

## Lesson 5: Teaching Directions, Maps, and Coordinates

Give students a lesson in navigation—from the points of the compass to GPS mapping.

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Teach your students some basic and more complex directional skills so they can navigate nature and the greater biosphere. This lesson starts with teaching basic directions and mapping techniques, then moves on to taking latitude and longitude coordinates and using GPS units.

### Directions and Maps

In two parts, teach your students about the cardinal directions and how to use a compass and maps. The lesson includes outdoor activities.

#### PART 1: DIRECTIONS

1. Sit in a circle outside. Ask students
  - » Where's the sun?
  - » What direction is the sun?
  - » Which way is north?
2. Use an object, such as a branch, to depict north. Explain the other cardinal directions and use a mnemonic device to aid students' memory, such as the sentence "Never eat soggy Wheaties."
3. Ask students to use materials in the area to mark the other directions.
4. Explain what a compass is and how it functions.
5. Use a compass to test the accuracy of where students placed objects to mark directions in step 3. Make any needed corrections.
6. Say the different directions out loud, and ask students to point where the direction is on a compass wheel or on a makeshift wheel outside. You can also hand out cards with directions for students to place on the wheel. For older students, ask them to determine more precise directions, such as northwest or southeast.
7. Go inside and ask students to find north and other directions in the classroom.
8. Have the students make direction markers and post them on the walls of the classroom. Double-check the location with a compass.

### LESSON OBJECTIVES AND MATERIALS

#### OBJECTIVES

- » Understand cardinal directions
- » Practice using maps
- » Learn how to use a compass
- » Use a GPS unit and understand latitude/longitude coordinates

#### MATERIALS

- » NM data-collection form
- » Field guides or animal fact sheets
- » Compass
- » Compass wheel
- » Different maps
- » Field journals (bound scientific notebooks)
- » A 4-foot square piece of colored paper
- » Transparent tape
- » Note cards
- » Globe
- » GPS unit

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## Directions and Maps (continued)

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### PART 2: MAPS

1. Explain to students how to use maps. Demonstrate several different types of maps, such as topographic, city, or state maps.
2. Ask students to list what information they can get from a map, such as directions, landmarks, and building projects.
3. Ask students to work together to determine which map would be best to find their way in the following scenarios:
  - » Going from your house to a downtown library (city map)
  - » Going from your house to a different elevation (topographic map)
  - » Going from your house to a different country (world map)
  - » Going from the school to the airport (road map)

## Practical and Assessment

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### Practical

Test your students' understanding of directions and mapping by taking them outside and asking them to point or position cards in the directions you say aloud (such as east, west, or southeast).

### Student Assessment

How'd your students do? Here are some ways to assess your students' comprehension, reflective of grade level.

#### EXCEEDS STANDARD

- » Student was able to point or place cards in the correct direction eight out of eight times.

#### MEETS STANDARD

- » Student was able to point or place cards in the correct direction seven out of eight times.

#### BELOW STANDARD

- » Student was able to point or place cards in the correct direction fewer than seven out of eight times.

### KEY POINTS

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Are some students picking up software skills more quickly than others? Ask them to help the students who are having trouble.

## GPS Units

Teach students about mapping latitude and longitude lines using GPS units. This lesson is split into three parts. The first part focuses on an activity of mapping the schoolyard to engage students, the second part introduces GPS units and how to use them, and the final part ties the others together by getting students to pinpoint exact locations on the schoolyard map.

### PART 1: MAPPING THE SCHOOLYARD GEOGRAPHICALLY

**Pre-Lesson Preparation:** Create a rough diagram of your schoolyard on a 4-foot-square piece of colored paper. You will add landmarks and points of interest later.

1. Show students your diagram of the schoolyard and discuss the orientation.
  - » Which way is north on our school grounds?
  - » What kinds of things could we add to make it easier for new students to find their way around our school? Make a list.
2. Ask students to sketch a map of the schoolyard in their field journals, noting important landmarks and geography.
3. Brainstorm different elements they'd like to include on the map, such as flagpoles, swings, trees, baseball diamonds, or lights.
4. Write the points of interest you come up with on note cards, and give one to each student.
5. Each student will draw the object listed on his or her note card on small pieces of paper. They will add these to the schoolyard diagram.
6. Ask students to attach each item to the diagram where they think it belongs. Use transparent tape so that students can move the objects around easily in the next section.

### PART 2: LATITUDE AND LONGITUDE LINES AND USING GPS UNITS

1. Ask students how they can validate the location of objects placed on the diagram in the previous activity. Brainstorm possible answers.
2. Refer to the NM data-collection form, and point out the section on taking latitude and longitude.
3. Show the students a globe, and explain to them the lines of latitude and longitude.
  - » Lines of latitude run horizontally and provide locations in the north/south directions, depicting north as a positive number and south as a negative number.
  - » Lines of longitude run vertically and provide locations in the east/west directions.
  - » Explain that each number reflects location in degrees, minutes, and seconds. For example, one reads  $47^{\circ} 15' 25''$  as "47 degrees, 15 minutes, and 25 seconds."
  - » You can write a coordinate in many different ways to precisely express a location on earth. For example, you can write  $47^{\circ} 15' 25''$  as 47.1525 or  $47^{\circ} 15.25'$ .
  - » Each degree of latitude represents 69 miles, each minute 1.15 miles, and each second 0.02 miles.
  - » Degrees of longitude vary in size, decreasing as one moves in both directions toward the poles.

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### CUSTOMIZATION TIP

Is the lesson too simple or advanced for your students? Here are some ways to customize the lesson based on grade level:

- » **Grade K:** Help students create and post objects on the map.
- » **Grade 1:** Create symbols for students to place on the map.
- » **Grade 2:** Give students more independence to make symbols and to use a map key.
- » **Grades 3-6:** Encourage students to map the schoolyard using GPS locations as they learn latitude/longitude coordinates.
- » **Grades 7 and up:** Challenge students to convert GPS and map locations from degrees and minutes into decimal degrees. Use grid paper to draw the school to scale.

## GPS Units (continued)

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4. Follow the NM lesson on how to use a GPS unit at: [depts.washington.edu/natmp/education/protocols/8\\_using\\_maps.html](https://depts.washington.edu/natmp/education/protocols/8_using_maps.html).
5. Pair students together, and equip each pair with a GPS unit. Explain that one student will read the unit while the other student records readings in his or her field journal.
6. Ask students to walk the schoolyard from south to north, writing latitude numbers every fifty feet as directed.
7. Repeat the step for writing longitude numbers from east to west.
8. Return to the classroom and ask students what they observed and if there was a number pattern.
9. Use a globe or a map to review why the numbers increase and decrease.
10. Talk about satellites and show how they work.

### PART 3: MAPPING THE SCHOOLYARD WITH GPS UNITS

1. Explain to students that they'll use the GPS unit to test the precision of objects placed on the schoolyard map.
2. Take latitude and longitude numbers (as a group) around different points of the schoolyard – at the corners and around the perimeter every ten feet or so.
3. Ask students to take GPS readings of their objects in the schoolyard.
4. Record all numbers on the large schoolyard map, and move the objects to the correct location as needed.

### KEY POINTS

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Don't have a GPS unit? Try using Google Earth or other online programs to pinpoint different longitude and latitude coordinates. Or use a globe or military map for inexact estimates.

## Practical and Assessment

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### Practical

Test your students' understanding of GPS units and latitude/longitude readings. Place Popsicle sticks in different locations around school grounds. Ask students to use their GPS units to record the latitude/longitude of each stick.

### Student Assessment

How'd your students do? Here are some ways to assess your students' comprehension of the material, reflective of grade level.

#### EXCEEDS STANDARD

» Student was able to identify the correct latitude/longitude coordinates ten out of ten times.

#### MEETS STANDARD

» Student was able to identify the correct latitude/longitude coordinates nine out of ten times.

#### BELOW STANDARD

» Student was able to identify the correct latitude/longitude coordinates eight out of ten times.

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## Links to Related NatureMapping Activities

If you enjoyed this lesson, check out these links to additional NM materials.

**Introduction to Mapping Part I:** An activity that teaches students about map elements and using them to find map locations, the idea of map scale, and how to measure using pacing: [depts.washington.edu/natmap/education/protocols/6\\_mapping\\_part1.html](https://depts.washington.edu/natmap/education/protocols/6_mapping_part1.html)

**Introduction to Mapping Part II:** Teaches the idea of map scale and how to read topographic maps: [depts.washington.edu/natmap/education/protocols/6\\_mapping\\_part2.html](https://depts.washington.edu/natmap/education/protocols/6_mapping_part2.html)

**Using Maps: Where Are You?:** Students learn how to locate the Township, Range, and Section, latitude and longitude or UTM of their homes and school: [depts.washington.edu/natmap/education/protocols/8\\_using\\_maps.html](https://depts.washington.edu/natmap/education/protocols/8_using_maps.html)

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