Living Archaeology Weekend: Lesson 3
Experimental Archaeology: Making Cordage

SUBJECTS: Science, social studies, mathematics
SKILLS: Knowledge, comprehension, application, analysis, synthesis, evaluation
STRATEGIES: reading, discussion, computation, brainstorming, experimentation, writing, invention
DURATION: one to two 45 minute class periods
CLASS SIZE: Any; work groups of 4 to 5
CURRICULUM CONNECTIONS:
Academic Expectations
1.2, 1.3, 2.1, 2.8, 2.10, 2.12, 2.16, 2.20
Program of Studies
MA-5-AT-U-1: Students will understand that patterns, relations and functions are tools that help explain or predict real-world phenomena.
MA-5-AT-S-VEO1: Students will explore unknowns and open sentences to express relationships.
MA-5-AT-S-VEO2: Students will represent real-world situations with mathematical sentences containing missing values.
MA-5-AT-S-VEO3: Students will use variables or missing values to model verbal descriptions of real-world situations.
MA-5-AT-S-EI1: Students will apply simple equations and simple inequalities to solve mathematical and/or real-world problems.
EL-5-DIU-S-5: Students will identify meanings of unfamiliar words and specialized vocabulary (words/terms needed to understand content)
EL-5-DIU-S-9: Students will demonstrate understanding of informational passages/texts.
SS-5-CS-U-1: Students will understand that culture is a system of beliefs, knowledge, institutions, customs/traditions, languages and skills shared by a group of people.
SS-5-CS-S-1: Students will demonstrate an understanding of culture and cultural elements (e.g., beliefs, traditions, languages, skills, literature, the arts) of diverse groups.
SS-5-HP-U-1: Students will understand that history is an account of human activities that is interpretive in nature. A variety of tools (e.g., primary and secondary sources) are needed to understand and analyze historical events.
EL-5-SLO-U-4: Students will understand that observation involves interpreting and constructing meaning. By viewing context, students infer, construct meaning, draw conclusions and form opinions about the world around them.
MATERIALS:
One spool of hemp rope (about ½ inch in diameter).
Milkweed or dogbane plant stalks (If you cannot obtain these native plant fibers, cotton string, raffia, woolen yarn, or other purchased string can be used; some craft stores sell a variety of suitable basketry fibers.)
Transparency of the "Experimental Archaeology" activity sheet and a copy for each student or team.

Objectives:

In their study of experimental archaeology, students will make cordage and use an activity sheet to:
1. Experience a technique and skill prehistoric peoples needed for everyday life.
2. Compute the amount of time and materials that might have been required to make cordage in prehistoric times.

Vocabulary:

cordage: several strands of fiber twisted together; string or rope.

experimental archaeology: scientific studies designed to discover processes that produced and/or modified artifacts and structures that are found in archaeological sites.

fiber: a slender threadlike strand or string. Bast fibers are the long fibers from a plant stalk.

replication: the act or process of reproducing artifacts, structures, and use patterns.

sinew: animal tendon prepared to use as cord or thread.

technology: the technique or means for making or doing something, often associated with tool making.

Background:

Archaeologists cannot ask prehistoric peoples how they made their tools; nor can they observe the manufacture and use of artifacts. Thus, they must find other ways to learn about past technological systems. Experimental replication of artifacts, structures, and wear patterns is one method. Experiments

provide possible interpretations and a basis for further study, but do not directly prove how artifacts were used or made.

Experimental archaeologists replicate artifacts using techniques that may have been used by ancient peoples. These studies help them to better understand the processes that produced the artifacts and structures found in archaeological sites. Replication studies include the reproduction of stone tools, basketry, ceramics, and cordage. By making these artifacts using prehistoric techniques, archaeologists can address numerous questions about how people lived in the past. Examples include: How long would it take to make a projectile point? Are some raw materials better for stone tool manufacture than others? What kind of clay is the best for ceramic vessels and where can it be found? How long would it take to make a small snare?

Experimental archaeologists also study how artifacts were used in the past. They do this by using them in ways that produce wear or damage patterns similar to those observed on artifacts. For example, archaeologists have used stone tools to butcher zoo elephants that have died in order to learn how Paleoindians may have butchered mammoths. They examine the wear patterns resulting on stone tools as well as the cut marks on the bones of the butchered animal. The results of their studies are used to make inferences about how prehistoric peoples may have performed similar tasks.

In this lesson, students will make cordage using native plant fibers. Cordage artifacts and textiles have been found in eastern Kentucky's dry rockshelters and in Mammoth and Salts caves (Funkhouser and Webb 1929; King 1974; Miller 1988). Cordage was made prehistorically from a variety of materials, including the bast fibers of milkweed and dogbane, and rattlesnake master. Human hair and animal sinew also were used. Finished cordage varied in size from 1 millimeter to several millimeters in diameter. Relative size may have been determined by the fibers selected and the intended purpose of the finished object. Experimental archaeologists produce cordage to learn how it was made, the characteristics of the finished pieces, and how much time was required to make these important artifacts.

Setting the Stage:

Distribute a piece of 2-ply twine about 12 inches long to each student. Ask them if they can determine how the twine was made.

The techniques that were used to make many prehistoric artifacts are unknown today. Thus, archaeologists are confronted with problems similar to what the students just experienced with the twine. To better understand how the artifacts were made and used, archaeologists must sometimes learn prehistoric manufacturing techniques, occasionally by trial and error. This is called experimental archaeology.

Share the **Background** information.

Procedure:

Briefly discuss the importance of natural resources to prehistoric peoples.

Demonstrate how to make cordage with the commercial hemp or raffia fibers (steps 1-4 below); then divide the class into groups of 4 to 5 students. Give each student about 15 inches of fibers. Assist each group, asking students who readily learned the procedure to help other students.

To prepare the fibers, cut the purchased rope into 15 inch sections. Untwist the rope and pull the fibers straight. If using raffia, separate out and use the longest and widest pieces. If using natural fibers, cut year-old dead stalks of milkweed or dogbane. Carefully break open the

stalks and strip the fiber away. Use these natural fibers in the same way as the purchased rope.

1. To make cordage, first rub the hemp or bast fibers between both palms to remove debris. Separate two long strands of several fibers each from the 15 inch rope/raffia or plant section, starting from one end.

2. If right-handed, hold one end of Strand A and one end of Strand B together, side-by-side, in your left hand between your forefinger and thumb (or *vice versa* if left-handed). Pick up Strand A between your right forefinger and thumb, and twirl the strand *away* from your body (clockwise), Step 1 on the figure.

3. Take the twisted Strand A and bring it toward your body, *over and then under* Strand B, Step 2 on the figure.

4. Hold strands A and B between your left forefinger and thumb about where you crossed A over B. Repeat the twirling and crossing sequence: pick up Strand B, twirl it away from your body, and cross it over and under Strand A.

Continue these steps. The twirling in one direction and crossing in another direction forms an interlocking pattern like that of machine-made rope. If the cordage looks all twisted in the same direction, then the locking twist is not taking place, and usually the strands are being twirled in the wrong direction.

Left-handed people will reverse the directions of twirling and crossing. They twirl the strands *toward* their bodies, and cross the strands *under then over.*

The process of making cordage is difficult to describe, and it sounds more complicated than it really is. Try it; it's surprisingly easy.

Distribute copies of the "Experimental Archaeology" activity sheet to each student or team. Project the "Experimental Archaeology" activity sheet. As a class, work through the first problem. Students complete the remaining problems working individually or in teams.

Closure:

Based on their experience with making cordage, have the students share their impressions of what daily life of prehistoric people might have been like. In what ways might it have been similar to their own daily lives? In what ways was it different?

Evaluation:

Evaluate students' efforts to make cordage.

Have students write a creative story or a report, make a chart, or construct a diorama about living in Kentucky's Eastern Mountains without modern technology. They need to include five things they would have to know how to do in order to live.

Evaluate the students' "Experimental Archaeology" activity sheets.

Extension:

Extension 1. Research how such major technological changes as the acquisition of the horse and the development of farming as a way of life changed prehistoric cultures. Discuss examples from modern life such as automobiles and computers.

Extension 2. Demonstrate and/or display cordage in an Archaeology or Culture Fair.

Extension 3. Invent a modern use for cordage made from native plant fibers.

References:

William D. Funkhouser and William S. Webb (1929). The So-called "Ash Caves" in Lee County, Kentucky. Reports in Archaeology and Anthropology, Vol. 1, Number 2 (particularly pages 48-49; 50 82-84; 86-101). University of Kentucky, Lexington, KY.

Mary Elizabeth King (1974). The Salts Cave Textiles: A Preliminary Account. In Archaeology of the Mammoth Cave Area, edited by Patty Jo Watson, pages 31-40. Academic Press, NY.

Joan Miller (1988). Experimental Replication of Early Woodland Vegetal Fiber Slippers. Southeastern Archaeology Volume 7, Number 2, pages 132-137.

This lesson was adapted with permission from *Lesson 16 - Experimental Archaeology: Making Cordage*, pages 81-86, in **Intrigue of the Past: A Teacher's Activity Guide for Fourth Through Seventh Grades**, by Shelley J. Smith, Jeanne M. Moe, Kelly A. Letts, and Danielle M. Patterson. U.S. Department of the Interior, Bureau of Land Management (1993).

Experimental Archaeology Activity Sheet Answers

To answer the questions, follow this general process:

Question 1.

for 10 meters of cordage:
a. Convert to centimeters
100 cm x 10 m = 1,000 cm
b. Set up the ratio
10/25 = X/1,000
c. Solve for X
25X = 10,000
10,000 ÷ 25 = 400 minutes
d. Convert to hours and minutes
400 ÷ 60 = 6.6 hours or 6 hours 40 minutes

for 100 meters of cordage
100 cm x 100 m = 10,000 cm
10/25 = X/10,000
25X = 100,000
100,000 ÷ 25 = 4,000 minutes
4,000 ÷ 60 = 66.6 hours or 66 hours 40 minutes

Question 2.
for 10 meters of cordage
100 cm x 10 m = 1,000 cm
7/25 = X/1,000
25X = 7,000
7,000 ÷ 25 = 280 mins.
280 ÷ 60 = 4.6 hours or 4 hours 40 minutes

for 100 meters of cordage
100 cm x 100 m = 10,000 cm
7/25 = x/10,000
25X = 70,000
70,000 ÷ 25 = 2,800 minutes
2,800 ÷ 60 = 46.6 hours or 46 hours 40 minutes

Question 3.
conversion is not necessary
1/2 = x/50
2x = 50
50 ÷ 2 = 25 stalks

Question 4.

100 cm x 2 m = 200 cm
10/25 = x/200
25x = 2,000
2,000 ÷ 25 = 80 minutes
80 ÷ 60 = 1.3 hours or 1 hour 20 minutes

Question 5.

First compute the number of square meters in the net.

100 cm x 42 m = 4,200 cm
4,200 x 120 = 504,000 sq. cm.
504,000 + 10,000 = 50.4 sq. m.

Measure the approximate length of cordage in each square meter of the net. Multiply that amount by 50.4, the number of square meters in the net. If there are 3 meters of cordage in each square meter, then there are 3x 50.4 = 151.2 meters of cordage in the entire net. Figuring 10 minutes per 25 centimeters of cordage, compute the amount of time required.

100 cm x 151.2 m = 15,120 cm
10/25 = X/15,120
25X = 151,200
151,200 ÷ 25 = 6,048 minutes
6,048 ÷ 60 = 100.8 hours

Experimental Archaeology **Name:** _____

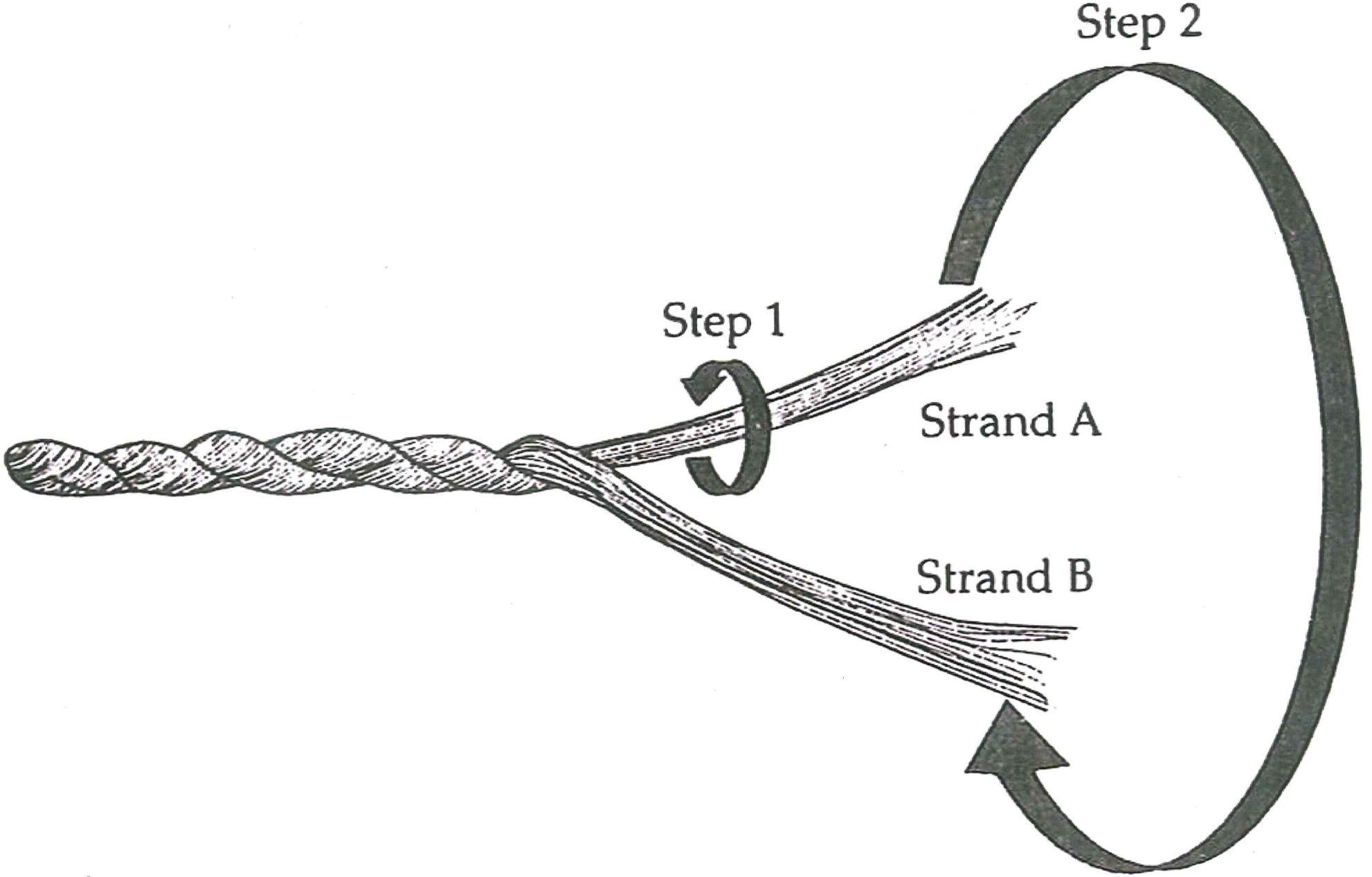
1. If it takes 10 minutes to make 25 centimeters of cordage, how long would it take to make 10 meters of cordage? 100 meters?

2. If you increased your speed from 10 minutes per 25 centimeters to 7 minutes per 25 centimeters, how long would it take to make 10 meters of cordage? 100 meters?

3. If it takes one milkweed stalk to make 2 meters of cordage, how many stalks would it take to make 50 meters?

4. It takes approximately 2 meters of cordage to make a snare to catch a small animal. How long would it take to make the cordage for the snare if you can make 25 centimeters in 10 minutes?

5. A cordage net measuring 42 meters by 120 centimeters was found at an archaeological site. How long do you think it took to make the net? How would you find out? (Outline the process).


Step 2
Step 1
Strand A
Strand B