Grades 3 & 4

# Mud Huts: How to Make Heat-Retaining Adobe Brick

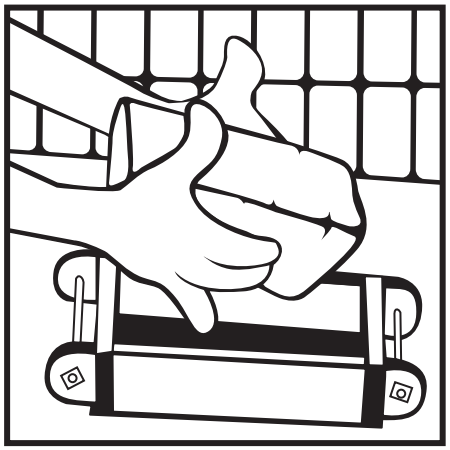
LESSON 9

(adapted from Science Fair Projects: The Environment, by Bob Bonnett and Dan Keene, Sterling Publishers, NY: 1995, pp 72-73)

## Objectives

**The students will:**

- Use the scientific method to test the heat retention of adobe brick.
- Discuss the benefits and drawbacks of traditional and environmentally friendly building materials.



## Materials

- Soil
- Water
- 1 bowl per group
- 1 large mixing spoon per group
- Straw, dry grass or pine needles
- 2 thermometers per group
- 1 one-pint milk carton per group
- Clock
- A sunny window
- Student Handout: "Making Adobe Brick"

## Procedure

1. **Ask students to imagine their dream houses.** Have they ever thought about what materials they would use if, like Zadou's family, they were building their own homes? Have students brainstorm important qualities in a building material. Some possible answers are strong, inexpensive, beautiful, warm/cool (depending on climate), easy to use for building, readily available/plentiful in the local area.
2. **Challenge them to think of what the benefits and drawbacks of different typical housing materials are** (eg. wood is easy to work with, beautiful, and plentiful in many places, but it may be expensive, doesn't hold heat well, and wood harvesting can cause deforestation, which can mean loss of habitat for animals, erosion, etc.)**.**
3. **Explain that adobe is a common building material in many parts of the world.** In the southwestern US, Mexico, and parts of Europe and Asia where there are not many trees, people often build houses out of mud bricks called adobe. These bricks are made by combining

## National Standards Addressed

**COMMON CORE LANGUAGE ARTS**

**Reading**

**RI.3.1** Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

**RI.3.2** Determine the main idea of a text; recount the key details and explain how they support the main idea.

**RI.3.4** Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3/4 topic or subject area.

**Speaking and Listening**

**SL.3.1** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3/4 topics and texts, building on others' ideas and expressing their own clearly.

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## Procedure (continued)

mud with straw or dry grass, and drying them in the sun. The Great Wall of China even has portions that are made of adobe! Ask students to brainstorm benefits and drawbacks of adobe.

4. **Tell students that they are going to construct their own adobe bricks.** They will test the ability of adobe to retain the heat of the sun. A building material which retains heat can keep a home warm in the winter and cool in the summer.
5. **Distribute the "Making Adobe Bricks" handout and read through it together.** Ask students to predict how long their bricks will hold an hour's worth of sunlight. They should write this hypothesis on their own handouts.
6. **Divide students into groups and distribute materials.** Allow students time to build their adobe bricks and set them in the window to dry for several days.
7. **Several days later, allow students time to measure the temperature inside and outside of their bricks over the course of an hour or two.**
8. **Ask students if their hypotheses were correct.** Then discuss (or give as a writing prompt):
    a. What are some of the advantages to using adobe bricks to build a house?
    b. What could be added to the mud mix to make stronger bricks?
    c. What would happen to your adobe brick if it froze and thawed a lot? What about if it got wet often? What does this tell you about where adobe bricks are most useful?
    d. Would you recommend adobe bricks to Zadou as a building material? Why or why not? If not, what would you recommend? Why?

## Links To Heifer International

**Choosing species of animals**
Just as communities must choose appropriate building materials for their region and climate, they must also select the appropriate Heifer animal gifts and training. Participants in Heifer projects carefully select the species and breeds of animals that are most suitable based on criteria that include region, climate, type and amount of space, cultural beliefs and existing knowledge of animal management practices. To learn about the many species of animals in Heifer's projects, take a look at the "Real Kids, Real Animals" student guide found in the Read to Feed materials at **www.heifer.org/rtfresources**

## Standards (continued)

**Speaking and Listening**

**SL.3.2** Determine the main ideas and supporting details of a text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.

**Writing**

**W.3.7** Conduct short research projects that build knowledge about a topic.

**W.3.8** Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories

**NEXT GENERATION SCIENCE STANDARDS**

***LS4.D Biodiversity and humans***

Populations of organisms live in a variety of habitats. Change in those habitats affects the organisms living there.

***ESS3.B Natural Hazards***

A variety of hazards result from natural processes; humans cannot eliminate hazards but can reduce their impacts.

***ETS1.C: Optimizing the Design Solution***

Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.

Name_____Date_____

## Making Adobe Bricks

**Testable Question:** How long will adobe bricks retain (hold) the sun's heat after absorbing it for an hour?

**Hypothesis:** _____

_____

_____

## Materials:

- Soil
- Water
- Bowl
- Mixing Spoon
- Straw, dry grass or pine needles
- 2 thermometers
- One-pint milk carton
- Clock
- A sunny window

## Steps:

1. Put the straw, soil, and water into a bowl and mix it well. The amounts are not exact, but the mixture should be stiff and thick.
2. Open the top of the empty one-pint milk carton. Pour the mud mixture from the bowl into the milk carton.
3. Make a hole in the mud by pushing a pencil halfway down in the middle of the opening. Loosen the mud around the pencil by moving the pencil in a small circle, and then leave it in the carton.
4. Place the milk carton in a sunny window and leave it there for several days to dry.
5. When the brick is firm and dry, take the pencil out of it and peel off the carton.
6. Leave your brick in a sunny window for one more hour. Then, put the brick on a table out of the sunlight.
7. Put a thermometer into the hole of the brick. This will measure the temperature inside the brick.
8. Lay another thermometer nearby on the table to measure the temperature of the air outside the brick. Record it on the data table, and calculate the difference in temperature between the inside of the brick and the temperature outside of it.
9. Wait ten minutes, and then read and record the temperatures showing on the thermometer inside and outside of the brick. Repeat every ten minutes until the temperatures are the same.
10. Answer the questions.

Name_____Date_____

## Data Table:

| Time | Temperature Inside Brick | Temperature Outside Brick | Temperature Difference |
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## Questions:

1. What happened to the temperature inside the brick as time went by?

2. Was your hypothesis correct, incorrect, or close? How close or far off was it?
   Did you expect it to take longer for the brick to reach room temperature, or less time than it did?

3. How could you change your brick to make it hold heat for longer than it did?

4. Based on your data, do you think adobe would be a good building material? Why or why not?