



FLORIDA PUBLIC
ARCHAEOLOGY
NETWORK

Archaeology – Beyond Excavation

Students learn how the genographic project, bioarchaeology, and experimental archaeology teach us about early native peoples.



STUDENT LEARNING GOAL:

Students will identify how the genographic project, bioarchaeology, and experimental archaeology teach us about early native people. Students will be able to assess use-wear in tools, analyze debitage, and test the efficiency of dugout canoe shapes.

SUNSHINE STATE STANDARDS ASSESSED:

Science

- SC.7.L.15.2 Explore the scientific theory of evolution by recognizing and explaining ways in which genetic variation and environmental factors contribute to evolution by natural selection and diversity of organisms.
- SC.7.L.16.1 Understand and explain that every organism requires a set of instructions that specifies its traits, that this hereditary information (DNA) contains genes located in the chromosomes of each cell, and that heredity is the passage of these instructions from one generation to another.
- SC.7.N.1.5 Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics.
- SC.7.N.3.2 Identify the benefits and limitations of the use of scientific models.
- SC.8.E.5.10 Assess how technology is essential to science for such purposes as access to outer space and other remote locations, sample collection, measurement, data collection and storage, computation, and communication of information.
- SC.8.N.1.5 Analyze the methods used to develop a scientific explanation as seen in different fields of science.
- SC.8.N.1.6 Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.
- SC.8.N.4.2 Explain how political, social, and economic concerns can affect science, and vice versa.

Social Studies

- SS.7.G.1.3 Interpret maps to identify geopolitical divisions and boundaries of places in North America.
- SS.7.G.3.1 Use maps to describe the location, abundance, and variety of natural resources in North America.
- SS.8.A.1.2 Analyze charts, graphs, maps, photographs and timelines; analyze political cartoons; determine cause and effect.

Language Arts

- LA.7.1.6.2 The student will listen to, read, and discuss familiar and conceptually challenging text.



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- LA.7.4.2.2 The student will record information (e.g., observations, notes, lists, charts, legends) related to a topic, including visual aids to organize and record information, as appropriate, and attribute sources of information.
- LA.8.1.6.2 The student will listen to, read, and discuss familiar and conceptually challenging text.
- LA.8.4.2.2 The student will record information (e.g., observations, notes, lists, charts, legends) related to a topic, including visual aids to organize and record information, as appropriate, and attribute sources of information.

Health

- HE.7.C.1.3 Analyze how environmental factors affect personal health.
- HE.8.C.1.3 Predict how environmental factors affect personal health.

RESOURCES:

- “2005 Pennsylvania Dugout Canoe Project,” 21 February 2012. <
<http://www.paarchaeology.state.pa.us/documents/Dugout.pdf>>
- “A Remarkable Epilogue.” History and Archaeology of Mission San Luis. 17 February 2012.
<<http://www.missionsanluis.org/research/archaeology5.cfm>>
- “A Science Primer – What is a Genome?” 20 February 2012.
<http://www.ncbi.nlm.nih.gov/About/primer/genetics_genome.html>
- “About Genetic Genealogy.” 20 February 2012. <<http://www.thegeneticgenealogist.com/>>
- “Corn Flour May Improve Iron Absorption.” 17 February 2012.
<http://findarticles.com/p/articles/mi_go2638/is_1_11/ai_n28767500/>
- Deitler, John E. Craft Specialization and the Emergence of Political Complexity in Southwest Florida. University of California. PhD Dissertation Anthropology. Michigan. Proquest LLC: 2008.
- “Dugout Canoes – Discovering 101 Canoes at Newnans Lake, FL” 21 February 2012 <<http://www.youtube.com/watch?v=9UNrck45OtE>>
- “Family Tree DNA.” 21 February 2012. <http://www.familytreedna.com/>
- “Human mtDNA Migrations.” 21 February 2012
<<http://www.mitomap.org/pub/MITOMAP/MitomapFigures/WorldMigrations.pdf>>
- “Native Americans Descended from a Single Ancestral Group, DNA Confirms.” 20 February 2012. <<http://www.sciencedaily.com/releases/2009/04/090428223836.htm>>
- “New Rice Line Could Benefit Malnourished Populations.” 17 February 2012.
<<http://www.greenenvironmentnews.com/Environment/Agriculture/New+Rice+Line+Could+Benefit+Malnourished+Populations>>
- “Notre Dame Archives.” 17 February 2012. < <http://www.archives.nd.edu/cgi-bin/display.pl?ANO011.HTM+95> >
- “Overview of Stable Isotope Research.” 16 February 2012. <<http://sisbl.uga.edu/stable.html>>
- Peters, Eric David. “Determining Form and Function: An Analysis of Use-Related Wear on *Strombus gigas* Shell Tools,” Lambda Alpha Journal, Vol. 31. 2001.
- Primitive Technology II – Ancestral Skills. 2001. The Society of Primitive Technology. Gibbs Smith Publishing. Utah.



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Staller, J., Tykot, R., and Benz, B. Histories of Maize: Multidisciplinary Approaches to Prehistory, Linguistics, Biogeography, Domestication, and Evolution of Maize. Left Coast Press, Inc. Walnut Creek, CA. 2009

“The DNA Learning Center.” 21 February 2012 <<http://www.dnalc.org/websites/>>

“The Genographic Project” 21 February 2012.

<<https://genographic.nationalgeographic.com/genographic/lan/en/index.html>>

“The Talimali Band of Apalachee.” 17 February 2012.

<<http://winhttp.nsula.edu/regionalfolklife/apalachee/Rapides.html>>

Tykot, Robert. “Isotope Analyses and the Histories of Maize” Chapter 10. Department of Anthropology, University of South Florida, Tampa, Florida.

<<http://luna.cas.usf.edu/~rtykot/10%20Tykot.pdf>>

PICTURE SOURCES (Image URLs and Permissions):

Crystal River Canoe Replicas

http://epicroadtours.us/2006/winter/crystal_river_archaeological_state_park/photo004.jpg

De Bry Engraving of Canoe Making, copyright British Museum

http://www.virtualjamestown.org/images/white_debry/debry_128_big.jpg

Gilmer Bennet, Chief of the Apalachee

<http://upload.wikimedia.org/wikipedia/commons/thumb/7/76/Chief-59.jpg/220px-Chief-59.jpg>

Haplogroup Map

http://upload.wikimedia.org/wikipedia/commons/thumb/d/dd/Migration_map4.png/300px-Migration_map4.png

Phytate Chemical Structure

http://upload.wikimedia.org/wikipedia/commons/thumb/4/45/Phytic_acid.svg/200px-Phytic_acid.svg.png

SNP Double Helix <http://upload.wikimedia.org/wikipedia/commons/thumb/2/2e/Dna-SNP.svg/220px-Dna-SNP.svg.png>

Weedon Island Canoe

<http://www.flpublicarchaeology.org/blog/wcrc/files/2011/03/St.-Petersburg-20110301-00041-e1299524649536-225x300.jpg>

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MATERIALS LIST for “Take a Look at a Haplogroup Map” ACTIVITY:

Perhaps an atlas if students need to look up the names of location on the map.

ANSWER KEY FOR “Take a Look at a Haplogroup Map” ACTIVITY:

1. A: Alaska, Eastern South America, Berengia.
2. U: Northern and Western Europe
3. C: Berengia, Eastern North America, Eastern South America
4. N: Middle East, Australia
5. L: Northwest Africa, northeast Africa, southern Africa

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6. Most similar = Melissa (M). Most different is David (D).

MATERIALS LIST for “Identifying Florida Canoe Types” ACTIVITY:

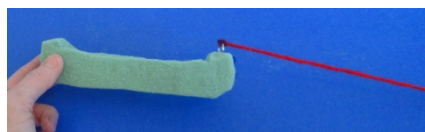
No additional Materials Needed

ANSWER KEY FOR “Identifying Florida Canoe Types” ACTIVITY:

- A. Type 3 because it was found in a coastal salt marsh near Tampa Bay. Also, it was dated later than 500 BCE, so even though I couldn’t see the ends, I knew it wasn’t a Type 1.
- B. Type 2 because the ends are angled up and the prow is not long.
- C. It could be Type 3 because of the long prow. But it was found at an inland site, so it’s more likely that it would be a Type 2.
- D. Type 2 because it has angled ends, with no long prow, plus it was found in Putnam County which is inland.
- E. Type 1 because the ends are not angled. It is also almost 2,500 years old, the division between archaic and more modern canoes.

MATERIALS LIST for “Testing Canoe Styles” ACTIVITY:

(Per Class) 3 four-foot sections of vinyl gutter with end caps (\$33 – best choice) OR 3 large tote bins. 1 spool of fishing line. 2-6 tiny eye screws. 1 spring scale (\$5). 2 fishing weights. An outdoor space with access to hose and running water. 2 stopwatches. Use chunks of Styrofoam to carve the three canoes. Refer to the Tool Technology teacher section for instructions on carving foam.



Canoe with ring and string (you’ll use fishing line). Still water and archaic canoe carved replicas.



ANSWER KEY FOR “Testing Canoe Styles” ACTIVITIES:

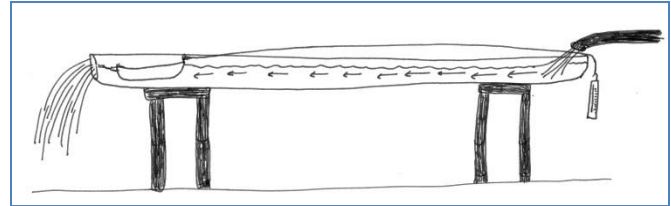
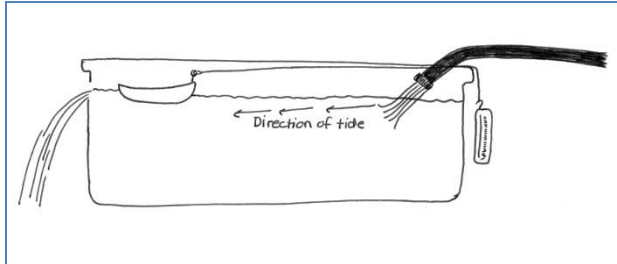
Teacher Tips: If using the gutter: Do not put an end cap on the gutter during the tidal test. This will allow hose water to flow out of the opposite end. For the still water and rough water tests, you will need to put the end cap on the gutter to keep the water in the chute. Use chairs to support the gutter/chute above the ground. This will allow the spring scale and fishing weights, which are suspended on fishing line, to use gravity to pull towards the ground. (See sketch.)



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*Tidal flow test with tub (left) and gutter (right).
The arrows show the direction of the tidal flow.*

If you are using the tub, you will need to cut a hole at the top of one end for use in the tidal experiment. This will allow the hose water to flow out of the back without floating the canoe right out of the tub. Student data will vary. Generally, the Type 1 canoe should perform the worst because it is the least hydrodynamic. Type 2 should do best on still water, Type 3 on rough water, and either Type 2 or 3 in the tidal situation.

MATERIALS LIST for “Use-Wear Studies on Wooden Tools” EXPERIMENT:

(Per student) Magnifying glass (Per Class) Digital camera. 3-4 sturdy whelk or clam shells. Dried corn. Sturdy tape or twine (not glue) to bind the shells onto handles. Dowels 1” in diameter and 2’ long, cut on a slant on one end. You will need at least 6 dowels, but 12 is preferable (so that many students can use the tools simultaneously). Discreetly label 1/3 of the dowels with a code that signifies digging, 1/3 as pounding, and 1/3 as handles. Photograph one dowel as a “before.” Bind shells onto 1/3 of the dowels to create hoes. It will take some trial and error to figure out exactly how to bind the shell so it won’t move. It’s okay to use duct tape.

ANSWER KEY FOR “Use-Wear Studies on Wooden Tools” EXPERIMENT:

Please remind the students that wooden artifacts normally do not survive in the archaeological record because they decompose. The wooden tools that do survive in wet sites can be assessed for wear, but many of the surface changes may have disappeared or been altered as the wood sat underwater for so many years. Wear studies are generally performed on sturdier materials, including shell, stone, coral, and pottery.

Answers will vary. Sample below.

- 1a. Digging tools have little splinters of wood chipping off, and the edge is blunted. The wear is all on the pointy end of the tool.
- 1b. Pounding tools have very blunted edges with bits of wood pressed outward at the edges. Some of the wear is on the angled end, but most is on the flat end.
- 1c. Handles show no wear on the ends, but there are some shallow gashes where the shell pressed into the handle.
- 2a. Digging tools under magnification showed more and tinier splinters plus there was lots of dirt ground into the gashes.
- 2b. Pounding tools under magnification showed lots of tiny dents on the flat end as well as plenty of corn powder ground into the nicks.
- 2c. Hafted tools will show more and tinier scratches and gashes. Adhesive residue from binding tape is still on the tool.

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- 3a. This tool has lots of wear on the pointy end, along with ground in dirt. It looks like it was used as a digging tool.
- 3b. This tool was very smashed on the flat end, with corn powder mashed into the grooves. That makes it a pounding tool.
- 3c. This tool has creases and grooves from a shell tool pressing against it. This means the tool was a handle for another tool.
4. Wear patterns on wood discovered at wet archaeological sites fall into three main groupings, with some intermediary pieces. Tools that had splinters stripped from the pointed end were generally used for digging. Tools that were smashed mostly on the flat end were probably used for pounding. And wooden tools that had grooves somewhere in the middle were probably used as handles for shell tools.

MATERIALS LIST for “Examining Debitage” ACTIVITY:

(Per team of 2 students) 2 small samples (10 flakes) of soap debitage from two sources. Source 1: curated debitage previously created by students carving with wooden tools in the Tool Technology unit. Source 2: new debitage created by a teacher carving (whittling) soap using a metal knife. You may need to carve up more than one bar of soap – or at least – an entire bar in order to provide enough debitage for everyone.

ANSWER KEY FOR “Examining Debitage” ACTIVITY:

Data will vary. In general, the debitage created with wooden tools will be smaller and less well-formed, more powder-like. The debitage created with metal tools will be thicker at the middle, but very narrow at one end. It may also have more variety in flake size.

AUTHOR: Kelley Weitzel MacCabe, <http://www.KelleyWeitzel.com>

STUDENT ARTICLES, EXPERIMENTS, & ACTIVITIES:

- 1) Studying Ancient Populations through Modern Genetics
- 2) Genetics and the Story of Human Migration
- 3) A Look at STRs (Repeats)
- 4) A Look at SNPs (Single Changes)
- 5) How Can Mutations Track Human Migration?
- 6) What is a Haplogroup?
- 7) ACTIVITY: Take a Look at a Haplogroup Map
- 8) Studying Ancient Populations through Isotopes, Cavities, and Skeletal Stress
- 9) What is Bioarchaeology?
- 10) Studying Ancient Peoples through Trial and Error
- 11) What is Experimental Archaeology?
- 12) ACTIVITY: Identifying Florida Canoe Types
- 13) Experimental Archaeology – Canoes

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- 14) ACTIVITY: Testing Canoe Styles
- 15) Canoe Manufacturing Centers
- 16) The Detailed Side of Experimental Archaeology
- 17) EXPERIMENT: Wear Studies on Wooden Tools
- 18) ACTIVITY: Examination of Debitage

KEY TERMS:

abrade, adenosine, allele, analysis, anemia, angle, autosomal chromosome, Bering Land Bridge, bioarchaeology, bone marrow, buoyancy, celt, chromosome, cross-section, curate, cytosine, debitage, deficiency, degradation, DNA, dowel, exodus, experimental archaeology, eye orbit, First Amendment, femur, genealogy, generation, genes, genetically modified crops, genetic variation, genetics, geology, girdle, guanine, haplogroup, haplotype, hydrodynamic, hydrology, impact damage, in situ, iron, junk DNA, labor draft, long bones, maritime, mitochondria, mitochondrial DNA (mtDNA), mutation, Newtons, nucleotide, nucleus, osteoarthritis, paper trail, parallel, peat, perpendicular, pestle, pillage, primitive technologist, protein, red blood cell, SNP (single nucleotide polymorphism), STR (standard tandem repeat), striation, tyrosine, unaffiliated, use-wear analysis, Y-chromosome

Good websites for archaeological terms

<http://archaeology4kids.tripod.com/id38.html>

http://mdah.state.ms.us/hpres/arch_vocab.php

<http://www.archaeologywordsmith.com/lookup.php?category=&where=headword&terms=primary+burial>

Good website for genetics terminology

http://www.clanlindsay.com/genetic_dna_glossary.htm

ASSESSMENT OPTIONS:

Writing Prompt #1: Genetic genealogy looks at a person’s DNA to make educated guesses about his or her ancestry. Think about the ethics of this kind of “genetic profiling,” and how it might be used positively and negatively. Write to explain why you feel that genetic genealogy should or should not be encouraged.

Writing Prompt #2: When permitted, archaeologists do study human graves to learn about peoples of the past. Think about how future archaeologists might interpret a modern cemetery. Write to explain three assumptions that archaeologists might make about our culture based on what they observe at a modern cemetery.

Assessment #1: Based on your reading of the articles about experimental archaeology, describe two basic methods that experimental archaeologists use when studying the past.



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Include at least one example of how each method has been applied, and discuss what was learned through this example.

Assessment #2: Based on your reading of the article titled “What is a Haplogroup?” explain why there will never be a way to solidly identify a person’s racial ancestry through genetics.

Assessment #3: Based on your reading of the article titled “What is Bioarchaeology?” explain three ways that prehistoric life left marks on the skeletons of Florida’s early people.

Classroom Technology Strategies

Podcasts (digital media) enable you to provide a quick bell-ringer activity that links the student with experts beyond the classroom. A fast internet search of podcasts + your topic opens up a new world of virtual guest speakers to enhance the student's experience. This may help students frame their own personal learning goals for the lesson.

Student Learning Enhancement

Analogies express relationships among words. They are an excellent way to develop OR assess student understanding of **New Terminology**. Five sample analogies are provided below. After students complete these, you can create more. Alternatively, student teams can create their own analogies using at least two words from the list of **New Terminology** per analogy.

- 1- Geology is to Hydrology as Land is to Water.
- 2- Distance is to Centimeters as Force is to Newtons.
- 3- Niacin is to the disease Pellagra as Iron is to the disease Anemia.
- 4- Kingdom Animalia is to Class Mammalia as Haplogroup is to Haplotype.
- 5- Science is to History as Genetics is to Genealogy.