



Schoolyard Geology

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Lesson 1: Map your Schoolyard

Overview	Geologists do a lot of mapping. You can do the same thing in your schoolyard. This exercise introduces the concept of maps.
Learning Outcomes	<ul style="list-style-type: none">• Maps are drawings of an area as seen from above.• Maps have a scale and north arrow.• Maps have legends to explain the meaning of different symbols and colors.• Maps can be used to navigate.• Students practice the skill of navigating using a map.• Students gain appreciation for the fact that geology is all around them.
Materials	<p>Aerial photo of schoolyard printed out from the National Map web site. (see Instructions) Tracing paper for each student. Tape measure (at least one for the class, preferably more). Compass (at least one for the class, preferably more). Colored pencils (or maybe crayons, but they are usually too big and clunky). Tape (preferably transparent) Scissors Rulers A "clipboard" for each student (something sturdy to write on while outside -- textbooks, binders, etc. all work well).</p>
Time Requirements	2-3 class periods

Class Period 0 (optional background)

- This lesson addresses several skills related to mapping. To begin with, you'll need to make sure your students have sufficient background in mapping concepts. We recommend the following USGS resources for helping teach basic map skills as background. You may want to integrate sections of these background activities into Activity 1, or do them as a separate activity entirely.
 - Select the map activity appropriate for your grade level and student background: [USGS Map Activities](#).

Class Period 1

- | | |
|--------------|--|
| Instructions | <ul style="list-style-type: none">• Draw a map of your schoolyard. The details of this exercise are found here: Activity 1: Map Your Schoolyard From Above |
|--------------|--|

Class Period 2 (optional)

- Finish up the maps from the previous activity. Students will use these today in a mini-field trip to map rocks on their schoolyard. The details of this exercise are found here:
 - [Activity 2: Navigating Your Schoolyard](#)

Class Period 3

- [Activity 3: Find the Rocks](#)

Invite a professional surveyor to come your class a guest. Surveyors use amazing new technology today -- much cooler than a tape measure and compass. Look some up in the phone book or search online (Using Google-Local turned up quite a few options in my area. [Click here.](#)). Many surveyors operate as individuals with small businesses, so you can probably find someone willing to help out. Bringing their equipment for a demonstration would be really exciting for your class.

Extensions

Science Fair: This activity could also make a good science fair project as students create precise maps of their schoolyard or neighborhood.

California

[Gr1. HSS2.](#) Compare the information that can be derived from a three-dimensional model to the information that can be derived from a picture of the same location.

[Gr1. HSS3.](#) Construct a simple map, using cardinal directions and map symbols.

[Gr2. HSS2.2.](#) Students demonstrate map skills by describing the absolute and relative locations of people, places, and environments.

[Gr7. Sc7d.](#) Construct scale models, maps, and appropriately labeled diagrams to communicate scientific knowledge (e. g., motion of Earth's plates and cell structure).

Science
Standards

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Lesson 1, Activity 1: Map your Schoolyard



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A good way to learn about maps is to make and use a map of a familiar area. For young children that may not have good spatial memory of their region, city, or even neighborhood, maps of the schoolyard may be the best way to approach teaching maps.

Maps are representations of an area as seen from above. This exercise introduces students to the view of their school from an airplane flying overhead. Students then make maps of their schoolyard by tracing over an aerial photograph that the teacher downloads from the web.

Overview

Making maps using this technique can take a bit of time, requires manual dexterity, and can be difficult if the aerial photograph for your school is not good quality. Teachers should try the activity out themselves and assess the suitability for their students. If it looks too tough, all is not lost! Provide your students with a blank map with the outlines of features from the aerial photograph and have them color it in and make the legend. The teacher completes steps 1-13 of the "During Class" instructions before class (without coloring). With students, begin the instructions at step 9.

Learning Outcomes

- Maps are drawings of an area as seen from above.
- Maps have a scale and north arrow.
- Maps have legends to explain the meaning of different symbols and colors.
- Maps can be used to navigate.

Aerial photo of schoolyard printed out from the [National Map](#) web site. (see Instructions)
Tracing paper for each student.

Materials Tape measure (one for the class). Colored pencils (or maybe crayons, but they are usually too big and clunky). Tape (preferably transparent) Scissors Rulers

Time 1-2 class periods
Requirements

Introducing
the Activity

Bring in a series of maps to show your students. These can be from the library, from your car, or from books and atlases. Try to get a variety of map scales and purposes (i.e., not all road maps). Ask students what these are and why people use them. See if they can identify the features that the maps share in common. What is different about them? The main goal is to get them to realize that maps show information about an area, that they have common features like scales and legends, and that they are interesting and pretty.

Ask students if they have ever made a map before. (Some may have made maps to buried treasures with their friends). Tell them that they are going to make a map of their schoolyard today. Remind them that maps are views of an area from above -- like what you would see from flying in an airplane. Then, pass out the air photos of their schoolyard.

Instructions

Before Class: (for the teacher)

1. Follow the instructions about how to download an image of your school from the [National Map](#).
2. Print the image out so that it covers nearly a full page. If you have a good photocopier, you can use its enlarge feature. Or import the image into WORD or POWERPOINT and stretch it out.
3. Photocopy the image for your students. Check the image to make sure that there is enough contrast on the image to trace it through the tracing paper. If you can figure out how to enlarge the image in WORD or POWERPOINT, you'll find that directly laser-printing one copy for each student in your class produces a better quality image than most photocopiers. This may take a bit longer, but it will help students quite a bit.

During Class:

1. Spend some time exploring the aerial photo.
 - o Find features on your map: grass playing fields, blacktop play areas, buildings, surrounding roads, trees, bushes, play structures, sandboxes, or any other features that might be in your school yard.
 - o Point out shadows, if they are present. You might even be able to tell which features are tallest by the lengths of their shadows -- taller trees cast longer shadows than shorter trees in aerial photos. For high school students: You could even calculate the exact height of objects if you knew the time of day and time of year that the photograph was taken (so you could know the angle of the sun in the sky) using trigonometry.
 - o Optional: Notice that you can frequently see the sides of some buildings. This is because the photos are not taken exactly overhead of the schoolyard (An airplane is directly overhead a certain point, but it takes a photo of a wide area below it. You will only be able to see the top of a building located directly below the plane. However, buildings away from the center of the photograph are seen from a slight angle. You can demonstrate this with your students and a few textbooks. Place the textbooks on the ground so that they are standing upright (cover is perpendicular to the floor -- you may have to open the books slightly to keep them from falling down.) Line up two or three books about a foot apart in this manner. Have students stand next to the books so that their head is directly over one of the books. Instruct them to look straight down at the book. They should see the top of that

book, but not its cover. However, they should be able to read the cover of books located just a little bit to the side. Imagine that these are buildings and not books.). The ability to see the sides of buildings is a feature of photographs taken from airplanes. Maps, however, are not photographs and you should never see the side of a building in a map.

2. Place tracing paper on top of image. Carefully line up the tops of the two pieces of paper.
3. The next step is easier if you work together with a friend. While you hold your papers in place, have a friend prepare a 1-inch long strip of tape.
4. Have your friend attach the tape to the top edge of the top sheet so that about half of the tape is attached to the page and half is sticking off the end. Then, fold the tape over so that it attaches the two sheets together like a hinge.
5. Do this again with a second piece of tape.
6. You should be able to lift the tracing paper up to look at the image underneath without letting move when it falls down.
7. *Teacher tips about tracing:* It may be hard to see through the tracing paper. Geologists use special tables called "light tables" that are made of glass and have a light shining up to make tracing easier. You can have the same result by taping your paper to the inside of a window. Geologists also use fancy translucent tracing paper called vellum that you can write on with regular pencils or pens (available from most office supply and stationary stores, but at about 20 cents a sheet it is fairly expensive). Overhead projector sheets, while clear, require special pens (usually too thick and clunky for map making) and are also expensive. Another hint is to use a dark pen to outline the edges of individual features on the paper photocopy first. Then they will show up better through the tracing paper. Features also show up better in color than they do on black and white photocopies, so project a color version of the image from a computer or overhead projector. Experiment with the photocopy of an image from your school to see what works best.
8. Trace the outline of the image onto the tracing paper. This way, you can always align the tracing paper with the image in case your tape slips.
9. Begin by tracing the tops of buildings. Only trace the tops, and not the sides because maps are what the world would look like if you were looking down from directly above it.
10. Color the buildings in a certain color.
11. Trace the outline of any grass playing fields. Color them green, or another color.
12. Trace other features that you see on the schoolyard, using different colors when you want to.
13. In the end, you should have a nice map of your school.
14. Carefully cut the tape with the scissors to free your map from the image underneath.
15. Every map has a legend -- this is the part of the map where you explain what each color means. For example, if you used green to indicate the color of grassy areas, draw a small green square at the bottom of your map and put the word "grass" next to the square.
16. Every map should indicate which way is north. Aerial photographs from the National Map are all rotated so that north is towards the top of the page. Draw a compass rose on your map to indicate north.

Map Scale:

1. Every map also has a scale bar. While digital data downloaded from the National map include information about the scale of the photograph, there is an easy and reliable way to determine the scale of the map of your school.
2. On your map, locate a feature in the schoolyard that will be easy to measure. For example, you can measure the tip-off circle in the center of a basketball court, the width of a parking space, the length of a building, etc.

3. Go outside with your class and measure the length of that object with a tape measure. For the example school in the photo above, we measured the a basketball court tip-off circle and found that it was 4.0 meters wide.
4. Return to the classroom and measure the length of the feature on your map using a ruler. On our example printout, it was 2.4 cm wide.
5. To make the scale bar on your map, draw a rectangle the exact length as you measured with your ruler. The height of the rectangle doesn't matter. On our example map, we drew a rectangle exactly 2.4 cm wide and about half a centimeter high.
6. Above the rectangle, label the bar by writing the length of the feature in "real life" -- the length you measured with a tape measure outside on the schoolyard. For our example, it was 4.0 meters. So every time something measure 2.4 cm on the map, it should measure 4.0 meters in real life. This is a good time to go over proportions in math problems!

Now the fun begins! Students can now try to use their map. Start by asking simple questions about direction on the map:

"If you are standing at home plate, which direction do you need to travel to reach first base?" (north, south, east, west, etc...)

Once students master direction, have them try to measure distance. Start with questions about distance on the map:

"How far apart are home plate and first base on the map? Use your ruler."

The hardest conceptual leap for students is to now convert map distance into distance in the real world. Using either mathematical proportions (older students), or creative use of their scale bar, they should be able to answer questions like: "In real life, how far is it from home plate to first base?"

Closing the Activity

After students have clearly mastered the art of reading the map in the classroom, you can take them outside to test their predictions with a tape measure. Note that the distance you measure on the map and the distance in the schoolyard might be a little different. Ask students why this might be (error in tracing the aerial photo, distortion of the original aerial photo).

This closing activity is a nice transition into the [next activity](#).

Homework

Finish drawing the map for homework, including any coloring students want to do to make it look nice.

Assessment

Students could write a description about how their map compared with what they saw when they visited the schoolyard. Were there items on the map that they could not find in real life? Were there objects in the schoolyard that were not on their map? Why or why not?

Extensions

Invite a kite-aerial photographer to your school to take aerial images of your schoolyard with your students. A number of these folks have web sites and you can try to find someone in your area, though it is a relatively rare talent.

Further Web Resources

[Air Photos: Background and Application to emergency management](#)
[Aerial photography using kites](#)
[College Lecture on Air Photo interpretation](#) (PowerPoint)

Science Standards:

California

[Gr1, HSS2](#). Compare the information that can be derived from a three-dimensional model to the information that can be derived from a picture of the same location.

[Gr1, HSS3](#). Construct a simple map, using cardinal directions and map symbols.

[Gr2, HSS2.2](#). Students demonstrate map skills by describing the absolute and relative locations of people, places, and environments.

[Gr7, Sc7d](#). Construct scale models, maps, and appropriately labeled diagrams to communicate scientific knowledge (e. g., motion of Earth's plates and cell structure).

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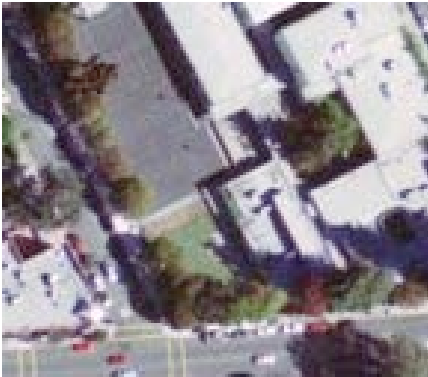
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Using the National Map



[Click to enlarge.](#)

This aerial photograph of Claremont School in Oakland was found using a free web site run by the USGS called the National Map. Cars, trees, basketball courts (including the shadow of the backboard), and even individual classroom windows are visible. You can download one of your school, too! The National Map has air photos of most of the country -- the clarity of the photos varies by region, with the best quality images covering urban areas throughout the country.

To obtain a high resolution aerial photo of your school or home:

1. Open the Terraserver portal to the National Map: <http://terraserver.microsoft.com/>
2. Type the address of your home or school on the left side.
3. Click the circular "GO" button to the right of your state.
4. A list of locations will pop up. You have the option to view either topographic maps or aerial photos. For some urban areas, you can get high resolution color aerial photos. These images are wonderful, so click on the bold words "Urban Areas" if you have the option. Otherwise, click on the bold words "Aerial Photo." The date next to the bold words indicate the approximate date the photo was taken or the map was originally published.
5. You can zoom in or out using the bar to the left of the image. You can move north, south, east, or west by clicking on the word written along the frame of the image. You can also zoom into a specific location by clicking on it on the map.
6. If you have a big screen and want the image to fill more of it, click on the size squares in the upper left corner above the image. The default is a small image.
7. You can save the image to your disk by clicking "Download" near the upper right and then following the instructions on the page below the image.
8. You can print the image by clicking "Print" near the upper right. A few options will appear along the top of the image. Click "Send to Printer" when you are ready to print. However, you might want to try "Show Grid Lines" to display latitude and longitude lines on the map, or "Switch to Landscape" to rotate the image so that it looks better on the page.

Advanced Users: Access the National Map directly to add layers, view digital elevation models, and more. While powerful, the National Map is probably too slow to use in either a classroom demonstration or activity.

1. Open the National Map web site: <http://nmviewogc.cr.usgs.gov/viewer.htm>. (The site can also be accessed from the easier to remember URL: <http://nationalmap.gov>. Click "Go to Viewer" in red on the left side to start viewing maps.)
2. From the icons on the left side, select **Find Place** (5th down).

3. Click on **Zoom to an Address** (middle of the page)
 4. Type in your *Street Address* and *Zip Code*. Click **Zoom to Address**
 5. From the right side, click on the *small black triangle* to the left of **Ortho-imagery** (middle of list).
 6. A new list will appear with all the available air photos available for this area. You'll have one or two options:
 - For urban areas, there is often high quality imagery available under the white heading **OTHER IMAGERY**. The names of these image collections can be cryptic, so just choose one to start with. Click on the *small white box* to the left of the name to turn on the check box.
 - If it says "No Imagery Available" below "OTHER IMAGERY," don't worry -- there is still a good option for you. For most of the US, there will be an item called **DOQ** in white. Click on the *small white box* to the left of DOQ to turn on the check box.
- Then, click the **Refresh Required** button at the bottom of this panel.
7. From the icons on the left side, click on **Zoom In** (2nd down).
 8. Now, move your mouse over the map in the center of the page. You can zoom in on a region by drawing a box around your area of interest. To do that, press the mouse button down in the upper corner of the imaginary box you want to draw around your school and *keep the mouse button down*. While holding the mouse button down, move your mouse and a box should draw on the map. When you let go of the mouse button, the map will zoom in on the area of you selected using the box. (If you are having trouble clicking and holding, clicking the mouse button once will recenter and zoom in on the point that you click on. This is a perfectly good option).
 9. Keep zooming in until you can see your school up close. Note that if you zoom in too far, the air photo image will not show up and you'll have only a question mark at the center of the screen. If that happens, you can select **Zoom Back** from the icon bar on the left side (4th one down). This will take you to the previous view you had. Try zooming in again to a slightly larger box this time.
 10. Feel free to play with turning on and off different layers, both in the **Orthoimagery category** and other categories on the right side.

To Save your image to a file or Print it...

1. From the icons on the left side, Click on the "Print" button (even if you don't want to print the image now).
2. A new window will pop and ask you if you would like to include latitude/longitude tick marks and a legend. Legends are an important part of maps, so you probably want to turn that on by checking the box. Latitude/Longitude tick marks are good for middle school students and above, but should probably be turned off when showing maps to younger students.
3. Click "Create Printable Map."
4. The window will change in a few seconds (up to 30). Click on the link labeled "View Printable Map."
5. Your web browser should automatically begin downloading an Acrobat PDF version of the map that was on your screen. You can save this to a disk or print it out using a PDF viewer program. The default file name will begin with "natmap" (for National Map) and will have a long string of numbers. You can rename the file.



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Lesson 1.2: Navigate your Schoolyard

Overview

Map reading seems to be a challenge for some students, but with the proper technique and repeated practice, students can master the skill. This exercise provides some hints on teaching students to read maps in the outdoors. The exercise can be combined with the next activity, "[Find the Rocks](#)."

Learning Outcomes

- Practice the skill of navigating using a map.
- Pre-drawn maps of schoolyard (from [Schoolyard Mapping Activity](#), or teachers can make the map for students if they choose not to do the previous activity. You might want to photocopy students' original maps so that they don't mess them up during this exercise.)

Materials

- At least one compass for the class, but preferably one compass per pair of students.
- At least one long tape measure for the class.
- Pencil
- Ruler
- A "clipboard" for each student (something sturdy to write on while outside -- textbooks, binders, etc. all work well).

Time Requirements

15 minutes (older students) - 50 minutes (younger students)

Introducing the Activity

To navigate using a map, you need to know where you are and where you want to go. You can find out where you are by determining your location relative to other features on the map. The more features that there are on a map, the easier it is to figure out where you are. For example, you might be next to a streetlight on the sidewalk near your school's main entrance. If you can find the school on the map, you know you must be near that. If your map shows sidewalks, you can pinpoint your position even further. But if your map does not show the location of streetlights, you'll need to use other information to figure out where you are. That's where your tape measure and compass can help you.

Head out onto the schoolyard with your school maps. Students should work in pairs to help one another try to read the map. Walk them through the following instructions, adapting them for your particular schoolyard.

Instructions for using a map:

Hold your compass level and look at the direction that the needle points. Make sure you are reading the correct end (north). You might want to draw an arrow pointing north on the ground using chalk.

Navigating using a map is a lot easier when you are holding it correctly. Hold your map so that the writing in the legend is right side up. Find the north arrow on your

map. Now, turn your whole body so that the north arrow on your map is facing the same direction as north in real life. Buildings and objects in front of you will be towards the top of the page on your map. Those that are to your right will be closer to the right side of the page (east of you). The process of turning yourself so your map north arrow faces north is called "getting oriented."

Instructions

To find out where you are located on your map, find at least one feature near you that also appears on your map. Let's say it's your school's main entrance. Using your compass, determine if you are standing north, south, east, or west of the entrance. Then, estimate or measure using a tape measure the distance between you and your school entrance. Let's say that you are about 10 meters due south of the entrance. Now, look at your map. Put your finger on the school entrance where it appears on your map. Move your finger towards south on the map. Now, use your map's scale bar to determine how long 10 meters in real life would be on your map. Measure out that distance on the map using your ruler, starting at the school entrance and moving in the direction of south on the map. Draw a dot on the map to indicate your location.

Check to make sure you are still oriented towards north. Then, look at the map and look for an object or building to the right of the dot that shows where you are currently standing. Now, look up. The object should be to your right. Looking back and forth between the map and the area around you, locate other objects that are near you. Don't forget to look behind you!

Have students move to various locations on the schoolyard and try to pinpoint their location.

Assessment

Ask students to explain the steps that they use to read a map. This can be done either verbally or in a short writing assignment.

Have students navigate to a "secret" location indicated on a photocopied map you hand out.

[USGS Map Exercises](#)

Further Web Resources

[Classroom map activities](#) (Grades 3-6)

[Critical Thinking Reading Assignment about map reading skills](#) (Grades 9-12). Have students read and discuss this article on the importance of geography and map reading from a newspaper article in 2005.

Science Standards:

California

[Gr1_HSS2](#). Compare the information that can be derived from a three-dimensional model to the information that can be derived from a picture of the same location.

[Gr1_HSS3](#). Construct a simple map, using cardinal directions and map symbols.

[Gr2_HSS2.2](#). Students demonstrate map skills by describing the absolute and relative locations of people, places, and environments.

[Gr7_Sc7d](#). Construct scale models, maps, and appropriately labeled diagrams to communicate scientific knowledge (e. g., motion of Earth's plates and cell structure).

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Lesson 1.3: Find the Rocks

Overview	<p>Rocks are all around us. Even in urban areas or built up areas around schools, geologic materials are present -- even if they are not in their natural form. This exercise is targeted towards younger students (Grades 1 - 4), but could serve as a short introductory/reconnaissance activity for further schoolyard mapping activities for older students. Students place the location of rocks on a map of their schoolyard, which could be combined with the previous activity "Navigate your Schoolyard."</p>
Learning Outcomes	<ul style="list-style-type: none">• Students gain appreciation for the fact that geology is all around them.• Practice the skill of navigating using a map.
Materials	<ul style="list-style-type: none">• Pre-drawn maps of schoolyard (from Schoolyard Mapping Activity. (Teachers can make the map for students if they choose not to do the previous activity). You might want to photocopy students' original maps so that they don't mess them up during this exercise. (optional)• Pencil• A "clipboard" for each student (something sturdy to write on while outside -- textbooks, binders, etc. all work well).
Time Requirements	10 minutes (older students) - 30 minutes (younger students)

Introducing the Activity

Rocks are all around us, and they play an important part of our lives. Who knows what people use rocks for? (examples include making cement for buildings, copper for electronic wiring, gold for jewelry, metal for cars, petroleum for fuel, and many more.). Lead students to make sure that they include gold. Why is gold so expensive? Because it's rare -- that means it's hard to find. Today we're going to go out on the schoolyard to find rocks. We probably won't find much gold, but we are going to start looking for all the places that we find rocks.

Find the rocks (Younger Students)

Students should go out onto the schoolyard in a single-file line. Walk the students along a pre-determined route around the schoolyard. Ask them to raise their hands when they locate rocks. Depending upon your class and age group, you can instruct students to write out a one sentence description of where they saw a rock and what it looked like. You can also give students five minutes to roam around the schoolyard on a quest for rocks. If you have bonus points or other incentives, offer them for the student who identifies and describes the most rocks in his or her notebook. Other options include having students sit in one spot and draw a picture of a rock they see.

Instructions

Take a look at the web resources below and read about different building stones and building materials. Be able to take students to a particularly interesting building stone -- even if it is just asphalt on their playground. Ask them if they can guess about its history. Tell them the process that you think it got there, including the stage that it was at one

point underground.

Making a geologic map: (Older Students)

If you decide to have students mark the location of rocks on their map (better for more advanced students), introduce the idea: Let's start making a certain type of map called a **Geologic Map**, which shows the location of rocks. Geologists use these maps to show the location of volcanoes, earthquake faults, landslides, gold mines, and other important geologic features. Right now, all we want to do is put an 'X' everywhere we see some sort of a rock in the schoolyard. For more advanced students, you can have them record a number on the map and then describe the rocks they see at that location (optionally combine with [Lesson 2: Rock Stories](#) by having them number and record locations now and then return to those locations during the next lesson.).

Closing the Activity

Students should have enjoyed their trip outdoors and will be particularly wound up upon returning to the classroom. Transition into asking students to describe where they saw rocks. If students used a map, you can project it onto the screen and have students indicate specific locations on the map. Either way, have students describe the locations where they found rocks. Were they all on the ground? Were they all a certain shape? A certain color? Hopefully students will end up by realizing that rocks are all around us in different shapes, different colors, and with different uses. Without rocks, there probably wouldn't be a schoolyard to visit!

Homework

Have students look for rocks on their way home from school and while at home. Have them write a description of the most interesting rock they saw. They should include a description of the location where they found it, what it looked like, and why they liked it so much.

If you are lucky at your school site, this activity will expose your students to exciting examples of stone building materials. There are abundant web resources about natural stone building materials on the web. We recommend the following general web sites.
[Global Examples of Building Stones](#) ** Excellent site!
[General Building Stone Information Activity](#)

*For trips outside your school site, take a look at these web sites about **Urban Geology Walking Tours in your neighborhood**. Tours with a ** have explanations of stone buildings that are particularly interesting and might be good background for any area:*

Further Web Resources

- [California - Berkeley](#)
- [California - Hayward](#)
- [California - Oakland](#)
- [California - Santa Cruz](#)
- [Illinois - Chicago](#)
- [Illinois - Chicago 2](#)
- [Maryland - Baltimore](#) **
- [New Mexico - Albuquerque](#)
- [Ohio - Cleveland](#)
- [Ohio - Cincinnati](#)
- [Utah - Salt Lake City](#)
- [Washington - Spokane](#) **
- [Washington, D.C.](#) **
- [Washington, D.C. 2](#)
- [Canada - Ontario - Toronto](#)
- [UK - general](#)
- [UK - London and others](#)
- [UK - Cambridge](#)

California

[Gr1.Sc4b](#). Record observations and data with pictures, numbers, or written statements.

[Gr1.Sc4d](#). Describe the relative position of objects by using two references (e.g., above and next to, below and left of).

[Gr2.Sc3](#). Earth is made of materials that have distinct properties and provide resources for human activities. As a basis for understanding this concept:

[Gr2.Sc3a](#). Students know how to compare the physical properties of different kinds of rocks and know that rock is composed of different combinations of mineral

[Gr4.Sc4a](#). Students know how to differentiate among igneous, sedimentary, and metamorphic rocks by referring to their properties and methods of formation (rock cycle).

[Gr9-12.ES3c](#). Students know how to explain the properties of rocks based on the physical and chemical conditions in which they formed, including plate tectonic processes.

Science Standards