ORNITHOLOGY

LESSON PLAN

Meets the following 5th Grade Science Standards:

Life Science:

2a: Students know many multicellular organisms have specialized structures to support the transport of materials.

2c: Students know the sequential steps of digestion and roles of teeth and the mouth, esophagus, and stomach

Investigation and Experimentation:

6a: Classify objects

6b: Develop a testable question

6f: Use tools and make observations

6g: Record data

6h: Draw conclusions and indicate if more evidence is needed

Meets the following 6th Grade Science Standards:

Ecology:

5a: Students know energy enters the ecosystems as sunlight by producers into chemical energy through photosynthesis and then from organism to organism through food webs.

5b:

ORIENTEERING

TEACHER'S NOTES

Scripture References:
Proverbs 16:9 – "*The heart of man plans his way, but the Lord establishes his steps."*

I. Directions and Degrees

A. An understanding of directions and degrees is an essential foundation to a student's development in basic navigation.

B. The four basic directions can be easily remembered with a mnemonic phrase "**N**ever **E**at **S**oggy **W**affles" (**N**orth **E**ast **S**outh **W**est).

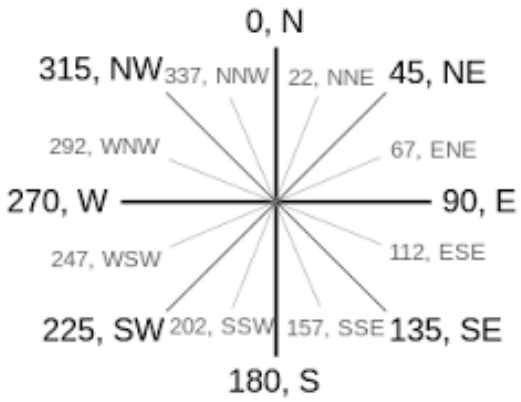
1. Have students share other mnemonic phrases they may have been taught, and then have them record at least one of those phrases in their notebooks; make sure they are appropriate.

C. These directions always remain the same relative to each other, which means if you find one direction, you can find the other three directions.

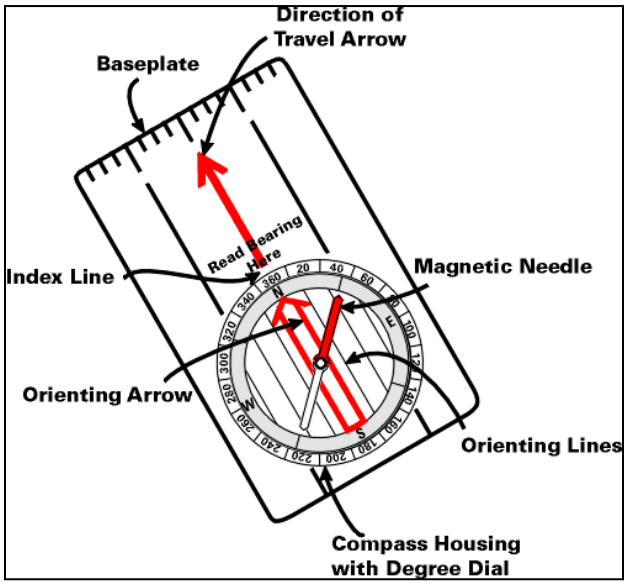
1. As a result, students can use the sun to help them figure out directions. The sun rises in the East and Sets in the west. When it is later in the day, they can find the position of the sun, know that they are looking west, and thus find North, South, and East as well. This basic understanding can equip them to succeed if/when they are lost.

D. Every direction can also be represented by a degree. Degrees help us to be more precise in navigating.

1. There are 360 degrees in a circle.
2. North = 0 or 360 degrees.
3. North East = 45 degrees.
4. East = 90 degrees
5. South East = 135 degrees.
6. South = 180 degrees
7. South West = 225 degrees.
8. West = 270 degrees.
9. North West = 315 degrees.
10. Have students record these degrees in their curriculum.



II. The Parts of a Base Plate Compass



A. **Base plate**: The base plate holds all of the compass parts. The base plate must be held level and horizontal for the compass to work. The base plate has inches on one side and millimeters on the other so that you can use it with your map to determine the length of your trip. You do this by measuring the distance and using the map scale to convert the inches or millimeters to miles.

B. **Compass Housing with Degree Dial**: This circle contains the magnetic needle. The dial has degree numbers on it as well as directions. You turn the dial to find and follow directions. This dial can be moved. The model shown above only shows degrees in 10 –degree intervals; other compass models may show 2-degree intervals or more than 10-degree intervals.

C. **Magnetic Needle**: This is painted red and is on a rotating pivot. It always points to magnetic north UNLESS there is something interfering (such as a large metal object).

D. **Index Lines**: This is a stationary white line that identifies your bearing, which is the degree you are trying to follow or find.

E. **Orienting Arrow**: This is the red outlined arrow on the bottom of the compass housing. It can be moved with the compass housing so that you can orient or point yourself in the right direction. We call this "the shed". We put Fred (the magnetic needle) in the shed and then follow "Mr. Dot" which allows us to take or follow that bearing.

F. **Mr. Dot/ Direction of Travel Arrow**: This arrow will point straight in front of you and point in the direction you should travel. By following "Mr. Dot" after you have put "Red Fred" in the "Shed," you will travel in the correct direction.

G. Depending on the model, compasses may also have a lanyard hook, east and west declination points, extensions for straight-edge work, whistles, or other features.

III. How to Use a Base-Plate Compass

A. To use a compass, it must be level and horizontal. It also must not be near any iron or steel objects (or magnets). Stay away from pocket knives, belt buckles, railroad tracks, trucks, electrical lines, etc. when using a compass in the field. It is also a good idea, if you are depending on a compass for navigation, to carry an extra one with you in case the first one gets broken.

B. To make compass use simple, we call the **magnetic needle Red Fred**. Have students identify Red Fred. We call the **red outlined orienting arrow** "**the Shed**." Have students identify "the shed". We call the **direction of travel arrow** "**Mr. Dot**". Mr. Dot should always be pointed in the direction you want to go (away from your body).

C. Taking a Bearing (Degree)
   1. Point Mr. Dot at the direction or object you want to go
   2. Put Fred in the shed by rotating the compass housing.
   3. Read the bearing at the index line/the degree at Mr. Dot.

D. Following a Bearing (Degree)
   1. Set the degree you want to face at the index line/Mr. Dot.
   2. Put Fred in the shed by slowing rotating your whole body.
   3. Find an object that lines up with Mr. Dot and walk directly to that object, counting your paces. YOU DO NOT look at the compass as you walk. (This is because you could walk sideways and still keep Fred in the shed.

E. Optional Student Challenge: Point to several objects in the distance, and have students take a bearing to that object. The angles will all be different, so answers will also be different.

IV. Paces

A. The origin of the word "pace" comes from Roman soldiers who used 1,000 paces (double steps) to go 5,000 feet…almost a mile. "Mille passus" is Latin for 1,000 paces and that is where word mile comes from.

B. A pace when defined as two steps is about five feet. Because of the ambiguity of the definition and length, paces are either defined clearly or not used in orienteering or letterboxing sports. **We define a pace as a double step and will teach students how many of their paces equal smaller set distances in feet.**

C. We will set up four distances to test a student's pace. The distances will be 10 feet, 25 feet, 50 feet, and 100 feet.

D. Have students walk and count their paces for each distance three times. They should record their average number of paces for each distance in their handbook.

V. Scavenger Hunt with Compass

A. Allot 30 minutes for students to use their newfound skills in a scavenger hunt. The instructions are on the last page of the Orienteering section.

B. Split them into groups. Have them record their answers and award the winning team(s) a prize.

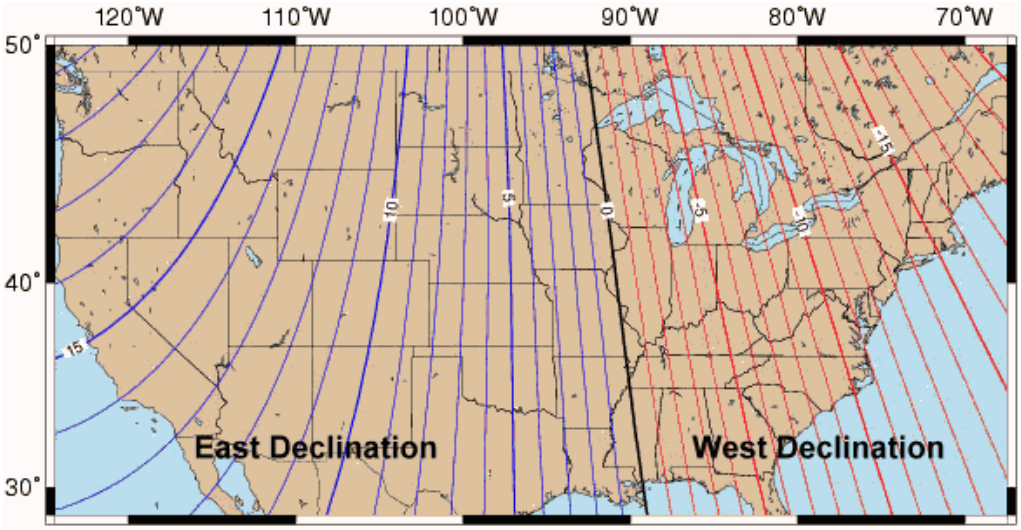
VI. Extra Resources

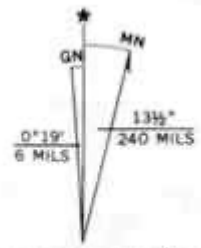
A. Suggested spiritual applications:

1. If we don't know where we are going, then we obviously cannot plan a route to get there.
2. In order to navigate, we must have a point of stable reference (magnetic north). In order to navigate life, we must have Christ as a point of reference.
3. The Bible is a spiritual map. It tells us boundaries as well as the "contour" of the land. With the Holy Spirit as the compass pointing to Christ, the "true north", we can reach our destination of Heaven.
4. If we are lost, we need to take inventory to determine what we need to survive. What do lost people and unsaved people have in common? What do unsaved people need to do to get what they need in order to survive (live forever)?

B. Magnetic Declination

1. Because of fluctuations in the Earth's inner and outer core, magnetic north is in flux. Maps are oriented to True North as it is too expensive to make a new map every time the magnetic north changes. The difference between true north and magnetic north is called magnetic declination or just declination. Declination not only changes yearly; it changes depending where you are. In general, the Mississippi River in the U.S. is at 0 declination. As you travel east or west of this, the declination increases or decreases. Maps have the declination for their area for THE YEAR THE MAP WAS PRINTED. In order to find the CURRENT declination, you can contact gdc.noaa.gov/





2. From the map above, you can see that the magnetic declination (sometimes called variation) for Angeles Crest is about 12 East according to current declination maps.

3. At the lower left-hand corner of topographical maps there is a symbol called the magnetic declination. The symbol is used in conjunction with a compass for navigational purposes. The center line with the star above represents the direction of true geographic north. The line coming off to the right represents the direction of magnetic north. When using a compass, the needle always points to magnetic north. The symbol tells you that for the area this map covers, the magnetic compass needle will always point 13.5 degrees to the east of true geographic north. To the left of the true north line is the grid north line. This tells you how much the UTM grid and zone lines are offset from true north.
4. The difference between magnetic north and true north varies with location (where you are) and is called magnetic declination. Most maps are oriented to True North (the axis on which the Earth turns) so you must correct the compass bearing to get an accurate direction. Maps will indicate what this correction is for the year the map was printed.
5. To make the correction, you adjust the orienting arrow on the compass to whatever the declination is. If you can't adjust the arrow, then you SUBTRACT east declinations and ADD west declinations. {To remember this, think East is Least and West is Best (or more)}.
6. Angeles Crest declination is 12 degrees east. Therefore, if you have a 90-degree bearing, you go 78 degrees (subtracting 12 degrees from 90). True = Magnetic + Declination. If you use the magnetic north arrow on a map, then adjust your orienting arrow on your compass; this automatically takes the declination into account.

C. Using a Compass with a Map
1. Maps are aligned with true north (the North Pole). Compass needles, however, point not to true north but to magnetic north. (See explanation which follows). If you are using the compass and a map to find your way, then you will have to adapt to the difference in magnetic and true north (assuming there is a difference). Some parts of the U.S. do not have a difference. In general, the farther away you are from the Mississippi River; the more difference (called declination) you will have between true and magnetic north. True north does not change; magnetic north, because of fluctuations in the Earth's core, is in constant flux. (As a side note, some scientists believe the magnetic poles will reverse in the near future. The rate of change in magnetic north has increased in the last 10 years).
2. To use a compass with a map you must: Lay your map on the ground or a level surface.
3. Set the compass to North by putting N at 0 degrees.

4. Find the compass rose (see below) or direction indicator on the map and line up the long edge of the compass with the magnetic north line with Mr. Dot pointing to magnetic north. Make sure the dial is still set to north. If the map has a magnetic north arrow, use it…not the true north arrow as this automatically compensates for the declination.
5. If the map does not have a magnetic north arrow, then you need to know the declination and adjust the compass accordingly. Declination for ACCC is 12 East so you subtract 12 degrees from your bearing.
6. With the compass lined up with magnetic north, turn the MAP (not the compass) so that Fred is in the shed. This aligns the compass with real direction.
7. DO NOT move your map as it is now oriented to true direction. Find where you are on the map….and where you want to go. Draw a faint, straight line between the two, using the long edge of the compass.
8. Lay the compass down so the straight right-side lines up with the line you have drawn on the map. Mr. Dot should line up with the direction you want to travel.
9. Put Fred in the Shed by moving the compass housing. DO NOT move the compass itself or the map.
10. Read the bearing (degree) that is lined up with Mr. Dot. This is the bearing you will follow.
11. Now, put the map away. To follow the bearing, you……find an object at that degree angle and walk towards it, holding the compass in your hand horizontally. Look at the object, not the compass.
12. When you get to that object, check your bearing. Find another object at that degree setting, and walk to it as in #9. Continue this until you reach your intended destination.
13. Congratulations! You did it!

D. How to Make a Home-Made Compass
1. Magnets come in a variety of shapes, such as horseshoe and rectangular. All magnets have north and south poles. If you have a rectangular magnet, tie a thin thread to the center of the magnet and tie the opposite end of the thread to any stationary object (chair, tree limb, etc.). Adjust the string on the center of the magnet until it is evenly balanced and then wait for the magnet to stop moving. It will be aligned to the north and south poles of the Earth. If you know which direction is north, then you can mark the north end of the magnet for future reference. However, remember that opposites attract. The south end of the magnet will be pointing to the North Pole. The north end of the magnet will be pointing to the South Pole.

2. If you have a magnet and a sewing needle (this works with a metal paper clip or a small nail, too), then stroke the north end of the magnet along the surface of the sewing from its eye to its point. Remove the magnet from the point of the needle, lift it up, and put in on the eye of the needle again. Stroke the needle 30 times from its eye to its point, always in the same direction. Then put a small cork or a piece of wood or Styrofoam in a bowl of still water. Put the needle on top of the cork, wood, or Styrofoam. Wait until the needle stops moving and the head of the needle will be pointing north. (Make sure there are no large objects nearby or the needle will point to them instead). If you use a paper clip, mark one end so you will know which is the "top" (where the eye of the needle would be).