Mapping Your Schoolyard

Activity Overview
Students use compasses and measuring tapes to create a map of their schoolyard.

Objectives
Students will:

- Measure their schoolyard using measurement tools
- Understand the relationship between a map and terrain
- Transpose observations on the ground to a scaled drawing
- Experience cooperative learning
- Understand how the school map will inform their restoration project

Subjects Covered
Math and Social Studies

Grades
3 through 12

Activity Time
1 hour units, number of units depends on the size of your schoolyard

Season
Any

Materials
Existing maps of your school grounds (if possible), a classroom set of compasses, at least 2, 100 - 200 foot or meter measuring tapes, grid paper, surveyor flags, clipboards, pencils, a ruler, table for setting up outside

State standards
Math:

Use coordinate systems to find map locations (C.4.4)

Use rectangular coordinate system to locate objects (C.8.5)

Analyze properties and relationships of figures (C.12.1)

Background

A map of the school yard is essential for developing a restoration plan for several reasons. The map of the school site helps you envision and effectively develop a landscape design plan that meets student learning objectives while restoring a natural landscape. Educationally, the mapping process offers hands-on, cooperative skill building experiences where students can employ math skills and visualize spatial relationships.

The first step in the map making process is to locate existing maps of the school property such as construction blueprints, topographic maps from the U.S. Geological Survey, city and community maps. These maps will save steps and time by providing a base map of your site. Additionally, you can use these maps to look at your school's position in relation to its surroundings, such as its geographical location, its position in the watershed, and its neighboring landowners. The maps may enable you to predict future land uses and future development that may affect your project. You can also identify natural areas with similar topography, soil, and hydrology that you can use as models for planning your restoration. All of this information will help you to understand your school's connections and relationships to the local environment.

Many schools have site maps showing the building locations and property perimeter. If not, you will need to begin mapping by measuring the perimeter of the schoolyard and then adding distinguishing features. Your completed map will show locations of all permanent features such as buildings, drives, sidewalks, fences, walls, and other permanent structures; utilities above and below ground; playgrounds and athletic fields; existing vegetation and open water.

Ultimately, this map will become a tool to help you determine what plant communities to plant on your site and where to plant them. The exact form a restoration takes can be determined by design considerations/restraints as well as your project goals and objectives. You may decide to include outdoor classroom seating areas, benches for quiet contemplation or socializing, pathways, rain gardens, butterfly and wildlife plantings, etc. There are many different ways to map your schoolyard. The following activity describes one way to create a map. Students may want to figure out their own way to map their grounds; for instance, students could use grid paper to estimate the location of objects and to create a relational scale among those objects. Regardless of approach, your final site map must include the following basic information:

1. direction and scale of the map
2. the physical outline of the site
3. location of human-built features such as buildings, utilities, play areas, and fences
4. slopes, low areas and high spots
5. soils

Use geometric models to solve problems (C.12.2)

Recognize & describe measurable attributes & units (D.4.1)

Demonstrate understanding of measurement (D.4.2)

Read & interpret measuring instruments (D.4.3)

Determine measurements by using standard tools (D.4.4)

Determine measurements by using basic relationships or estimations (D.4.5)

Identify & describe attributes in situations not directly or easily measurable (D.8.1)

Demonstrate understanding of measurement facts, principles, techniques (D.8.2)

Determine measurement directly by using standard units (D.8.3)

Determine measurement indirectly (D.8.4)

Select & use tools to determine measurements directly (D.12.2)

Determine measurement indirectly (D.12.3)

Social Studies:

Use reference points to locate positions on earth's surface (A.4.1)

Use atlases, databases, charts, graphs, maps, etc. (A.4.5)

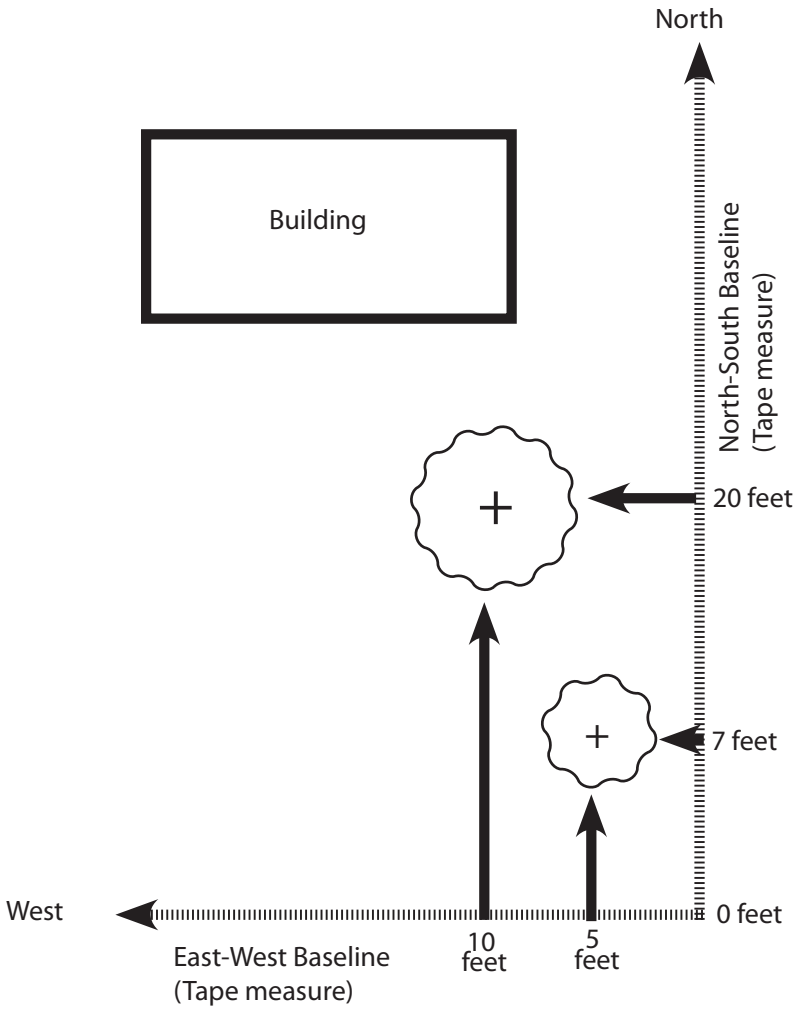
6. existing vegetation
7. light availability
8. traffic patterns
9. other uses

Pre-activity Preparation
Inside Preparation:

1. Divide the schoolyard into "mapping sections" to accommodate length of measuring tapes, time available, and class size (i.e. classroom management).
2. Determine the scale on your map based on the size of your schoolyard or mapping sections. The ultimate scale should allow you to view the whole site with adequate detail. Depending upon the size of your site, a scale ranging from 10 to 40 feet per inch seems to provide satisfactory information. Fitting a map on 11 X 17 grid paper is practical for making multiple copies and for student usability. Mapping sections can be pieced together to view the entire school property. One way to determine the scale of the map is to measure the perimeter of the school property or selected area and determine a ground to map ratio that will fit the size of paper. For example, if the area measures 320 feet by 200 feet and the paper is 17 X 11 inches, you may calculate a scale of 1 inch = 20 feet through simple division (320 ÷ 17, 200 ÷ 11). The site will measure 16 by 10 inches on the paper. This step takes some trial and error calculations. You can purchase grid paper to fit your scale or you can make a grid on the computer.
3. Familiarize students with compass operation using Earth Partnership for Schools activity , "Compass Basics." Students will need to be able to sight objects using cardinal directions N, S, E, and W. Students can also map their classroom as a warm-up exercise.
4. Assemble measuring equipment -- at least two measuring tapes, surveyor's flags, one compass per student, pencils for marking objects on the map, masking tape, and a folding table or other flat surface.

Outside Preparation:

1. Extend the measuring tapes on the ground to use as "baselines" for plotting the location of objects. First, lay out a baseline measuring tape on the north/south axis. Use a directional compass (set compass bearing N or S depending on walking direction) and one measuring tape. Walk in a north or south line using a compass while laying the tape on the ground. Place surveyor's flags at 20 foot intervals to help mark the baseline. Add additional tape measures to lengthen the baseline, if desired.
2. Next, layout a baseline on the east/west axis. Begin on the 0 mark of the north/south line and lay out the second baseline perpendicular to the first. Again use a directional compass (set compass bearing E or W depending upon walking direction) and one measuring tape. Walk in an east west line using a compass while laying the tape on the ground. Place



Tape measures laid out as baselines to locate trees.

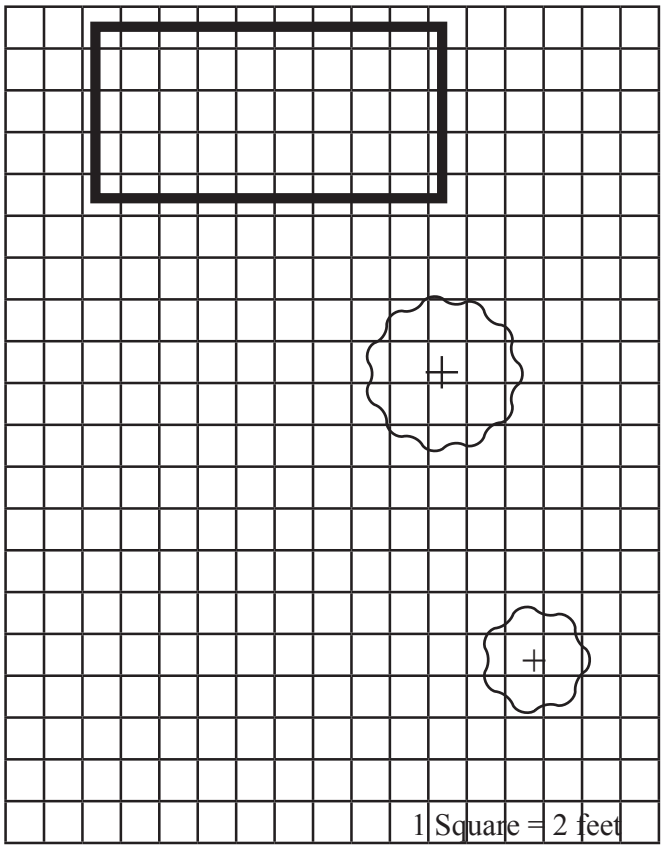
surveyor's flags at 20 foot intervals to help mark the baseline. Add additional tape measures to lengthen the baseline, if desired.

3. Transpose the baseline onto the grid paper map. Use a ruler to draw the base lines on the map. Tape the map on a card table or other flat surface in the mapping area.

Activity Description

1. Before going outside, review the mapping procedure on an overhead projector or chalkboard.
2. Form teams of two. Go outside and practice locating objects using the compass. First, line up on the N-S baseline. One partner takes 10 to 20 steps away from the N-S baseline while his/her partner stands opposite on the baseline. The partners should be facing each other. The person on the baseline sets his/her compass bearing to East and moves along the baseline until the partner is sighted exactly East on the compass. Look down and read the measurement on the baseline. This is the distance your partner is from 0 on the north/south baseline. Now trade places. Repeat.

Mapping Your Schoolyard (cont.)



Map on grid paper showing location of trees and a building.

3. Next, go to the E-W baseline and repeat this practice exercise except set the compass bearing to N or S. When locating real objects, you must sight each object from the N-S baseline and the E-W baseline.
4. Now you are ready to locate trees, benches, etc., within the designated area. You will do this by sighting objects from each baseline so that you take two measurements for each sighted feature. After an object is sighted, place a flag next to it so others know it has already been located for the map.
5. Once the measurements are taken go to the map and mark the object on the map.
6. Once all objects have been sighted, create a final map.
7. Have students discuss how the information they collected will inform their project.

Please note that this activity is written with two base lines joining at the 0 marks. Another option is to have the baselines intersect in the middle. The second option creates four quadrats. Each schoolyard is unique; try to layout your baselines to minimize the number of baselines needed to map your site.

Mapping Your Schoolyard (cont.)

Extensions

- Digitize the schoolyard map.
- Create a 3-D model of the schoolgrounds.
- Make map overlays using tracing paper of soils, sun shade patterns, and hydrology. See Earth Partnership for Schools activity, "Noting Notable Features."
- Identify and examine characteristics of existing plants on the school grounds. Activities may include a key for identification, measuring the diameter and canopy, and measuring the shade patterns cast by the plants at different times of the day.

Additional Resources

- Sobel, D. (1998). Mapmaking with children: Sense of place education for the elementary years. Portsmouth, NH: Heinemann Publishers.

Websites

- Department of Natural Science, Edgewood College, Madison, WI. Maps and mapping, http://natsci.edgewood.edu/wingra/watershed/watershed_maps.htm.
- United States Geological Survey (USGS) Learning Web. Map adventures, K- 3. http://interactive2.usgs.gov/learningweb/teachers/mapadv.htm.
- United States Geological Survey (USGS) Learning Web. What do maps show?, grades 5 -8. http://interactive2.usgs.gov/learningweb/teachers/mapsshow.htm.
- United States Geological Survey (USGS) Learning Web. Exploring maps, grades 7 – 12. http://interactive2.usgs.gov/learningweb/teachers/exploremaps.htm.

Assessments

- Provide sighting measurements for trees, benches, signs, etc., and then locate these features on a map.
- Explain to another student how to set up a baseline.
- After experiencing this mapping method, describe alternate ways you might map a schoolyard.
- Describe the challenges you encountered mapping and how you might problem-solve solutions.
- Have students present their completed map to classmates and explain why the map is important to the restoration project.