PREVIEW

Cambium

INNOVATIVE CURRICULUM FROM THE ARBOR SCHOOL OF ARTS & SCIENCES

MAPPING

In this issue

ARBOR SCHOOL
OF ARTS & SCIENCES

Human beings innately wish to understand their situation in the world and naturally turn outward to take in the environs. People have always wanted to know where they might go and how they might return home in safety, and the use of pictures to chart possible answers to these concerns predates written language. Even young children draw to capture the excitement they feel about exploring their homes and the interior realms of imagination. As they get older, their growing curiosity about places farther afield provides an opportunity to guide them in extending the scope of those maps.

One of our chief aims at Arbor is to equip students to make sense of the world and the people in it. Since the early days of the school, humanities teacher Una Whitcomb has guided her Senior students to study other civilizations in part by envisioning the physical conditions that shaped them. She wants the students to see how geography isolated some cultures while facilitating exchanges among others. She asks them to examine their own places in the world and the origins of their ideas. Beyond showing political borders and landforms, maps let students take in the rise and spread of religions, the diversity of languages in the world, or the overlay of natural resources and places of conflict in Africa. Mapmaking requires mathematical skill, spatial awareness, artistry, patience, and close observation. It offers points of entry for intelligences of many bents.

Map work also reinforces habits of mind. It asks children to make connections and understand relationships. It helps to inculcate the desire to seek more information, to be critical of hasty characterizations of any group of people, to know what lies behind conflicts seen in the nightly news. We believe that study of other civilizations and belief systems leads to respect and regard for them. And so the influence of geography on culture has become a major current in the humanities curricula at Arbor. Una's lessons have grown roots in the youngest children's studies.

Once every six years, the yearlong themes of study in our mixed-age classrooms converge to emphasize mapping throughout the school. 2007-2008 was such a year, so it seemed natural that our inaugural issue of Cambium should present some of these lessons. You will find cartography applied to global geography, to the science of archaeology, to an imaginary journey couched in literature, and to biography. As of this writing, more mapping projects are blossoming in our classrooms: the Juniors are tracking the American pioneers westward across the Plains; the Intermediates are creating maps of their current selves for a change capsule. We hope this issue will inspire new ideas for incorporating map-making in your curriculum.

FLATTENING THE WORLD
MAPPING THE GLOBE WITH INTERMEDIATES

by Graham Files and the Intermediate team

Materials:
- Oranges, one per pair of students
- Scrap paper, 5.5" x 8"
- String or yarn
- Permanent markers
- Paper towels
- Citrus peeler
- Transparency sheets
- Overhead pens
- World maps (see list of projections on p. 3), preferably laminated
- Nystrom desk maps, packs of 50
- 11" x 17" paper
- Rulers and yardsticks
- 11" x 17" heavy paper for maps, one sheet per student
- Tracing paper

Students will work in these pairs throughout the lesson string; make your assignments accordingly.

A citrus peeler is a plastic ring with a molded sharp tooth to segment the orange skin without piercing the fruit inside. Hand-held models are equally good; both are available at cookware stores for $1.50 or less.

The Intermediates, our fourth and fifth graders, delved into mapping on a grand scale this year. In asking them to become cartographers, we hone their spatial thinking and provide them with valuable practice in grid and scale work. They also gain knowledge of world geography that will assist them in studying biomes and oceanography during their yearlong focus on Environments. As always, their teachers frame their explorations with a set of guiding questions: What purposes do maps serve, and what features make them useful tools? Is there any accurate way to represent the whole surface of a sphere in two dimensions? Examining different projections of the globe opens the door for students to explore the purposes of maps historically and currently, to access complex ideas in geometry, even to dig into questions of global power and inequality. Look at a Mercator map – the classic rectangular picture of the world, with its perpendicular lines of latitude and longitude and Greenland looming large as Africa. In reality, Africa is fourteen times greater in size, as shown by the equal-area Mollweide projection. Every map is a compromise between accuracy of shape and accuracy of area, and the consequences for how we think about our world are intriguing for students of this age to consider. But first they must understand the challenges inherent in mapping the globe that fuel squabbles among cartographers even today.

Given an orange, a length of string, and a marker, children can quickly recognize the quandaries mapmakers face. If the orange stands in for Earth and the continents and lines of latitude and longitude are roughly delineated on its skin, what happens when you remove the peel and try to flatten your drawing? After studying how cartographers have attempted to balance accuracy and functionality by drawing our planet in shapes that recall everything from hearts to spinning tops to butterflies, students choose the projection they feel is best and work in pairs to create their own maps of the world. This project offers points of engagement to students of mathematical, collaborative, or artistic bent.

FORECAST

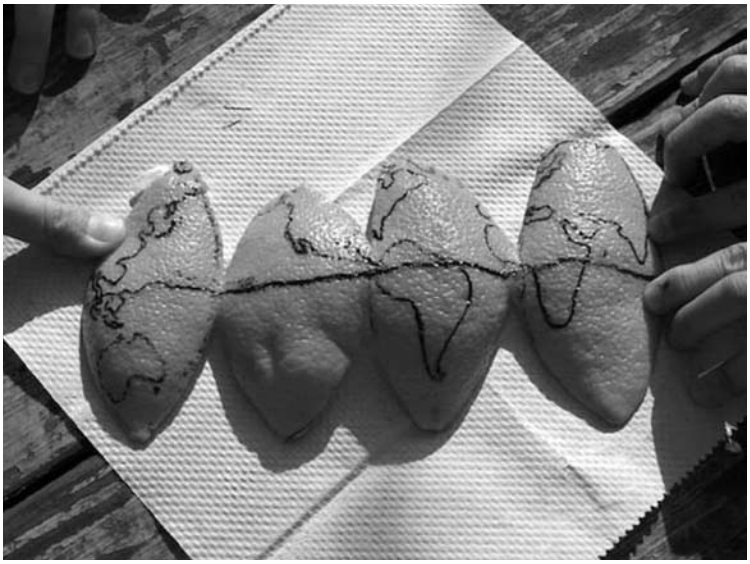
Day 1:

Announce student pairings; distribute an orange and a half-sheet of paper to each pair. Ask them to wrap the orange in the paper and notice what happens to the paper: it must be folded or crumpled. Link this to maps, explaining that a map is a projection of a three-dimensional object on a two-dimensional surface. To investigate the concept of moving from three dimensions to two, introduce an orange to stand in for Earth: if we were to draw the continents on the orange, how would we begin? Lead students to the idea that finding the poles and marking lines of latitude and longitude could help orient drawings.

Now one partner will hold a length of string around the orange to mark the prime and 90° meridians and the equator while the other traces the string with a permanent marker. Using the globe as a reference, the students roughly draw the continents on their orange, locating England on the prime meridian. As the pairs finish, use a citrus peel

cutter to quarter the orange's skin along the meridians, stopping short of the equator on all but one of the cuts so that the peel can be preserved in one piece. Let the students carefully remove the peel and then lay it flat on a paper towel to demonstrate the accurate two-dimensional representation of the earth. The resulting segments, called gores, leave gaps in the oceans and continuous landmasses; connecting the boundary lines of the continents distorts the actual shape and size of the land features. One partner should gently press a sheet of transparency plastic over the orange peel while the other traces the continents to see this effect. Compare the students' "orange maps" with a Mercator projection, then compare the Mercator map with the globe: Look particularly at the relative sizes of Greenland and Africa. What do the students notice about each version of Earth?

Every projection is a compromise between accurate shape and accurate size. Check in: Do students know all the continent names?



Day 2:

Review as a class why curved surfaces cannot lie flat unless the surface is cut. A flat map can accurately show either the size of lands and seas or their shape; it cannot show both without some error. Today students will examine a variety of map projections, comparing and contrasting them.

Let each pair choose a map station to visit first. They will record their observations on the large sheet. Prompt them to consider the shape of the map/world, whether the grid lines are straight or curved, whether proportions or shapes are true to the globe, whether any landform has been omitted, etc. They should use their own descriptions for shapes; vocabulary like "sinusoidal" and "ellipsoid" can come later if you want to introduce it. After five minutes the children rotate to a new station and add to the previous group's observations. Each pair should have time to observe every projection.

Day 3:

Discuss yesterday's work: What did the students notice about each projection? What have they grasped about accurate sizes vs. accurate shapes? Compare similar projections: Mercator vs. Peters; Robinson vs. Eckert IV. What differences can they find? How would those differences make each map more or less useful? What can they add to yesterday's observations? Use the Rubric to fill in any big ideas they miss.

Students should take away the most important characteristics, differences, and functions of the major projections. Mercator is good for navigation because it is locally accurate (might this be why it became so prominent?); Robinson is a good compromise shape/size picture of the whole world.

Behind the Scenes, Day 2:
Set up stations around the room, each with a different projection. Each station also needs an 11" x 17" sheet of paper titled with the name of the projection and divided into quarters for students' notes in the following categories: Shape, Grid Lines, Shows Well, Shows Poorly. Later you will compare their observations to the Projection Rubric (p. 6).

Map projections you'll need:
- Mercator
- Gall-Peters
- Robinson
- Goode's Homolosine
- Eckert IV
- Mollweide

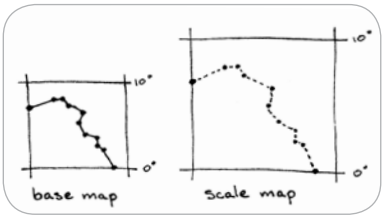
For extra interest: Werner's cardiform, Waterman's butterfly, Fuller's dymaxion

In discussing the various projections, it may be interesting to engage the students on Peters's argument that the Mercator projection assigns more size, and therefore a sense of political importance, to North America and Europe, while diminishing Africa and South America. The counterargument? Peters's map, like all cylindrical projections, is still grossly distorted in much of the developing world. In fact, it is really accurate only along the 45° parallels, about the latitude of his native Germany!

Some projections are more challenging to draw than others: you may wish to encourage high achievers to tackle Goode's Homolosine.

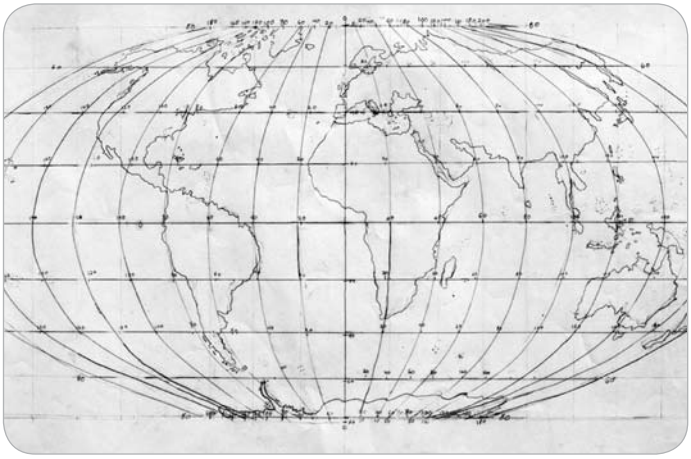
Day 4:

Each pair chooses a projection to work with and develops a strategy for laying down the lines of latitude and longitude. Give each student a desk map in the projection of choice, hereafter called the *base map*. These will be the primary references for the students' own maps and can be marked up in whatever way is most useful. Distribute rulers and 11" x 17" practice paper, then discuss gridding out a map to scale. What scale will best fill the larger paper? What will the reference points be? Demonstrate dot-to-dot technique for scale work by marking salient points along a coastline, considering each dot's position within the latitude-longitude grid, and marking that position on the larger map. Once the dots are transferred, connect them according to the shape of the land. Elicit the steps they will need to take to establish the scale map grid:



1. Draw the prime meridian
2. Draw the equator
3. On the base map, measure distance in cm between the equator and lines of latitude. Convert these measurements to the student's scale; e.g. if 10° North is 2.4 cm from the equator on the base map and the student is using a scale of 1:2, 10° North will be 4.8 cm from the equator on her map.
4. Repeat the process for the distance of lines of longitude from the prime meridian.

The pairs should collaboratively mock up a rough grid indicating these measurements. The grid plan should include the scale of their maps, which lines of latitude and longitude will be shown, and how they will manage curved lines if their projection requires them. Show students how to bend a ship curve along the points where each line of longitude must intercept the lines of latitude, then trace the arc.



Taking the time now to record the necessary measurements and conversions in a grid plan will be extremely helpful as students begin work on their scale maps.

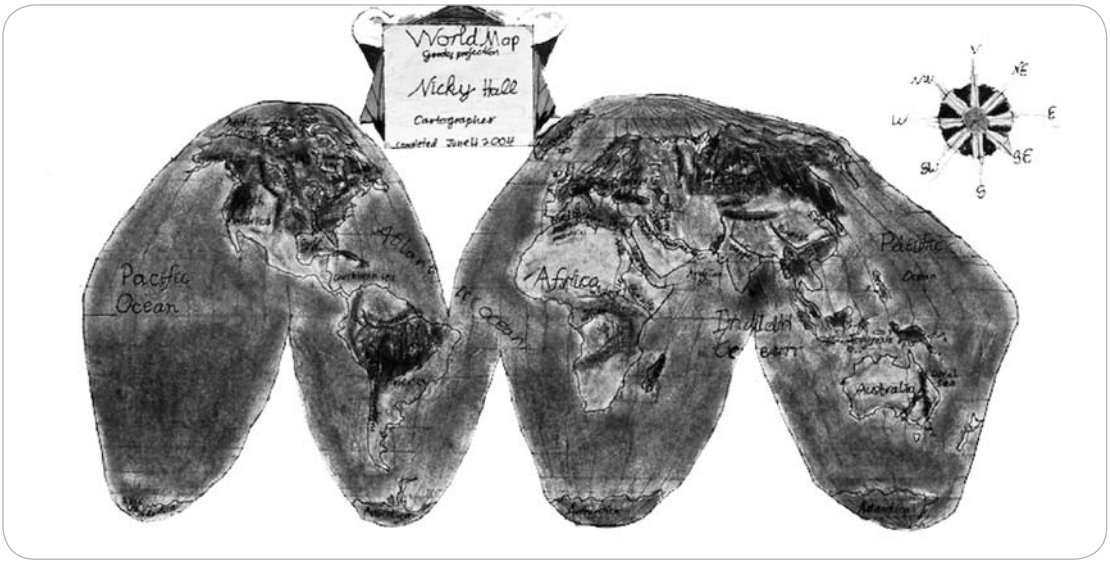
Day 4-5:

Working in pairs, students set up and pencil their grids on 11" x 17" heavy paper. Students should apportion the work of holding rulers and curves in place and drawing in lines of latitude and longitude. When one partner's grid is complete, they must repeat the process on the second partner's paper.

Collaboration rather than independent work during this stage means students are twice as likely to catch mistakes. It is also much easier to manage the yardstick and drawing as a team.

Independent Work:

Partners collaborate to draw in continents and major lakes, rivers, mountain ranges, and other landforms. (These are physical maps, so political borders and capitals are unnecessary.) They label important features of their maps, create keys, note scale and projection, and draw compass roses. They color their maps with colored pencils or watercolors. You may choose to spray the maps with fixative outdoors.



Using the maps:

Arbor Intermediates' world maps become tools for subsequent units. Students create overlays of important biomes on tracing paper, which lets them see the relationships of biomes to geography: tropical rainforests occur between the Tropics of Cancer and Capricorn; rivers have their sources in mountain ranges; plains tend to lie between mountain ranges, etc. Overlays of ocean currents and major oceanic mountain ranges and trenches may be created during an oceanography unit.

RESOURCES

VanCleave, Janice. *Geography for Every Kid.* New York: John Wiley & Sons, 1993. *The genesis for the orange lesson was in this good activity book for students aged 9-12.*

Sammis, Fran. *Mapping Our World series.* New York: Marshall Cavendish. *Each entry in this series introduces information about the climate, land use, resources, plants and animals, population, politics, and religions of a continent, using maps, text and photographs. Good for grades 4-8.*

Nystrom desk size student activity outline maps are sold in packets of 50 for $13.00. These are nearly impossible to find on the web or in catalogs, but can be ordered by telephone from the Herff Jones Education Division at 1-800-621-8086. Ask for DD96 Robinson world, DD99 Mollweide world, DD9 Mercator world, and DD94 Pacific Rim world (an Eckert IV projection).

A useful comparison chart of more than thirty different projections is available at <http://www.radicalcartography.net/?projectionref>.

<http://www.wikipedia.org> also provides useful background, history, and images of the projections: search "Mollweide projection," "Mercator projection," etc.

We furnish all our classrooms with atlases, and by the fourth and fifth grades we find the children are capable of using standard atlases published for adults rather than simplified children's versions. The Intermediate shelves house the excellent Goode's World Atlas and Dorling Kindersley's Student Atlas, numerous editions by Hammond and Rand McNally, and more. If you are considering the purchase of atlases for your classroom, the following article by William Slattery may help you compare the many options on the market: <http://www.socialstudies.com/pdf/atlases.pdf>.

Field Notes:

Errors are inevitable. The best way to fix a painstakingly drawn coastline that's 10 degrees too far east? Trace it on tracing paper. Turn the tracing paper over and trace the tracing, applying a heavy layer of graphite. Lay the tracing paper over the map and position the coastline correctly, then trace firmly over it. The graphite on the back side will transfer to the map paper. Erase the old, incorrect line.

Maps by Ursula Clausing-Hufford and Nicky Hall. Orange circumscribed by Hillary Ellman and Alex Lam.

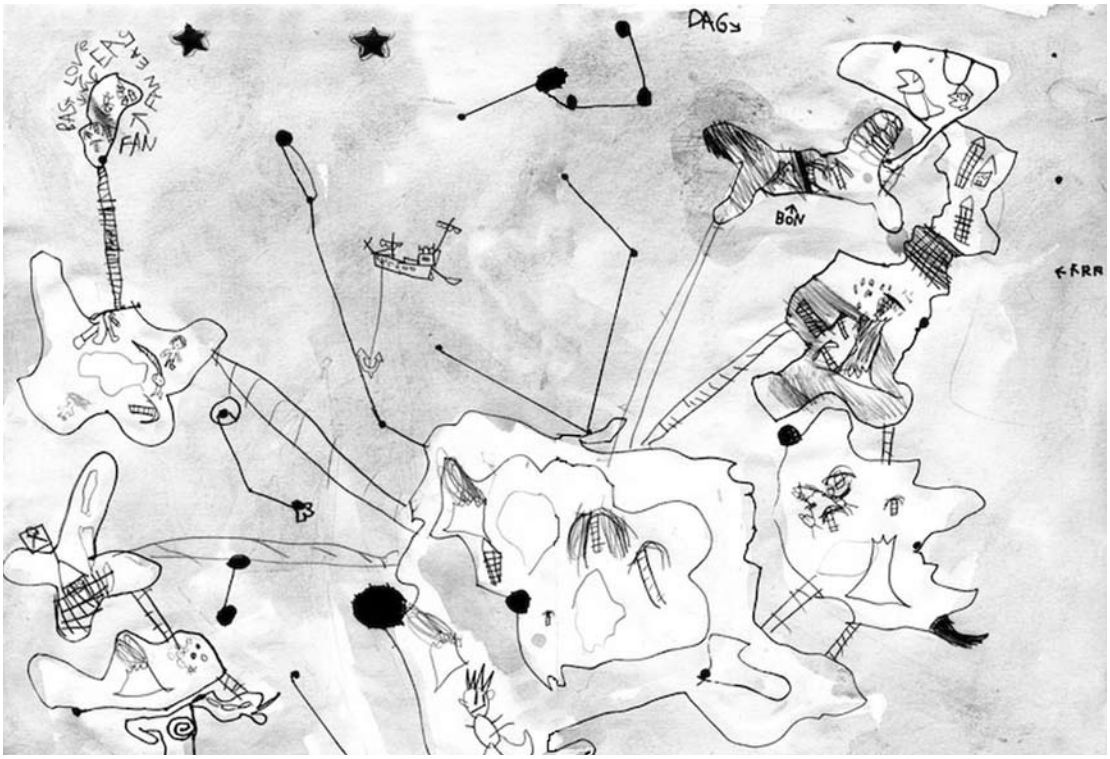
Projection Name	Shape	Grid Lines	Shows Well	Shows Poorly
Eckert IV	Somewhat flattened oval	Lines of latitude are straight; lines of longitude are curved.	Sizes; shapes are fairly good; a pleasing shape overall	Tropical regions are stretched in a north-south direction
Goode's Homolosine	Interrupted	Grid resembles sinusoidal from the Equator to 40° and Mollweide from 40° to the poles.	Sizes; shapes are well represented within each lobe (except for Asia, which is the most distorted continent)	Asia; oceans are broken up
Mercator	Rectangular	All grid lines are straight.	Compass bearings; shapes are true for small regions (good for making local area maps)	Cannot represent the poles at all; sizes radically exaggerated near poles; shapes true only locally
Mollweide	True ellipsoid	Central line of longitude and all lines of latitude are straight; others are curved.	Sizes; shapes in center of projection	Polar regions are compressed
Peters	Rectangular	All grid lines are straight.	Sizes	Shapes distorted everywhere but at 45°; tropical areas stretched north-south; polar areas compressed
Robinson	Oval, except the poles are represented by lines	Equator and all lines of latitude straight; others are curved.	Shapes are pretty good, especially near the Equator.	Poles are straight lines; areas away from the Equator are exaggerated in size

HOME, ADVENTURE, HOME
PRIMARIES MAP AN IMAGINARY JOURNEY

by Felicity Nunley, Lori Pressman, and the Primary team

The Primary students at Arbor – kindergartners and first graders – distinguish themselves in many ways: by their small size, by their wonderment and passion as they embrace the school culture, by the trays of lovably misshapen oatcakes and cookies they proudly proffer all over campus on baking days, and perhaps most of all by the engines of their imagination. They transform the school into a fantasyscape. We nurture those powerful imaginations by bringing them to bear on the curriculum: in the years when Journeys are the theme of study for the Primaries, the students take on the personae of the historical passengers on the Mayflower and imagine themselves into every stage of the voyage.

In preparation for this undertaking, the Primaries begin in the fall with a study of maps. In September and October, writer-in-residence Melissa Madenski guided the students through a series of lessons inspired by David Sobel's *Mapmaking with Children* in which they made maps of their homes and of journeys from home to school or to another favorite place. These charts of the children's known world, their safe places, prepare them to map and explore the realm of make-believe with an imaginary journey to an unknown land. Their teachers lay the foundations during the summer by documenting a journey of their own. In 2007, lead teacher Felicity Nunley and reading specialist Robin Gunn received a grant to travel north for a three-day kayak adventure in the San Juan Islands. They photographed each phase of the trip, from the planning and packing to their return home, for a slide show and kept detailed journals of their experiences to share with the students. The class studied the arc of adventure stories in their teachers' trip and in literature, then applied that structure to their own imaginary voyages. In addition to mapping practice, this lesson string builds young students' skills in reading comprehension, writing, reasoning, using coordinates, and decomposing the number 10. It is a chance to stretch their imaginations, work independently, and share their creations and stories with the class. Bon voyage!



Yearlong curricular Themes provide authentic context for the skills we teach at Arbor as well as enriching the content of lessons. At the Primary level, Theme is a vehicle for building the children's reading and writing abilities and an introduction to topics they'll encounter in more depth as Juniors, Intermediates, and Seniors. The rotation of Themes is as follows:

Primaries:
Seasons and Cycles, Journeys

Juniors:
Change and Continuity, Communities

Intermediates:
Inventions and Discoveries, Environments

Senior Humanities:
SE Asia, Sub-Saharan Africa and China; The Americas; Eurasia

Senior Science:
Pattern and Diversity, Energy and Motion, Systems and Structures

A teacher's journey can take place on a far more modest scale. Young children can appreciate the adventure in any outing; a drive to visit relatives or a weekend of camping can be ample fodder for discussing the stages of journeys. Be sure your trip involves a map or two, however simple.

Maps to collect:

Road maps
Symbolic maps
Nautical charts
Trail maps
Tourist maps
Topographic maps

Behind the Scenes, Day 3:

Hang maps, particularly nautical charts, conspicuously near the working area.

Materials:

- Heavy watercolor paper for each student
- Permanent markers
- Blue watercolor paint
- Paint brushes

Field Notes:

Beginning the maps without understanding what they were drawing was a challenge for some of our literal thinkers: we wanted to loosen them up with a free, abstract exercise. We have found that if they know they're making maps, kids tend to jump prematurely to detailed images. As an experiment, we encouraged this slower unfolding and were pleased with the results.

FORECAST

Day 1:

Read aloud *Three Days on a River in a Red Canoe*, by Vera Williams, to introduce the Home – Adventure – Home idea. Use the story to tease out the steps of a journey:

1. idea for trip
2. packing/planning
3. farewell
4. adventure
5. return home

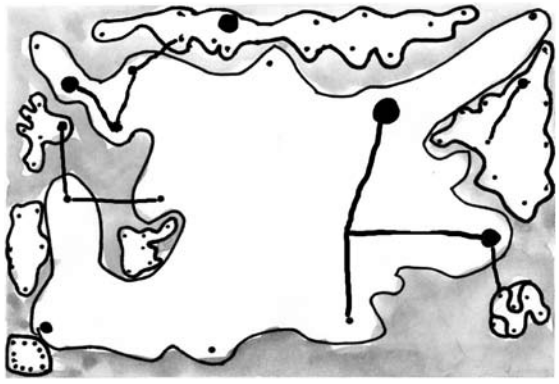
This is a long story, and children will be eager to share commentary and their own boat ride tales.

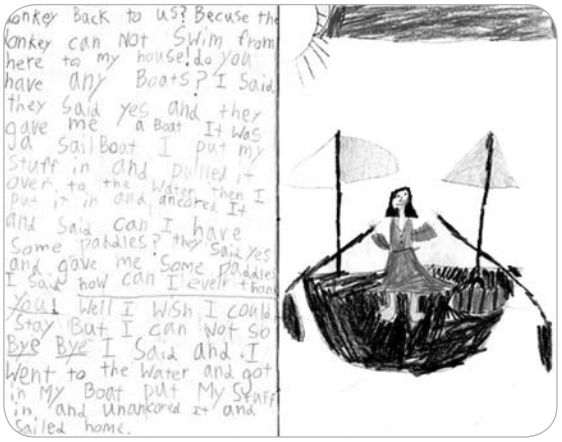
Day 2:

Teacher's travels. Review the Home – Adventure – Home structure from Day 1. Show pictures of your journey, looking for evidence of the five steps and paying particular attention to maps of the trip. Ask children to bring in maps from home for Day 3, and collect a wide variety of maps and nautical charts to use as models.

Days 3-4:

Map drawing and painting. Distribute heavy paper and permanent markers. Without explaining that they are making maps, instruct children to draw 20 small dots, 15 larger dots, 10 straight lines connecting some of the dots, and curved lines to surround groups of dots. Then encourage students to make a connection between their own drawings and the charts on the walls: they have just charted a previously unknown group of islands. The children can decide which parts of their drawing will be land masses and which will be water. Paint water with a watercolor wash. As they spend time with their maps, they will naturally begin to invent the landscape and inhabitants.





Day 5:

Read aloud *On Sand Island*, by Jacqueline Briggs Martin and David A. Johnson, asking children to listen for answers to the four questions below.

1. What is the name of the island?
2. What lives there?
3. What grows there?
4. What's the weather?

Are they able to extract these details as they hear descriptions of Sand Island? Brainstorm possible landscapes and names for the children's own islands. It works well to prepare a sheet of the questions above for each student.

Day 6:

Symbols and keys. Look at the map and chart collection and draw attention to the symbols. Talk about what these little drawings mean and introduce the word "symbol." Then find the map key and talk about how it helps us decode the symbols. Brainstorm and draw some symbols for mountains, rivers, towns, etc. on the board. Give the students scrap paper to practice drawing possible symbols and potential landmarks for their maps, then have them add the ones they want to use and draw keys. Ours loved adorning their maps with cliffs, caves, dragon lairs, coconut groves, fairy villages, and marine monsters. By the end of the lesson, many kids will be aching to share about their islands. Allow extra time for this.

Field Notes:

Map-making practice should include discussion of what's important to put on a map. What are the things to notice that will help travelers find their way? Be prepared to introduce the term landmark, and engage children in thinking of various landmarks that let them know they're getting close to school or home.

Day 7:

Coordinate grids. Examine a tourist map or a simple atlas and show the kids how a grid helps people find landmarks more easily. (Arbor children have had previous experience with coordinates during math games.) Have students take turns laying the tracing paper grids you have prepared over their maps, and recording the location of important landmarks using the coordinates. Announce that they will all have the chance to travel to their islands, so they'll be able to navigate to these landmarks themselves.

Behind the Scenes, Day 7:

Prepare some simple grid overlays on tracing paper or transparencies to the dimensions of the kids' maps. Label boxes A, B, C along the horizontal axis and 1, 2, 3 along the vertical axis. You may wish to create a simple worksheet asking questions like, "What is in B4?" that students can complete according to their individual maps.

Day 8:

Prepare packing lists: Considering the weather conditions on their islands and their planned activities during the visit, children should write a packing list of supplies they will need.

Evaluate writing mechanics. Making a list is a good chance to practice aligning words on the page, spacing between letters, sounding out words they may not have written before, etc. List writing is particularly accessible to kindergarteners.

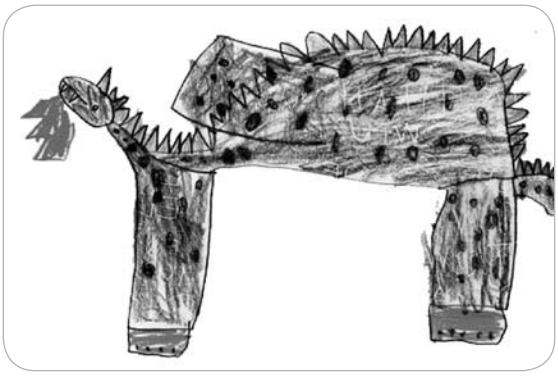
Day 9:

The Adventure Store. Each traveler is given $10 to spend at the store and must calculate how best to use it to procure the items on his or her packing list. This is a small-group activity: students can take turns to play store employees serving the travelers; they will receive as much math practice as the customers as they add up the items to be sold. We used a puppet theater as our storefront.

Can they manipulate items to make different combinations of 10? How strong is their number sense? Can the employees check the customers' addition?

Behind the Scenes, Day 9:

Review children's packing lists and prepare an Adventure Store pricelist. Keep the items cheap and make sure there are many combinations that will add up to $10.



A postcard from Dragonworld

Day 10:

Farewell. Students draw and write a farewell postcard to a friend or family member explaining where they're going and when they will return. The class packs a suitcase with their imaginary supplies. A local dignitary (Director Kit Hawkins, in Arbor's case) visits to wish them safe travels. They physically leave the classroom, dispersing onto the playing fields to act out their journeys.

Materials, Day 10:

- A suitcase
- Heavy paper cut to 5.5" x 8.5" for postcards

Days 11-14:

Adventure writing. Students write journal entries describing their voyage and experiences. We broke down the entries as follows, and offered prompts in our group circle before the children sat down to write: 1. Travel and arriving: *How did you travel to your island? By boat, plane, dragon, fairy chariot? Were you tired when you arrived, or eager to explore?* 2. Landscape and weather: *What does your island's landscape look like? Was it sunny and warm? Stormy? Cold?* 3. A danger and a solution: *Did you meet any people or animals who live on the island? What happened to you that was exciting/scary/challenging, and what did you do?* 4. Return home: *How did you get home? What did you do first, and who were you happy to see? What will you remember about your trip?*

This is another opportunity to look at writing mechanics, and at imaginative content. Have students adopted elements of any of the journeys in the read-aloud books, or is their adventure entirely new?

Arbor Primaries' days end with half-hour read-alouds, and we use this time to introduce many Home-Adventure-Home books. We often begin with *My Father's Dragon* – see Resources for more ideas. We also keep class lists of books that fit the Home-Adventure-Home pattern; the children eagerly add titles they read at home.

Culminating day:

This year we combined a Welcome Home celebration with our H2O Expo, the culminating event for the Primaries' simultaneous science work studying the properties of water and things that float. The children presented their work to their visiting parents, and were thrilled to read aloud from their journals and to show off their island maps. If it isn't feasible to bring the parents to school, you might consider asking them to write letters welcoming their adventurers home that you can read aloud to the class.

RESOURCES

Some Home-Adventure-Home fiction:

- Armstrong, Jennifer. *Lili the Brave*. New York: Random House Books for Young Readers, 1997.
  This story of a girl emigrating from Norway will challenge children to think about what home really means: Lili does not return to her familiar village after her journey, but bravely sets out to establish a new home in America.
- Eastman, P. D. *Are You My Mother?* New York: Random House Books for Young Readers, 1960.
- Gannett, Ruth Stiles and Ruth Chrisman Gannett. *My Father's Dragon*. New York: Random House Books for Young Readers, 1948.
- Heidbreder, Robert, illus. Kady MacDonald Denton. *A Sea-Wishing Day.* Toronto: Kids Can Press, 2007.
- Hobbie, Holly. *Toot & Puddle series*. New York: Little, Brown Young Readers.
- Lobel, Arnold. *Mouse Soup*. New York: HarperCollins, 1977.
- Martin, Jacqueline Briggs, illus. David A. Johnson. *On Sand Island*. New York: Houghton Mifflin, 2003.
- Milne, A. A., illus. Ernest H. Shepard. *Winnie-the-Pooh*. New York: Dutton, 1926.
- Sendak, Maurice. *Where the Wild Things Are*. New York: HarperCollins, 1963.
- Sís, Peter. *A Small Tall Tale from the Far Far North*. New York: Farrar, Straus, and Giroux, 2001.
- Sís, Peter. *Madlenka*. New York: Farrar, Straus, and Giroux, 2000.
- Sís, Peter. *The Three Golden Keys*. New York: Farrar, Straus, and Giroux, 2001.
- Sís, Peter. *Tibet Through the Red Box*. Farrar, Straus, and Giroux, 1998.
- Williams, Vera B. *Three Days on a River in a Red Canoe*. New York: Greenwillow Books, 1981.

For your inspiration:

- Sobel, David. *Mapmaking with Children: Sense of Place Education for the Elementary Years*. Portsmouth, NH: Heinemann, 1998.

Maps and artwork by Miles Cohen, Lola de Garmo, Katie Palka, and Eliana August.

EVIDENCE OF CIVILIZATION
JUNIORS PLOT AN ARCHAEOLOGICAL TEST PIT

by Peter ffitch, Janet Reynoldson, and Jane Lindquist

Second- and third-graders are capable of sophisticated mapping and can begin to plot objects accurately with coordinates. At Arbor, mapping is an important component of the Juniors' study of the native peoples of North America, and of the larger goal to help the children develop a sense of place. As they study the impact of natural resources on the possible lives of humans, they build understanding of the ways in which geography influences entire cultures. To explore this concept hands-on and to practice mapmaking skills, the Juniors build weather-proof shelters of natural materials for clothespin dolls, map the resulting "villages," and keep journals to imagine the dolls' existence in the cold, damp, winter woods. They also excavate an archaeological test pit to uncover the remains of a fishing or hunter-gatherer society carefully prepared by the Seniors under the direction of science teacher Jane Lindquist. To work like archaeologists, the Juniors must lay out a string grid over the test pit, draw a scale representation of the dig on graph paper, carefully and patiently use tools and brushes to unearth objects, and scrupulously log each "artifact" they find with a drawing in the correct location on their maps and a written description on a log sheet.

The test pit lesson string is a good entry point for students to practice deductive reasoning as well as skills in working with coordinate grids and scale. What do the clues tell you about the people who may have lived in this area? How might the climate, weather, and soil conditions affect what is preserved? What evidence of our civilization might future archaeologists find, and what would it tell about us?

Creating the Test Pit:
This is a wonderful opportunity to engage parent volunteers, or better yet, older students. In an undisturbed corner of the school-yard, sandbox, long-jump pit, or wherever else you are permitted to dig, mark an 8' x 8' area. Use shovels to loosen the soil to a depth of 8". Seed the area with your "artifacts," take a photo to record their location in the pit, and gently cover them with soil or sand so that they lie an inch or two below the surface.

If you have no outdoor space for this project, you can conduct the whole lesson on a smaller scale in the classroom using large plastic trays filled with sand or cat litter. Use smaller digging implements accordingly.

Fishing society artifacts: shells, horsehair on fishing pole, rocks for weights, shell jewelry, beads, fish drying rack, basketry scraps, fish bones, charcoal, obsidian flakes, shark's tooth

Hunter-gatherer society artifacts: bones, animal pelt or leather, animal pictographs, bone jewelry, arrowheads, obsidian tool flakes, dried roots, baskets, seeds, bees wax, charcoal, cedar bark

Materials:

- Cake pans for each pair of students, filled with sand or dirt and a few objects to practice brushing loose
- Small digging and brushing tools (see p.13)
- Rulers
- Paper the size of the cake pans
- Stakes, string or surveyor's tape, scissors or knife, compass (optional)
- Graph paper, rulers, meter sticks, and clipboards for all students.

The placement of objects in a dig is very important to archaeologists, since it may give essential clues to how objects were used and how the people organized their dwellings and community. Make sure students put artifacts back where they found them.

How do archaeologists decide where to dig?

Excavations are very expensive, so they must first do a survey of the area and determine where people are most likely to have lived. Where are the conditions most favorable for food, water, shelter, and defense from enemies? Archaeologists look for mounds or disturbances in the ground that don't look quite natural. Then they excavate using a test pit. If you have a natural area in which to dig, ask the students to consider these questions. Can they find the site themselves?

FORECAST

Day 1:

Classroom Archaeology. Explain to the students that they will be archaeologists looking for evidence of an earlier civilization that may have inhabited this area. Talk about how archaeologists work (see sidebar). What do the kids know and wonder about this work? Discuss artifacts as clues: if you find a shell, then some seaweed, then a piece of a basket, what does that tell you about the location? What kind of lives would people with these resources lead? What might they expect to uncover here? Discuss the importance of noting the precise location of artifacts they find – why might this matter?

Look for kids to make connections and reasonable guesses about the artifacts they might find and their significance.

After the group discussion, kids work in pairs to unearth "artifacts" in rectangular cake pans filled with sand or dirt. The objects are similar to those the students will find in the test pit. The partners practice gently brushing away sand to reveal artifacts, measuring to find each item's exact location in the pan, and recording their findings on a paper map by drawing the item in situ or by carefully removing and tracing it. They must replace the artifact in its original position afterward.

This is an important spatial orientation exercise, and it may be a challenge for some younger children. Using paper the same size as the pan makes the work easier because they don't have to work with scale yet.

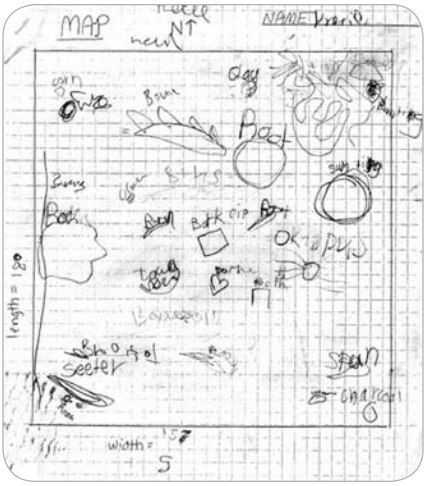
The goal is to practice all the skills they will need at the larger test pit and to establish the slow, careful pace of this work.

Day 2:

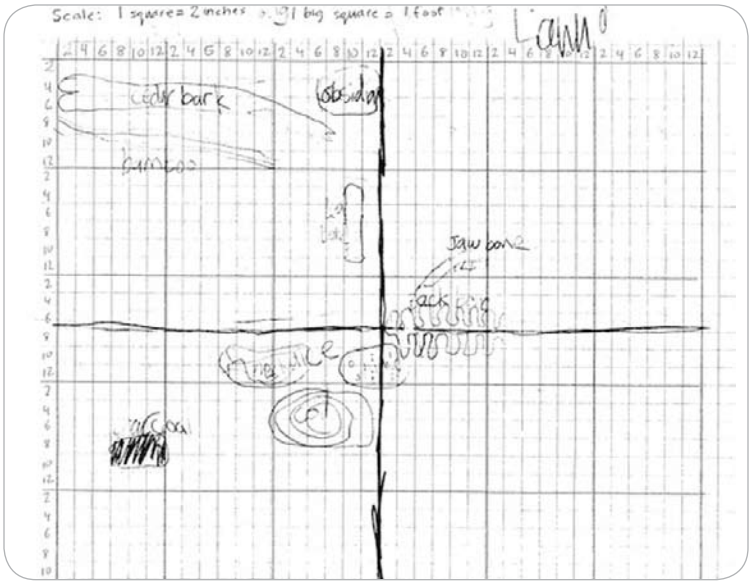
Investigate the Test Pit. Invite students out to the test pit site. If you are working outdoors, today is the day to let the students loose their energy and enthusiasm so that they can settle down to the painstaking work ahead. Have students measure the pit's dimensions and use stakes and string to divide the pit into quarters. Try not to walk through the pit – why? Note the cardinal directions to orient the dig site maps for Day 3.

Day 3:

Mapping the Pit. In the classroom, draw a picture of the test pit on the blackboard or overhead projector. Guide students to determine an appropriate scale and plot an accurate drawing of the pit area on graph paper. Draw in lines for the string grid the students laid out, and include reference points such as the cardinal directions or arrows pointing toward prominent school landmarks to fix the orientation of the pit. Explain that everyone will map the discoveries by drawing pictures of each artifact on the graph paper in the area corresponding to its location in the pit.



Day 4: *(allow 45 min per group – they may work in shifts)*
The Dig Begins. Arm pairs or small teams of students with clipboards for their test pit drawings and distribute log sheets for written descriptions of the finds. Remind students to proceed with caution: any object out of place could be an artifact, and must be treated with care. Monitor work in the pit for gentle technique and take time to discuss discoveries as they occur. What is this object? What is it made of? How might it have been used? Does it give us clues about how this civilization lived? Students should add each new artifact to their maps, carefully measuring to locate the object within the pit and then to scale on their maps, and describe it on the team log sheet. Descriptions should be as precise as possible, including measurements marking the location where the artifact was found, as well as the dimensions of the artifact itself.



Be sure to assess the social component of this project: are the pairs cooperating and sharing the work equally?

Days 5 and beyond, if you have time:
Continue work at the test pit.

Final day culminating options:
1. Make a collective map at a larger scale in the classroom and have students plot the artifacts. Discuss all the artifacts discovered and what clues they give as to who may have inhabited the area. 2. Draw pictures depicting the settlement the class imagines the artifacts to represent. 3. Tell stories about the culture and lives of the people who left these artifacts.

RESOURCES

The article at <http://library.thinkquest.org/5751/archaeology-2.htm> provides a brief, accessible overview of the archaeological process. The language is simple enough to use with second and third graders, and includes a basic glossary.

The Organization for Community Networks's Academy Curricular Exchange offers a lesson for grades 6-8 called "Archaeological Inquiry" by Kirby Giles of Fillmore Middle School in Utah. The list serve format isn't as slick as many of the web resources available today, but the content of this lesson helped inspire us to begin digging with our Juniors. Find "Archaeological Inquiry" online at <http://ofcn.org/cyber.serv/academy/ace/soc/cecsst/cecsst188.html>.

A project called "Intrigue of the Past: North Carolina's First Peoples" offers lesson plans for grades 4-7. These use scientific language and do not involve hands-on digging, but may be useful background for leading students through plotting a grid: <http://rla.unc.edu/lessons/Lesson/L201/L201.htm>.

Behind the scenes, Day 4:
Prepare test pit log sheets: lay out a simple grid with columns labeled "Date," "Weather," "Tools Used," "Artifacts Found," and "Location." Each team of students will need one to record the dig activities.

Tools of the trade:
old scrub brushes, paint brushes, toothbrushes, trowels, buckets, sieves, screens, spoons, straws for blowing air to dust off objects, magnifying glasses, surveyor's tape, stakes

Archaeologists ask…
- Is there evidence of food eaten?
- Is there evidence of trading with other cultures?
- What kind of social relationships might these people have had?
- What kind of dwellings might they have built?

Field Notes:
"Is this real?" We finesse our answers so that children can suspend their disbelief and fully immerse themselves in the work, and we find our kids are eager to participate in the archaeological fantasy even if their older peers spill the beans. The more authentic the artifacts – real bones, stone flakes – the better. We 'fess up at the end, of course.
Test pit maps by Lianna Semonsen and Katie Mahorney.

Archaeologists pictured: Mia Friedman, Maria Gray, Cole Whisnand, Julia Hapke, Scott Hermanns, Summer Pearson

APOSTLE OF INDEPENDENCE
SENIORS MAP THE LIFE OF JOSÉ MARTÍ

by Anne Moloney and the Senior team

The Poetry of José Martí

In Humanities and Spanish, Arbor Seniors studied the following poems.

- From *Versos sencillos*:
- XXXIX Cultivo una rosa blanca
- XXXIV ¡Penas! ¿Quién osa decir
- XXX El rayo surca, sangriento
- II Yo sé de Egipto y Nigricia
- I Yo soy un hombre sincero
- V Si ves un monte de espumas

From *Major Poems*:

- Sueño despierto/I Dream Awake
- Crin hirsute/The Bristling Mane

The Arbor curriculum is designed to spiral and expand, drawing up themes from the earlier grades and casting them wider as the students gain in experience and capability. Students may be surprised to learn they will revisit Migrations and North America as Seniors, protesting that they've "already done that" as Juniors. But this time they will plunge into deeper, richer waters. They will conduct interviews to study the immigrant experience in America; consider the philosophy of the immigrants who founded the United States, particularly as encoded in the Constitution; and turn their eyes to the shaping of their country from the Civil War to Civil Rights. They also study poetry, and their extended focus on the work of such poets as Langston Hughes and Walt Whitman offers another point of entry into understanding the America of the 19th and 20th centuries.

As this year's sixth, seventh, and eighth graders took in America's bitter fight to extend her privileges and responsibilities to all her citizens, we asked them to contemplate the situation of others simultaneously struggling for liberty. The lens of poetry brought into view the life of Cuban writer and national hero José Martí, a contemporary of Whitman, but a generation younger and born into a nation still colonized and enslaved. Avoiding a traditional condensed introduction to Cuban history to set the context for Martí, Design teacher Anne Moloney conceived a mapping project that would allow independent exploration and a deeply personal interpretation of the poet's brief but incandescent life. While a literal point-to-point tracing of his travels from Cuba to Spain to New York and back superimposed on the globe was permissible, Anne hoped to inspire a more reflective and artistic Design project. This was also a chance for the students to try a more open-ended assignment; you may choose to impose stricter parameters for children who need the structure.

Mapping Martí's life complemented the students' readings of his poems in Spanish and in different translations. We also hope this lesson string will model an engaging new approach applicable to any biographical study. We found it to be particularly instructive about the students' individual thought processes and strategies for learning.

Behind the Scenes, Day 1:

Prepare copies of brief biographies, guiding questions, and artistic maps to distribute in class.

FORECAST

Days 1-2:

Introduce the project, displaying and distributing various creative mapping models. Instead of plotting Martí's trips on a world map and flagging the locations of key events in his life, students might map a reading of his palm, impose his most striking characteristics on a picture of his head with examples illustrating each trait, or lay out a board game based on his exploits. (See Resources for good examples.) Hand out biographical information for students to read in class and at home. We used the Introductions to two books of Martí's poetry; these scholarly texts were a challenge for many students. We wanted them to have access to more than one version of his life story, but the difficulty of the reading meant that most kids read a single source. The guiding questions (p. 15) helped them find the key biographical information, and we encouraged students to work in small groups. A class discussion helped solidify their thinking about how the political situation in Cuba impacted Martí's life and poetry.

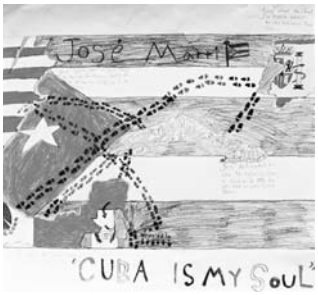
Day 3:

Students brainstorm formats for their maps: they must convey the details elicited by the guiding questions and characterize something essential in their reading of Martí's life and poetry. They must sketch ideas for teacher approval. Make sure mapping books are available to those who need further inspiration (see Resources).

Encourage empathy and deeper thinking about the themes in Martí's life and experience as you check in with each student.

Independent work sessions:

Maps are now under construction and students should be able to work independently or in consultation with a small group to solve problems of representation and gather fresh ideas. At Arbor, a 50-minute independent work period once per week allowed them to finish in about six weeks; next time we teach this unit we will dedicate a block of time so students can work more productively and finish the maps more quickly. Most maps are portable enough to allow work at home to speed the process.



RESOURCES

- Martí, José. *Major Poems*. Trans. Elinor Randall. Ed. Philip S. Foner. New York: Holmes & Meier Publishers, 1982. *This translation offers greater linguistic fidelity to the Spanish words. We preferred it.*
- Martí, José. *Versos sencillos/Simple Verses*. Trans. Manuel A. Tellechea. Houston: University of Houston Arte Público Press, 1997. *This translation favors literary accuracy in the English rhyme scheme and meter.*
- Harmon, Katharine. *You Are Here: Personal Geographies and Other Maps of the Imagination*. New York: Princeton Architectural Press, 2004.
  - p. 25 Arthur Merton, "A Symbolic Head," 1879
  - p. 26 Johann Hartlieb, German palm reading chart from "Map Die Kunst Chiromantia," c. 1480
  - p. 49 "The Road to Success," artist and date unknown
  - p. 62 Sara Fenelli, "Map of My Day," 1995

Audio recordings:

Seeger, Pete. "Guantanamera." Adapted from the poetry of José Martí. *This song is a compilation of several poems, including I and V from* Versos sencillos/Simple Verses. *Many other versions are available from iTunes. We compared lyrics, tempo, and instrumentation as we danced to interpretations by Cuba L.A., Compay Segundo, Los Lobos, and Nini Camps.*

Materials, Day 3:

- Sheets of 11" x 17" heavy paper for the maps
- Watercolors, colored pencils, markers

Questions for Martí reading:

- Where and when was he born?
- Why was he sent to jail as a teenager?
- What happened to shorten his jail sentence?
- Why was he sent to Spain?
- What did he study, and what degrees did he receive?
- How did he end up living in Mexico, Guatemala, back in Cuba and Spain, New York, Venezuela, and back in New York?
- What jobs did he hold?
- How many children did he have?
- What were important relationships in his life?
- What were his philosophical views?
- How and when did he die?

Maps by Linus Rollman, Elliott Friedman, and Corey Friedman.

THE INTELLECT, CHARACTER, AND
CREATIVITY INSTITUTE AT
ARBOR SCHOOL OF ARTS & SCIENCES

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Cambium: (n) the cellular growth tissue of trees and other woody plants, from medieval Latin "change; exchange."

What content would you like to see offered in Cambium? Do you have ideas about how we can improve it? Send us an email: cambium@arborschool.org

Masthead by Jake Grant, after an 1890 botanical illustration. Plant block print by Annika Lovestrand.

The Arbor School of Arts & Sciences *is a non-profit, independent elementary school serving grades K-8 on a 20-acre campus near Portland, OR. Low student-teacher ratios and mixed-age class groupings that keep children with the same teacher for two years support each child as an individual and foster a sense of belonging and community. An Arbor education means active engagement in learning, concrete experiences, and interdisciplinary work.* For more information on the Arbor philosophy, please visit www.arborschool.org.

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A map of home by Solomon Olshin

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BASE 10 AND BEYOND

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