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How to Analyze Maps & Atlases

A Critical Thinking Curriculum Guide

Includes selected maps from the *Perthes World Atlas*

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Editor's Introduction

That summer I went hiking in the Colorado Rockies with my two brothers and our friend Charley, I taught myself to read topographical maps. I remember the drive to the trailhead of one of our hikes—how I followed our progress on a topographical map I held open in my lap. Where the road curved left, my finger curved left on the map. Where the road turned right, my finger curved right. When my finger reached the trailhead on the map, right there we found the park rangers' trail sign.

Hiking later that day, we saw the weather turn ugly. My map showed a cabin just a quarter mile uphill. The storm started as we reached the cabin, and I remember huddling under the tin roof, listening to the wild drumming of raindrops—dry, happy, and convinced that a good map was a beautiful tool.

After the rain, we hiked higher, crossed a pass, found another cabin we'd seen marked on the map. Leaving our packs there, we dashed north to pyramid-shaped Wild Horse Peak, which we found right where the map said it would be. The four of us scrambled up to the top. Looking northwest, we saw a herd of more than 100 elk picking their way through boulders and brush. Looking north, a plain stretched to a distant line of peaks. My map told me that the horizon's tallest, sharpest peak—called Uncompahgre Peak—was, like Wild Horse Peak, shaped like a pyramid.

We saw two more things from the top of Wild Horse Peak: another thunderstorm rolling in and two hikers coming from the east, headed straight for our mountain. We bounded down the mountain, arriving at the southeast corner of the pyramid just as the two hikers strode up. Now I was in for a big surprise—I knew these two people from college: Al Pelz and his dad. I'd traveled to one of the world's emptiest places and run into two dear friends.

And now we come to the point of this story. Al and his dad were orienteering. They had a topographic map just like mine, and a fancy compass. Having drawn a line on their map, they had been walking west all day along that line while we had been walking east. The trouble was, Al and his dad, standing at the southeast corner of Wild Horse Peak, were convinced they were standing at the southeast corner of Uncompahgre Peak.

Al showed me his map and compass and his carefully penciled line. He explained how he and his dad had precisely followed exacting scientific procedures—so this peak must be Uncompahgre. I told Al how I'd traced the road with my finger, matching the map to the landscape. The trailhead, the cabin, the pass, the second cabin, and Wild Horse Peak had all been just where we expected them to be. Al looked at me and shook his head sadly. "Slattery," he declared, "that's a very romantic way to read a map."

As Al and his dad searched the foot of Wild Horse Peak—looking for the campsite at the foot of Uncompahgre Peak—my own party quickstepped downhill. Before we reached our goal, a bolt of lightning struck so close to us that we were knocked to the ground. Then came 30 hours of rain. And no one I know has seen Al Pelz or his dad since that

day. I hope they didn't die in the storm. I hope they didn't finally reach Uncompaghre peak and die of embarrassment. I hope they found their way back to the road, and that they were better at reading road maps than they were at reading topographic maps, so now they are back in Philadelphia, safe and sound.

Al and his dad taught me that being able to read a map might make the difference between life and death. Years later, hiking through a summer snowstorm in New Zealand and dressed too lightly for the weather, I was halfway between shelters, hypothermia was setting in, and I saw a little symbol on my map, one I didn't recognize. I checked the map's legend: the symbol meant "cave." I looked at my map, I looked at the snowy landscape, and I saw the one small black interruption in all that white.

If I didn't know how to read a map, I would not be alive today—and that's why I've asked geographer Betsy Hedberg and our team here at Social Studies School Service to create this map skills curriculum for you.

HOW TO USE THIS CURRICULUM

The curriculum consists of a PowerPoint® presentation, eight lesson plans, and six posters. The purpose of the curriculum is to acquaint students with map conventions and how to "think like a geographer"—that is, to develop critical thinking skills that equip students to both extract information from and express their ideas in maps, to become expert map readers and skillful mapmakers.

The PowerPoint® presentation introduces students to (or refreshes their memory of) basic map and atlas conventions, and sets students to work on using some of those conventions in the context of a selection of global issues. PowerPoint® is a great educational tool that is easy to misuse. We present PowerPoint® images along with scripts that suggest accompanying talking points. The last thing we want, however, is for you to simply show our pictures and read our scripts. Studies show that students have trouble looking and listening at the same time—i.e., students who pay close attention to the pictures won't pay full attention to what you say, while students who pay close attention to what you say won't fully analyze the pictures. We supply each slide with a script only to help you get your class discussion started, to equip you with convenient background information, and to help you cover certain essential points. When you show one of our slides, we hope that you will ask more questions than our script supplies. Rather than explaining the slide to your students, ask students to explain the slide to you.

The eight lesson plans dovetail with the PowerPoint® presentation, introducing, deepening, and extending its information. Correlated with National Geography Standards, the lessons begin with a mental mapping exercise; teach map conventions, map reading, and how different maps convey different meanings; and then provide opportunities to build skills in map interpretation. The final lesson asks students to use their map skills to evaluate a local, national, or global problem, and then to apply their knowledge, through citizen action, in order to change the world for the better.

The six posters, based on the National Council for Geographic Education's "Five Geographic Skills," summarize how to think like a geographer—to ask geographic questions; to acquire, organize, and analyze geographic information; and to answer geographic questions (which usually means to forge newer and more sophisticated geographic questions).

Most of our lessons assume the use of computers. With the help of good classroom libraries of geographic materials, variations on most of the lessons can be accomplished without computers, but geographic literacy today (and geographic literacy tomorrow) increasingly depends on computer literacy.

Finally, we wish to thank Dietmar Haesler for allowing us to use maps from Klett's *Perthes World Atlas* in our PowerPoint® presentation. Providing first-class cartography at a moderate price, the *Perthes World Atlas* belongs in every geography classroom, and as a teaching tool, Klett's new digital version of the atlas shows amazing potential.

William Slattery
Culver City, California
January 10, 2008

LESSON 1: MENTAL MAPPING

Teacher Pages

Grade levels: 6–12
Estimated time: 3–4 class periods

INTRODUCTION

Most people conceptualize the geographical layout of the places they live in, visit, or even simply imagine. These conceptualizations are called “mental maps.” Even very young children have mental maps of their homes, their neighborhoods, and other places they visit regularly. By the sixth grade, most students will have developed a mental map of the world.

This lesson asks students to draw mental maps of the local area (town or school neighborhood) and/or the world. The lesson is designed to be a bit of a trick: The main point of the lesson is *not* to test how much students know about their neighborhood and/or the world, but to test how much students know about maps.

Prepare yourself for a lot of groaning protests, since very few students imagine that they can draw a good map. Hush the groaning by promising that the maps will not be graded. Claim that you are only trying to figure out what they know and what they need to learn. This claim has the advantage of being true.

Your real purpose is to discover which mapping skills your students have and which need further development. Which map conventions will your students use, and which will they ignore? For example, most students will draw world maps with north at the top of the page, whether or not they have consciously intended to do this. Local maps are less likely to respect the “north is up” map convention. Very few students are likely to remember to equip their maps with a legend—but no map is complete, you will tell (and show) students, if the map lacks a legend.

This lesson is intended to show students that they already know a lot about map conventions, so they already can claim to be people who possess map skills. It is also intended to show students that they are likely to blithely ignore many of the map skills they already possess, and that they are likely to draw maps that do not reflect their full knowledge. This lesson, like all the others in this curriculum, is intended to raise students’ consciousness of map conventions. While these lessons include geography content, and while we hope students will view enough world maps to become more familiar with the overall layout of the Earth’s continents, oceans, and other major features, the real purpose of this curriculum is to make students more sophisticated map users and mapmakers.

OBJECTIVES

Students will:

- Draw mental maps of the neighborhood around their school, and compare these maps to actual maps of the area
- Draw mental maps of the world, and compare these maps to actual world maps
- Compare their own maps with maps by other students, and discuss which maps show the best use of map conventions.

NATIONAL GEOGRAPHY STANDARDS

Standard 1: How to use maps and other geographic representations, tools, and technologies to acquire, process, and report information from a spatial perspective

Standard 2: How to use mental maps to organize information about people, places, and environments in a spatial context

MATERIALS

- Blank pieces of white paper, unlined (two for each student)
- Pencils and/or colored pencils
- A map of the neighborhood of the school where you teach. If you do not have access to a suitable neighborhood map, you may obtain one at Google™ Maps by following these directions:
    - Go to Google™ Maps at http://maps.google.com.
    - In the small window at the top of the Google™ Maps screen, type in the school's address, and click "Search Maps."
    - You will see the map appear on the right-hand side of the screen. In the upper left-hand corner of the map, you will see arrows pointing up, down, left, and right. You can click any of these arrows to re-center the map. You can also zoom in and out on the map by using the zoom tool below the arrows.
    - When the map looks the way you want it to, click "Print" above the map.
    - Make enough copies to supply one map to each student.
- A world wall map or world atlases

PROCEDURE

Important: Before beginning this lesson, remove any world maps from the classroom, and ask students to put away books and anything else with a map on it.

Teachers should feel free to exercise flexibility in choosing what areas students will map. You may require students to draw one map or two, depending on time constraints. You may ask them all to draw the neighborhood around the school, have each draw their own

neighborhood, or have everyone draw the entire town, city, or state. If you have been studying another nation, you may assign that. We do urge you, if possible, to have students draw two maps. The first map is meant to be a naïve effort. The second map, drawn after a discussion of map conventions, is meant to help students assimilate those conventions through the process of active learning.

First class session:

1. Give each student a blank, unlined piece of white paper. Ask them to sit back for a moment and try to visualize the neighborhood around their school. (If the school is located in a very small town, you might ask them to envision the entire town).
2. Ask students to draw maps of the neighborhood on their papers. Their maps should show the school and as many details as they can recall about the neighborhood. Ask them to be as accurate as possible, but reassure them that they will not be graded on how perfectly they draw their maps. Tell them how much time they have, and ask them to make the best maps they can in that period of time. Students should work individually, rather than sharing ideas.
3. Once students have completed their neighborhood maps, explain that they have just drawn mental maps. Define mental maps as “maps that we store in our imaginations.” Ask students to think of other mental maps that they keep in their heads (e.g. their houses, favorite vacation spots, the United States, the world) and have them share some of their ideas with the class.
4. Discuss the ways in which mental maps are important and valuable. Ask students to share their ideas regarding how they might use their mental maps in their daily lives or for special reasons. For example, they might rely on mental maps to get from place to place around town. They might also use mental maps when visiting places they have not been to in a long time or when giving directions to someone else.
5. Give students time to look at each other’s maps. Be systematic so that every student sees every map. For instance, students might leave their maps on their desks, then file up and down the rows of desks until each student has seen every map and returned to his or her desk. You may have the students sit still and pass the maps. Use whatever system best fits your class. Make sure you join them in looking at all the maps.
6. Ask students, did you see anything on anyone else’s map that looked great, something you wish you’d included on your own map? Some students will have drawn boxes to represent buildings, some will have drawn trees to represent park lands, some will have drawn waves on any bodies of water. Steer the conversation toward recognizing the value of map conventions—but delay using that term until students have already pointed out a number of examples.
7. What makes a good map? Smart use of map conventions—plus real knowledge of the area being mapped. Every map is filled with map conventions. Could a map exist without conventions? Even the idea that a small drawing can represent a large area—who decided that? It’s a tradition. It’s a convention.

8. Using a blackboard or equivalent device, ask students to list all the map conventions used in all the maps in the class. Are there some conventions that everyone used? Are there any conventions that only one person used? Did anyone look at a map and couldn't figure out what some of the symbols were meant to represent? Explain what a map legend is: a visual summary of the conventions used in a map.
9. Give each student copies of the professional map of the school neighborhood and of **Student Handout 1.** Ask students, as homework, to draw another map of the neighborhood. Their new map should (1) use a selection of the conventions talked about in class, (2) use elements from the professional map to improve accuracy, and (3) include a legend. To motivate good work, let students know that you will post as many maps as you can on a bulletin board.

Second class session:

After collecting the homework, use the *How to Analyze Maps and Atlases* PowerPoint® presentation as the basis for a discussion of some of the most fundamental map conventions: projections, scale, latitude and longitude, various types of maps, and the importance of map legends. If you have read the "Editor's Introduction," you know that we recommend against the concept of a "PowerPoint® lecture." The PowerPoint® slide presentation is designed as an organized series of discussion starters. Slides 1–35 are relevant to the fundamental map conventions.

Third class session:

Finish the PowerPoint® presentation if you did yet not get all the way through it; otherwise:

1. Pass out additional pieces of blank paper. This time, ask students to draw mental maps of the entire world. Ask them to draw the map as best they can, including continents, oceans, countries, states, cities, physical features such as mountain ranges, lakes, and rivers, and other things that are often found on world maps. Once again, let students know that their grade does not depend on how well they draw this map, but encourage them to be as accurate as possible. Ask them to use appropriate map conventions and remind them that their maps must include a compass rose and a legend—but let them off the hook when it comes to scale.
2. Once students have finished their world maps, uncover or hang up the classroom's world wall map, or allow students to look at world maps in their textbooks or atlases.
3. Ask students to compare their world maps to the actual map of the world and to answer the questions in **Student Handout 2.**
4. Discuss students' impressions of the world mental-mapping project. Did they find this activity more difficult than mapping the neighborhood? If so, why?

5. Ask the class what parts of the world they mapped most accurately. Least accurately? Ask students if studying map conventions helped make their maps better. Reassure the class about the holes in their geographic information: if they already knew everything, they wouldn't need to be in school. You might remind them of stand-up comic Steven Wright's deadpan joke: "It's a small world, but I'd hate to have to paint it." Learning about the world is a lifelong project; this week let's learn all we can about maps so, for the rest of our lives, we will understand how to read and learn from the maps we encounter. We will understand the language of maps.
6. Ask students about the conventions they used in their maps. How many people:
    - Oriented their maps to put north at the top of the page? Drew in some kind of compass rose?
    - Used lines to separate different countries, states, or other areas?
    - Used dots to represent cities? Used stars to indicate capital cities?
    - Used other symbols on their maps (such as upside-down Vs to represent mountains, or wavy lines for bodies of water)?
    - Drew the equator? The tropics of Capricorn and Cancer? Lines of latitude and longitude?
    - Colored oceans and other bodies of water blue (if they colored their maps)?
    - Included (perhaps as inset maps) the Arctic and Antarctic Circles?
    - Labeled the Atlantic and Pacific oceans? The Indian Ocean? The Gulf of Mexico? The Caribbean? The Mediterranean?
    - Included and labeled all the continents?
    - Included and labeled more than 20 countries? 30 countries? 40? 50? 190?
    - Included a legend?
7. Winding up: Tell the class that they will be learning a great deal about the Earth and seeing many more maps as they continue with the lessons and go through the PowerPoint® presentation in this unit. The activities so far have been warm-ups to get students to realize the things they already know about the layout of both their immediate neighborhood and the entire world, and to help them realize how much more there is to learn about the world. It has been a reminder of the map conventions learned in grammar school, as well as a wake-up call alerting students to how much more informative maps can be for people more expert in using map conventions.
8. Students should know that geographers agree that "geographic literacy" is the goal of studying geography. Ask what they think geographic literacy is.
9. Summing up. Tell your students what you think geographic literacy is. If you find yourself at a loss for words, perhaps you'll tell them something like this:
    - Geographic literacy, first of all, means understanding the language of maps—and understanding the language of maps means understanding map conventions.

- But there is more to geographic literacy than understanding map conventions, just like there is more to reading books than being able to sound out words. Geographic literacy really means being able to ask questions about where things are and how different places are related to each other.
- Geographic literacy means knowing how to gather information about the world's many places, and about the people in all those places.
- Geographic literacy means knowing how to organize and analyze what you know about the world, and to organize and analyze so you see with fresh eyes how all the facts fit together.
- Geographic literacy means knowing how to figure the world out. The best geographers are not the ones who know the most, but the ones who know how to ask the best questions, chase the hardest after the answers, and see how those answers raise new questions.

ASSESSMENT:

Have students write paragraphs answering the questions in **Student Handout 3.**

EXTENSION IDEAS:

- Have students draw world maps while referring to an actual world map as a guide. Ask them to compare their new world maps to the mental world maps they made before, and have them shade the new maps with different colors according to how familiar they think they are with the maps of various parts of the world. For example, they might shade parts they're very familiar with in green, parts they know something about but are less familiar with in yellow, and parts they know virtually nothing about in red. Ask students to keep these maps (or keep them in a file yourself) and, at the end of the unit, give them this same assignment to do again. Then have students compare the maps to see may if any have significantly improved their understanding.
- Discuss some of the differences between students' mental maps of the school neighborhood and of the world. Ask students why they think your mental map of the school neighborhood might be different from theirs. They should understand that our mental maps often reflect our personal experiences in a place.

  After this discussion, have students draw mental maps of a place they have visited with their families. Ask them to challenge their relatives to draw their own mental maps of the same area, and then have the whole family compare their mental maps. How do these maps differ? How might these differences reflect each person's unique experience in the place?

  Discuss how every map reflects what one person (or group of people) thinks is important.

- Look up your local area in every atlas and map that is available, compare notes as a class, then have each student write a description of how their locality fits into the larger region.
- Look up your local neighborhood on Google™ maps (http://maps.google.com/maps), then cooperate to make a custom classroom map. Each person should add at least one flag or pin (e.g., I live here; this is the skateboard park where I play with my friends; I love to shop in this vintage clothing store…) to personalize the map and make it more relevant to your students.
- Look up your school or local neighborhood on Wikipedia (http://en.wikipedia.org/wiki/Main_Page). If nothing's there, look up your town or city or region and add a header (e.g., the header "Neighborhoods of Chicago" or "Schools of Chicago" and have the class compose and add a few paragraphs about your own school or neighborhood.

LESSON 1: MENTAL MAPPING

Student Handout 1

No one who draws a map from memory will draw a 100%-accurate map. Mental maps always turn out to be inaccurate pictures of the real world (or of some part of the real world). But mental maps can be—in fact, they always are—perfect pictures of students' own ideas about the neighborhood.

1. Which parts of your mental map did you draw most accurately? Name those things here.

2. Name some things you notice on the actual map that you drew incorrectly on your mental map.

3. Can you say what made you get those details wrong?

4. What things on your mental map are not on the actual map? Why are these things important enough to be on your map?

5. If you could draw your map over again, what would you do differently?

LESSON 1: MENTAL MAPPING

Student Handout 2

1. Which parts of the world did you represent the most accurately?

2. Why do you think this is the case?

3. Are there any parts of the world that you were completely "blank" about? If so, which parts are these?

4. Why do you think these are the areas that you represented the least accurately on your mental map?

5. If you were going to draw your map over again—without having a chance to study before you draw it—what aspects of the map do you think would be better the second time around?

LESSON 1: MENTAL MAPPING

Student Handout 3

1. Which parts of the world do you know best? Why?

2. Which parts of the world do you know the least about?

3. Which parts of the world are you most curious about? For each place you name, tell why you are curious.

4. What questions do you have about the world—about the places and people in the world—that you think a deep study of geography might answer?