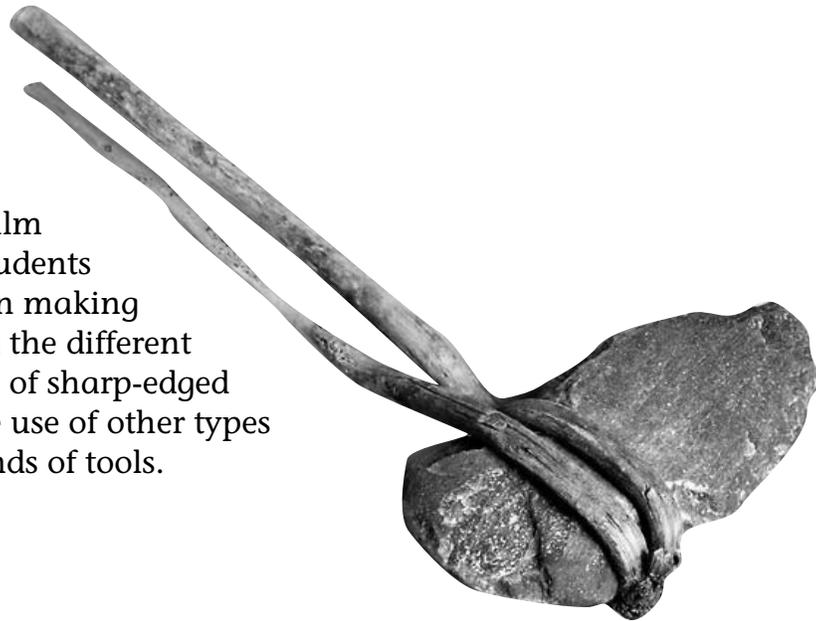




Lesson Plan Six: Making Stone Into Tools

Through observation of replica points and photos of the production process, and/or watching a film on flintknapping, students will learn the steps in making projectile points and the different uses of various types of sharp-edged lithics, as well as the use of other types of stone for other kinds of tools.



Location: classroom, and/or a museum if possible

Suggested group size: individual, small groups, and whole classroom

Subject(s): archeology, anthropology, geology, history

Concepts covered: steps and methods for lithic production, uses of lithics, antiquity of use of stone tools

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Student outcomes: At the end of this activity, students will know the tools, materials, and steps required for making flaked stone tools, and will know that different types of stone were suitable for different kinds of tools. They will understand that lithics varied by use, origin of the stone, group of people who made them, and the time and place in which they were made.



EDUCATIONAL STANDARDS

New Mexico State Standards

Language Arts

K-4 Benchmark I-D: Acquire reading strategies

Grade 4

5. Increase vocabulary through reading, listening, and interacting

K-4 Benchmark III-A: Use language, literature, and media to gain and demonstrate awareness of cultures around the world

Social Studies

Strand: History

K-4 Benchmark I-C: World: Students will identify and describe similar historical characteristics of the United States and its neighboring countries.

Grade 4

1. Explain how historical events, people, and culture influence the present-day Canada, Mexico, and the United States (e.g., food, art, shelter, language).

K-4 Benchmark I-D: Understand time passage and chronology.

Grade 4

1. Describe and explain how historians and archeologists provide information about people in different time periods.

K-4 Benchmark III-C: Be familiar with aspects of human behavior and man-made and natural environments in order to recognize their impact on the past and present

Grade 4

2. Describe how environments, both natural and man-made, have influenced people and events over time, and describe how places change.

NATIONAL STANDARDS

History

Topic 1 Living and Working Together in Families and Communities, now and long ago



Standard 2 Grades K-4: The history of students' own local community and how communities in North America varied long ago

2A: The student understands the history of his or her local community

Grade K-4: Describe local community life long ago, including jobs, schooling, transportation, communication, religious observances, and recreation (obtain historical data)

Standard 2B Grades K-4: The student understands how communities in North America varied long ago

Grade K-4: Compare and contrast the different ways in which early Hawaiian and Native American peoples such as the Iroquois, the Sioux, the Hopi, the Nez Perce, the Inuit, and the Cherokee adapted to their various environments and created their patterns of community life long ago. (Compare and contrast differing sets of ideas)

Topic 2: The History of Students' Own State or Region

Standard 3 K-4: The people, events, problems, and ideas that created the history of their state

3A: The student understands the history of indigenous peoples who first lived in his or her state or region

Grade K-4: Draw upon data in paintings and artifacts to hypothesize about the culture of the early Hawaiians or Native Americans who are known to have lived in the state or region, e.g., the Anasazi of the Southwest, the Makah of the Northwest coast, the Eskimos/Inupiat of Alaska, the Creeks of the Southeast, the Mississippians (Cahokia) or the Mound Builders

Social Studies

I. Culture

Middle Grades

b. identify and use key concepts such as chronology, causality, change, conflict, and complexity to explain, analyze, and show connections among patterns of historical change and continuity

**English Language Arts**

7. 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 nonprint texts, artifacts, and people) to communicate their discoveries in ways that suit their purpose and audience.

MATERIALS

Lithics kit from Bandelier: antler tools, replica point, raw materials, series of photos on pressure flaking, photos printed from Bandelier website

Optional: video on flintknapping (for loan from Bandelier, 505-672-3861 x 517)

BACKGROUND

Until the Spanish arrived in the New Mexico area, the Ancestral Pueblo people had no metal, but were skilled at using many other materials to make tools. Stone was often used for things that needed to be long-wearing or very sharp. Durable tools such as axes, hammers, and manos and metates were generally made of hard stones, by grinding them into the necessary shape. Tools for piercing or cutting, such as projectile points or knives, were usually chipped from stone such as chert or obsidian that form very sharp edges when they fracture.

The people who lived in the Bandelier area were ideally situated for making stone tools. Within a few miles southwest along the Rio Grande there were locations to find fine-grained basalt suitable for making some kinds of points. Only a little farther away, but to the northwest, on Obsidian Ridge and in the Valles Caldera, were sources for very fine-quality obsidian. The people sought obsidian not only for making tools for their own use but also as a valued trade item. Near Abiquiu, there are places on Pedernal Peak from which chert, a stone much like flint, has been dug for centuries. Chert was also available as cobbles that had washed down the Rio Grande and could be collected much closer to home. Granite from the Sangre de Cristo Mountains was also available in the form of cobbles, which were useful for such things as hammers and mauls. And just downstream from the village of Tyuonyi in Frijoles Canyon is a source for the kind of basalt that is ideal for hard-used tools such as corn-grinding stones..

Obsidian is very much like glass, except it comes from a volcano instead of a factory. It is composed almost entirely of silica and is often translucent. It chips just like glass does, in rounded patterns called conchoidal fractures (named because they resemble seashells). And, perhaps most importantly, just like glass it can break with an extremely sharp edge, very useful for cutting and slicing (but not for chopping). In fact, current doctors sometimes use scalpels made of glass or obsidian for doing surgery on very sensitive organs, such as eyes and hearts, because such a scalpel is sharper than one made of steel. It will make a cut that



heals better and more quickly. That's why this lesson doesn't include actually making or using tools of glass or obsidian, because it is so easy to get badly cut.

Basalt is also volcanic, but with a different composition than obsidian, being low in silica. It is the hard, dark-colored rock that most people think of when they think of lava. Sometimes it is full of tiny bubble holes, called vesicles. It is harder to work with than obsidian, since it doesn't break so readily. That is also one of its big advantages, since it can be used to make tools that are used for such tasks as hammering and grinding.

All around Bandelier, in the area known as the Pajarito Plateau, the high pinkish-orange cliffs are composed of tuff. It is volcanic ash which poured out of the Valles Caldera as flows hundreds of feet thick. They gradually cooled into rock, called tuff, which is usually quite soft and crumbly. Later, rain and snow ran down the mountainsides, carving into the thick tuff layers and forming the sheer-walled canyons so characteristic of the Pajarito Plateau. Tuff was not useful for tools, but the people shaped loose stones into building blocks. They also carved small caves, known as cavates, into the cliffs for use as back rooms of houses (see the lesson plan "Be An Ancestral Pueblo Architect").

Minerals were commonly used for two other purposes by the Ancestral Pueblo people. Various kinds of pottery clay were found in different locations; some sources are still in use by present-day Pueblo people. A variety of different minerals, including ochre, were used for colors for dyes, designs on pottery, and body painting for dances; they came from many different places, and some came by trade.

Surprisingly, stones were also used in farming. On many mesa tops there were areas that were naturally covered with a "blanket" of small pieces of tuff. These areas were particularly good for farming, because the tuff retained moisture from rain and snow. In other areas the people would gather small stones (gravel to egg-sized) and use them to cover the areas in their gardens where the plants were growing. The stones helped prevent the growth of weeds, limited evaporation of moisture from the soil, helped warm the soil in early spring, and sometimes even condensed water out of the air, which would then run down the rock surface and go into the soil around the plants.

For generations, people all over America have enjoyed hunting for arrowheads and other ancient stone tools in places where Native American groups had lived. Visitors are often surprised to hear that it is against the rules to collect them (or anything else, other than memories) in the park. Stone tools can be very valuable to archeologists trying to learn more about the early inhabitants of the area, but only if they are left where they are. Since the tools are made from materials that come from many places, and different versions of tools were made during



different time periods, these artifacts can provide good information when found in their original places. For scientists studying the very earliest (10,000+ years ago) people of the area, lithics are the only evidence of their presence, since all non-stone traces, such as shelters and clothing, have long since vanished.

VOCABULARY

Atlatl: a throwing stick used to propel a spear farther and with more force than just throwing with one's arm

Baton: flaking tool made from the thick base of an antler

Basalt: a hard, dense, durable volcanic rock often used for tools such as hammers, axes, and grinding stones.

Cavate: small room carved into the cliff, often used as the back room of a talus house

Chert: stone similar to flint, used for making sharp-edged tools

Cobble: a stone that has washed down a river or stream; often they have become rounded along the way

Conchoidal: seashell-shaped fracture pattern found in obsidian and glass

Core: chunk of stone from which flakes are removed for making points, etc

Flake: thin piece of stone chipped from a core to be used to make points, etc

Granite: a hard, dense rock formed inside of mountains; in New Mexico, it is common in the Sangre de Cristo Mountains

Lithics: tools or other items made from stone, and the leftover scrap chips

Maul: a stone tool used much like a sledge hammer

Obsidian: volcanic glass; can be worked to have extremely sharp edges

Ochre: pigment found in various tones from yellow through red; color comes from iron oxide

Pajarito: Spanish for "little bird". Pajarito Plateau is the name for the area around Bandelier



Percussion: method of making sharp edges on lithics by striking one stone with another

Pressure-flaking: method of making sharp edges on lithics using pressure from tools made from antlers

Projectile point: stone shaped to have a pointed tip and sharp edges, to be the head of an arrow or spear

Tine: one of the points on an antler; can be used for pressure flaking

Tuff: compacted volcanic ash stone, which is soft and crumbly

Turquoise: a soft stone, found in varying shades of blue to green, popular for making jewelry throughout the Southwest past and present. There is a source south of Santa Fe near Cerrillos, which has been mined for hundreds or thousands of years.

PRE AND POST-EVALUATION

Pre-Evaluation:

Either as a class brain-storming session or as small groups or individuals, ask the students to make a list of all the things the Ancestral Pueblo people did that required the use of rocks/stones/minerals. Be sure to consider building as well as making tools, and there were other uses too. Remember that, until the Spanish came to the area, the people had no metal for toolmaking, and plastic wouldn't be around until centuries later.

Post-Evaluation:

Have the class re-visit their list, and see if they have different answers. As individuals, have them make drawings of themselves as Ancestral Pueblo people (or the local group in your area) at their home, showing as many uses of stones as they were likely to have had. You could have a contest to see who comes up with the most (but they all have to make sense)

PROCEDURES: ACTIVITIES TO CHOOSE FROM

1. In small groups or as individuals, have the students compare and contrast the replica point with the samples of raw obsidian. What are some differences that show that one has been worked and the other is still just a rock? (points, knives, scrapers, etc., are chipped to make a sharp edge, while unworked pieces will have chips in miscellaneous places; points will be chipped to be thin and of consistent thickness, while unworked pieces tend to be thick and/or bumpy in such a way that they wouldn't function very well as a tool; worked pieces





tend to show an overall shape that suggests their intended use, while unworked pieces are often no particular shape)

2. Ask the class as a whole or as small groups to list all the qualities you would want in a good arrowhead or knife if you were an Ancestral Pueblo hunter or cook. Be sure that they include: it will hold an edge when being used; it can be re-sharpened; it will cut things easily; if your aim is good, an arrowhead will kill your prey cleanly instead of just injuring it; with practice you can readily make more.
3. Have the class watch all or part of the video on flintknapping (available for loan from Bandelier, 505-672-3861 x 517). Ask each student to write down two things that were new to them and two things that surprised them, and have some students share their lists with the class.
4. Using the timeline (see lesson plan “Making and Using Timelines”), book *Exploring Bandelier*, and the newspaper, “Pueblo People Past and Present” included in this curriculum guide, have the students, as individuals or in small groups, do research into the history and use of stone tools in North America, with each attempting to find a tool from each of two different time periods. Ask them to make a large drawing of each tool and label it with what it is called, and other information they may find including what it was used for, what it was made of, what group of people used it, and when it was used. Have each group present their tools and information to the class, and post all the drawings on a wall or board in chronological order. Discuss: did different people at different times use similar tools? Were some tools used over a very long period of time by many different groups of people? If you were an archeologist and you found a particular tool in an archeological site, would it help you learn something about the people who lived there? If someone walking by had picked it up and taken it home, would part of the story of that place be gone?
5. If any of the students are gardeners, or help someone with a garden, ask them if they know of any present-day gardening methods that are similar to the use of rocks in gardens, or planting in an area covered with an absorbent layer of tuff. (possibilities: use of mulch or sheets of plastic to cut back on weeds; use of soil amendments that help the soil hold water more effectively)
6. Have the class as a whole or in small groups make a list of all the things they can think of that the Ancestral Pueblo people around Bandelier used that were made, entirely or in part, of stone. On a chart, divide them up into ones that should be made of:



basalt: corn-grinding
tuff: soft and easy to shape
clay: pottery, slip for pottery designs
granite river rocks: hard and rounded
obsidian: brittle and sharp
turquoise: soft, rare, and colorful

Hints:

Basalt: vorn-grinding stones, axes, hammers, chisels
Obsidian: arrow and spear points, knives, scrapers
Tuff: bricks for building houses
Turquoise: jewelry (earrings, pendants, beads)
Clay: pottery, slip for decorating pottery, paint for ceremonial dances.
Granite river rocks: hammers, mauls, pottery-polishing stones

- 7A. As a class discussion, ask the students what they could learn if they were archeologists studying a particular location in Bandelier, and found a tool that they knew was a kind made 800 years ago, used for skinning deer, and made from obsidian that came from the Jemez Mountains. Then ask them what they could learn if they were visiting a friend who showed them a tool made 800 years ago, used for skinning deer, and made from obsidian that came from the Jemez Mountains, and it was sitting on the desk in his room. (In the first case, the archeologist would probably conclude that someone had lived in that location 800 years ago who hunted deer and either went up to the Jemez Mountains to get obsidian to made tools, or traded with someone who did. This would suggest trade or travel routes from Bandelier into the mountains, which in turn would suggest that the people had a wide knowledge of their landscape and/or other groups to trade with. It would also suggest the good possibility that the people who lived in the area at that time had weapons good enough to kill a deer, and the likelihood that they used the deer's skin as well as the meat. In the second case, all you could learn was that, because the tool had been removed from its original location, a wonderful opportunity to learn about the early people had been lost forever.)
- 7B. As a class discussion (or a writing assignment) ask the students if they would be more proud to have a collection of arrowheads they had found or a collection of arrowheads they had made, and why. (Arrowheads they had found would have had to be removed from their provenience, their location in relation to other parts of the story of the people who made them. This would not only make it impossible to fully understand the lives of those people, it would also be disrespectful to their present-day descendants. Arrowheads they had made would truly be something to be proud of, since they would reflect patience, perseverance, and the willingness to work hard and practice to learn an age-old skill. Of course it would be important to





make it clear to anyone who saw them that they were not old ones. Many people who make arrowheads and other chipped items today make them out of colored glass so they are not only beautiful, but also obviously not old.)

EXTENSION IDEAS

1. Take a field trip to a site or museum that features Ancestral Pueblo lithics (or the lithics local to your area, if not Pueblo). Use their written or posted material, or arrange for a guide if possible, to identify the dates, uses, and materials of lithics on display. Consider using this trip to also do the activities in the “What Can Pot Sherds Tell Us About The Past” lesson.

Please also see lesson plan “Field Trip Planning and Activities”, in Unit 3, for information and ideas on planning a terrific field trip.

RESOURCES

Books:

Panchyk, Richard, *Archeology for Kids, Uncovering the Mysteries of Our Past*, Chicago Review Press, 2001 (ISBN 1-55652-395-5)
(available for loan from Bandelier, 505-672-3861 x 517)

U.S. Department of the Interior, *Intrigue of the Past, Discovering Archeology in New Mexico, manual of Project Archeology*. For information on workshops, contact the Heritage Education Team, Bureau of Land Management, Anasazi Heritage Center, PO Box 758, Dolores, Colorado, 81323, (303) 882-4811

Video:

“*Flintknapping, with Bruce Bradley Ph.D.*,” an expert tool-maker takes viewers through all the steps in making a whole series of tools from obsidian.
(Available for loan from Bandelier, 505-672-3861 x 517)

Web Information:

Bandelier website: www.nps.gov/band

Bandelier museum collection website:
w.c.nps.gov/museum/exhibits/band
or go to the Bandelier website
(www.nps.gov/band) and click on the collections icon.

