment, evaporation, temperature
- Crystal-growing experiment materials:
 - Clean jar or Pyrex mixing bowl



(Photograph by Margery H. Freer)

Learn more

- History of Salt This Wikipedia article offers an excellent overview of the sources, history, production, and uses of salt with images and references.
- What you need to know about salt From the Salt Institute.
- About Salt: The Most Intimate Mineral An article from About.com exploring where salt comes from.
- Salt Evaporation Pond This article from Wikipedia describes shallow man-made salt evaporation ponds designed to produce salt from sea water and includes stunning photographs of modern salt evaporation ponds in the San Francisco Bay.
- Photographic Tour of the Salar de Uyuni The Salar de Uyuni in Bolivia is the world's largest salt flat. This About.com article is a useful resource for extending the discussion to sources of salt in South America.

- String (preferably cotton)
- Scissors
- Tape
- Pencil
- Paperclip
- 1-2 cups boiling water
- 1-2 cups table salt
- Notebook
- Camera (**optional**)
- Point-of-view writing project materials:
 - Word processing program
 - Printers
 - Paper
 - Colored pencils or water colors for illustrations
 - Materials for constructing book cover (yarn, sturdy cardstock or thin cardboard, scissors, hole punch, etc.)
- Salt map-making project materials:
 - For each group of students:
 - 1 c. salt
 - 1 c. flour
 - 2/3 c. water
 - Selected colors of acrylic paint
 - Paper
 - Glue
 - Cardboard
 - Waxed paper
 - Permanent marker

TECHNOLOGY RESOURCES

- Computers with internet connections, printers, and word-processing software
- Multimedia projector
- **Optional:** Digital cameras, with software for downloading and printing images

Pre-activities

Students should discuss the mineral salt and name some uses that they can think of (food, road safety, etc.) As you lead the discussion, create a graphic organizer (such as a word web) on large chart paper or poster board to list all the things that the students know about salt. Post this in the classroom so that students can add to and refine their thinking as more knowledge is gained.

Bring in some non-perishable products and have students read nutritional information on ordinary food labels (cereals, soups, chips, ketchup, pasta, tuna, etc.) to identify the words “sodium” and “salt.” Discuss these uses of salt and have students share ideas about where salt comes from. Tell them that over the next several days they will learn why salt is important to humans and animals. They will research the history of how salt has been farmed and traded over centuries. They will find out where salt occurs as a natural resource by taking a virtual tour of salt fields and mines. They will begin this study by conducting experiments: 1. dissolving salt to create *brine*, a saline solution, and 2. creating salt crystals through the process of evaporation.

Activities

ACTIVITY ONE

Introduce the properties, sources, and uses of salt.

- **Grade four teachers** may choose to use the Science NetLinks lesson plan “Salt: Up Close and Personal.” In the lesson, students observe salt under a variety of magnifications, keep records of their observations, and analyze the data. This establishes a visual experience that will serve as a reference point throughout the remainder of the salt trade investigation. Discuss the common form observed in each level of magnification viewed. (Students should recognize the cubic shape of the crystal.)
- **Grade seven teachers** may choose to have students conduct research on the properties, sources, and uses of salt, and have a class discussion of the results of their research.
- **Teachers of all grades** should be sure to tell students that salt is halite, the mineral form of sodium chloride, NaCl, commonly known as *rock salt*. Halite forms isometric crystals, which are cube-shaped.

ACTIVITY TWO

- [The Cultural Ecology of Yak Production in Dolpo, West Nepal](#) Another scholarly article that may be of interest to teachers, from the International Livestock Research Institute.

RELATED PAGES

- [Of earth, water, and fire: World pottery traditions:](#) In this lesson, a photo analysis activity helps students learn about pottery traditions from around the world. Students discuss how these traditions are similar to and different from one another.
- [To market, to market: Photograph analysis:](#) In this lesson, students analyze photos of markets from around the world to gain an understanding of the similarities and differences between geographically distant places, to learn about the economic and cultural significance of markets, and to improve visual literacy skills.
- [Vietnam waterways: Ecology and conservation:](#) In this interdisciplinary lesson for grades 6-8, students will examine the relationship between the physical environment and cultural characteristics of the Mekong River valley in Vietnam. Students will evaluate the current conditions of the Mekong River and suggest long-range solutions for improving, restoring, or preserving the quality of the river.

RELATED TOPICS

- Learn more about [Asia](#), [Nepal](#), [Vietnam](#), [geography](#), [history](#), [labs](#), [mapping](#), [minerals](#), [photograph analysis](#), [salt](#), [science](#), [social studies](#), [trade](#), and [world cultures](#).

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Experiment with dissolving salt and using mineral solution to grow crystals.

1. Boil 1 - 2 cups of water and then transfer it to a clean jar or Pyrex bowl.
2. Gradually pour in enough salt to saturate the water. Stir until all of the salt that can dissolve is dissolved. Stop when you begin to see salt crystals in the bottom of your jar or bowl that will not dissolve.
3. Tie a paperclip to a piece of string. Tie the other end of the piece of string to a pencil and hang the string, paperclip side down, in the water. Rest the pencil across the top of your jar or bowl and tape it in place. Make sure that the paperclip at the end of the string does not touch any of the salt at the bottom of the jar.
4. Tell students they will leave the string in place overnight, and make observations about it in the coming days.
5. After demonstrating how salt dissolves and setting up the crystal growth experiment, ask students to make a prediction about what they think will happen to the string in the jar or bowl. Allow some time for discussion.
6. Tell students that in a *solution*, a *solvent* can only hold a certain amount of *solute*. This is called the *solubility* of a solution.
7. Ask students to identify the solvent in this experiment. (*Water*)
Ask students to identify the solution. (*Salt dissolved in water*)
8. Explain the following to students:

In this experiment, the starting solution had reached its maximum solubility and was thus a *saturated* solution. (The water could not dissolve any more salt.)

As the temperature of the solution drops, its solubility will begin to decrease and the solution will not be able to hold the solute. As a result, the solution will become a *supersaturated* solution.

The supersaturated solution will be forced to get rid of some of the solute, and will place it on the nearest surface that can hold it. In this case, that surface is the thread that is submerged in the solution. As the temperature of the solution continues to drop, more salt should accumulate on the thread forming the salt crystal.

9.
 - o **Grade four teachers:** Tell students that the volume of the solution will continue to drop as water evaporates from the solution, and more solute will accumulate on the thread until all the solvent has evaporated.

Have students use all the information you've just given them to create a word wall of these important words:

- Crystal
- Salt
- Dissolve
- Solvent
- Solution
- Solubility
- Surface
- Supersaturated
- Saturated
- Submerge
- Evaporate
- Accumulate
- Experiment
- Evaporation
- Temperature

[*Optional Language Arts Activity:* Write these words on cards and distribute to students in small groups (one complete set of word cards to each group). Have each group of students work together to classify each word by part of speech: Noun, verb, or adjective. Students should be able to identify words that fit into more than one category.]

- o **Grade seven teachers:** Ask students to formulate a hypothesis predicting the following:
 - Will the volume of the solution continue to drop as water evaporates from the solution? If so, why?
 - Will more solute accumulate on the thread until all the solvent has evaporated? If so, why?

Have students develop a hypothesis, record materials, and explain each step in the experiment to test their hypothesis using the following words. (Be sure students identify the dependent and independent variables in this experiment, and discuss the relationships between them):

- Crystal
- Salt
- Dissolve
- Solvent
- Solution
- Solubility
- Surface
- Supersaturated
- Saturated
- Submerge
- Evaporate

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- Accumulate
- Experiment
- Evaporation
- Temperature
- Hypothesis
- Prediction
- Variable
- Relationship
- Dependent
- Independent

Note: Advanced students may wish to set up a control to test their hypothesis (What would happen without the string or thread surface? What would happen if the water temperature required to dissolve the salt was maintained over time, or if evaporation was prevented?)

10. **Teachers of all grades:** Over the following days, have students take the string out of the jar each day and observe if salt crystals have formed on the string. Have them use a magnifying glass to inspect the crystals in detail. Salt crystals may take some time to get large so if you want to grow large crystals, replace the salt water solution daily. Suggestion: You may wish to have students document the experiment with a digital camera and write text to describe daily observations of growth and change.
11. **Grade seven teachers:** After the experiment, schedule one class period for each pair of students to present its original hypothesis, experiment, observations, and conclusions. Discuss students' results and collect written reports.

ACTIVITY THREE

A virtual tour of salt farms

1. Tell students that they will take a tour in pictures and text of places where salt is made using solar energy, and harvested. Show students the image "[Wide View of Salt-making Fields along the Coast South of Nha Trang,](#)" and read the accompanying text:

This wide landscape view of salt-making fields along the coast south of Nha Trang shows sea water evaporating in some front and back fields, while salt is nearly ready for harvest in the middle fields.

This type of salt production is a low-cost technology that is known and used in shallow coastal regions throughout Southeast Asia. Sea water enters the fields at high tide. The fields are edged with roughly three-foot high mud dikes, which retain sea water after the tide recedes. Over a period of sunny days, the water evaporates leaving the dry, white salt powder to be collected for sale.

In tropical regions, salt is an especially necessary and highly prized addition to people's diet, as it helps retain body fluids in the heat. Traditionally, salt was traded to interior groups from the coasts or, in some regions, it could be mined from salt layers found within inland mountains.

2. Ask students to compare the process of "salt-making" in these fields with the salt crystal growing experiment they have conducted in the classroom. Allow students time to discuss and create a collaborative Venn diagram on large chart paper. Students should be able to explain the process of evaporation essential to salt formation. They should also be able to explain that salt water is a solution, both in the ocean and in the classroom dissolving experiment. Ask students to suggest ways in which the sea water might get salt.
3. Briefly review the importance of salt for human health. (Note: for more information on this topic, see the page "[Salt and Health](#)" from the Salt Association.) Ask students to consider how civilizations might survive if they are geographically located far away from a natural resource necessary for proper health and nutrition. (You may suggest that they consider the importance of vitamin C in citrus fruits, which do not grow much of North American states. How do children in Kansas, for example, get orange juice to drink?) What about salt? If salt is farmed and harvested in mineral mines and salt fields along the coast, how could a region with no access to either get salt? Students should share ideas about trade. Show students a map of Nepal. Discuss the definition of *landlocked* and ask them to guess where the Nepalese people might have gotten salt for many years.

Grade seven teachers: Have students read the *Nepali Times* article "[Salt Mountain: How Plastic Bags and a Drop of Iodine Bred Success,](#)" which describes the health issues related to low salt/iodine intake in Nepal, and discusses current efforts to get iodized salt to the mountain villagers.

4. Tell students that they will look at a series of photographs documenting the process of farming salt in fields in Vietnam, harvesting the sea salt, and taking it to Nepal and its neighbor, Tibet.
5. Access the [images of salt production and trade](#) from the LEARN NC multimedia collection.
6. Ask students to review the images and descriptions, taking notes about each photograph and text. Students should work in small groups or pairs to create a story about the process of farming, harvesting, transporting, and trading salt. The photographs should be numbered and put into a logical order to illustrate the story. Students will complete this task in small teams and then share the results as a reference for completing the subsequent independent writing project.

Note: Another option for helping students to see the salt fields of Vietnam and the landlocked region of Nepal is via Google Earth. Type in Nha Trang and view satellite images of salt fields. Students can then view a virtual trek to Nepal:

In the “fly to” button, type in Nepa1. This is an impressive way to see the contrasting geography of Asia.

ACTIVITY FOUR

Independent writing project in fact or fiction

- Briefly share and discuss how the students ordered the photographs. Talk about where the salt came from and how it was transported to Nepal.
- Ask students to use their knowledge of the salt trade to complete the following writing assignment. They will have one to two class periods for writing either:
 - A factual “how to” guide, *or*
 - A fictional first-person narrative about the process of farming, transporting, and trading salt.

Students will select one option and write from one of the following points of view:

- A salt crystal
- A salt farmer in Nha Trang, Vietnam
- A salt trader in Nepal
- An inanimate object or tool used in the process of farming, transporting, or trading salt.

Final drafts will be illustrated and shared or published as a class anthology of Nepalese salt-trading stories.

ACTIVITY FIVE

Optional topographical salt map-making project: Students will create a topographical map of southeastern Asia to show the geographical location of the manuscripts they’ve written.

Grade seven teachers: As a pre-activity or extension, you may wish to use the *National Geographic* lesson “Investigating Central Asia Through Maps.” The lesson introduces students to physical, political, and thematic maps, and helps them understand the purpose of each kind of map.

- Use the following recipe to create mapping dough. You may choose to mix one batch for each team of students, using the teams from activity three, or you may choose to mix two batches to have enough for two large maps created by new teams.

Mapping dough:

- 1 c. salt
 - 1 c. flour
 - 2/3 c. water
- Have students trace or draw an outline of the topographical region on paper, glue this paper to cardboard, and cover it with waxed paper. Then, students should use the mapping dough to create a molded topographical map of Nepal within Southeastern Asia. Allow the dough to dry for several days, then paint features, elevations, rivers, oceans, etc. with acrylic paint. Label the map with a permanent marker and create a key to explain elevations, etc.
 - Grade seven teachers:** Have students use a fine point permanent marker to trace a trading route from salt fields to the mountains of Nepal.

Assessment

Students should demonstrate understanding of the importance of the mineral salt for human health. They should be able to explain in writing the process by which salt is farmed, harvested, transported, and traded, and to identify geographical features of southeastern Asia. They should use their knowledge of the salt trade to complete one of the writing assignments in the lesson.

Additionally, seventh-grade students should demonstrate understanding of the experiment in activity two by formulating a hypothesis and explanation of the experiment, observations, and conclusions in the written report. Did students understand, successfully test, summarize, and draw conclusions about the relationships between variables in the experiment? Did students demonstrate their ability to analyze evidence by using the listed vocabulary words in their written reports? Did students practice safe procedures when boiling the water?

Critical vocabulary

- Crystal
- Dissolve
- Solvent
- Solution
- Solubility
- Surface
- Supersaturated
- Saturated

- Submerge
- Evaporate
- Accumulate
- Experiment
- Evaporation
- Temperature
- Mineral
- Nepal
- Landlocked
- Harvest
- Coastal

ADDITIONAL SEVENTH-GRADE VOCABULARY

- Hypothesis
- Prediction
- Variable
- Relationship
- Dependent
- Independent

Websites

- **Grade four teachers:**
 - “Salt: Up Close and Personal” lesson plan from Science NetLinks
- **Grade seven teachers:**
 - “Salt Mountain: How Plastic Bags and a Drop of Iodine Bred Success,” from the *Nepali Times*
 - “Investigating Central Asia Through Maps” lesson plan from *National Geographic*

• Common Core State Standards

◦ ENGLISH LANGUAGE ARTS (2010)

▪ Science & Technical Subjects

▪ Grades 6-8

- 6-8.LS.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

• North Carolina Essential Standards

◦ SCIENCE (2010)

▪ Grade 6

- 6.P.2 Understand the structure, classifications and physical properties of matter. 6.P.2.1 Recognize that all matter is made up of atoms and atoms of the same element are all alike, but are different from the atoms of other atoms. 6.P.2.2 Explain the effect...

◦ SOCIAL STUDIES (2010)

▪ Grade 7

- 7.G.1 Understand how geography, demographic trends, and environmental conditions shape modern societies and regions. 7.G.1.1 Explain how environmental conditions and human response to those conditions influence modern societies and regions (e.g. natural barriers,...)
- 7.G.2 Apply the tools of a geographer to understand modern societies and regions. 7.G.2.1 Construct maps, charts, and graphs to explain data about geographic phenomena (e.g. migration patterns and population and resource distribution patterns). 7.G.2.2 Use...

North Carolina curriculum alignment

INFORMATION SKILLS (2000)**Grade 4**

- **Goal 5:** The learner will COMMUNICATE reading, listening, and viewing experiences.
 - **Objective 5.01:** Respond to reading, listening, viewing experiences orally, artistically, dramatically, through various formats (e.g., print, multimedia).

SCIENCE (2005)**Grade 4**

- **Goal 2:** The learner will conduct investigations and use appropriate technology to build an understanding of the composition and uses of rocks and minerals.
 - **Objective 2.01:** Describe and evaluate the properties of several minerals.
 - **Objective 2.05:** Discuss and communicate the uses of rocks and minerals.

Grade 7

- **Goal 1:** The learner will design and conduct investigations to demonstrate an understanding of scientific inquiry.
 - **Objective 1.01:** Identify and create questions and hypotheses that can be answered through scientific investigations.
 - **Objective 1.03:** Apply safety procedures in the laboratory and in field studies.
 - Recognize potential hazards.
 - Safely manipulate materials and equipment.
 - Conduct appropriate procedures.
 - **Objective 1.04:** Analyze variables in scientific investigations:
 - Identify dependent and independent.
 - Use of a Control.
 - Manipulate.
 - Describe relationships between.
 - Define operationally.
 - **Objective 1.05:** Analyze evidence to:
 - Explain observations.
 - Make inferences and predictions.
 - Develop the relationship between evidence and explanation.

SOCIAL STUDIES (2003)**Grade 7**

- **Goal 1:** The learner will use the five themes of geography and geographic tools to answer geographic questions and analyze geographic concepts.
 - **Objective 1.01:** Create maps, charts, graphs, databases, and models as tools to illustrate information about different people, places and regions in Africa, Asia, and Australia.

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