Forestry Suppliers Lesson Plan

Orienteering

Forestry Suppliers' Orienteering F.I.E.L.D. Kit™
Fundamental Investigation of the Environment Leading to Discovery™
Study Kit Correlated to National Science Education Content Standards

If you're interested in orienteering for classroom activities, consider the Forestry Suppliers' Orienteering F.I.E.L.D. Kit. Use the kit for the exercises outlined in this Lesson Plan, as well as other related activities (see "Further Studies" section for a few ideas).

This F.I.E.L.D. Kit is available exclusively from Forestry Suppliers and includes some of the items used in this lesson plan. All kit items may also be purchased individually. Call our Sales Department at 1-800-647-5368 or visit us on the web at www.forestry-suppliers.com.

Fields of Study:
- Earth Science
- Mathematics

National Science Education Content Standards Correlation

Grades	A	B	C	D	E	F	G
K-4	✓	✓			✓		✓
5-8	✓				✓		✓
9-12	✓				✓	✓	✓

Orienteering Kit Contents Stock Number 36850		Required For This Lesson Plan			
Qty.	Description	K-4	5-8	9-12	Stock Number
10	Suunto Partner A-10 Baseplate Compasses Azimuth (0-360°)	✓	✓	✓	37056
1	Demonstration Compass, Azimuth (0-360°)	✓	✓	✓	36952
10	Orienteering Station Markers				37214
1	Orienteering Control Cards, Pack of 25				36903
1	Orienteering Punches, Style A, Box of 10				36851
1	Be Expert With Map and Compass				37041
1	Orienteering and Map Games for Teachers				26889

Grades K-4

Background

All of us have been intrigued by the behavior of magnets. Magnets seem to "magically" attract or pull objects to themselves. With ease, a strong magnet can readily move a heavy metallic object. Magnets have many specific uses. For example, electric motors contain electromagnets and give power to our refrigerators, washing machines and many other machines that are important in our everyday lives.

Observations concerning the phenomena and behavior of magnets were mentioned in early Chinese writings. The literature makes reference to the "attractive power" of the lodestone. Lodestone was found to be magnetic because it attracted metal objects. Another name for lodestone is magnetite. Magnetite is iron ore which is a "rock" embedded with iron. It has been said that a Chinese general initially used a piece of lodestone as a compass. Since lodestone always points in a north-south direction if allowed to freely rotate, a piece of lodestone might have been placed on a section or piece of wood or in a floating bowl. Placed either way, the lodestone would point north. From these applications, the lodestone was probably used as an early compass. Military commanders during the Han dynasty (206 BC to 220 AD) used compasses. Although lodestone compasses were used for hundreds of years before they were used on ships, during the 1200s Chinese navigators began to use compasses on ships.

Primitive compasses became more accurate when the idea of a compass needle was applied. A strip of metal was magnetized by stroking it with a permanent magnet. Balancing this needle on a pivot allowed for free rotation. After settling, the needle would point to the north. A compass needle will point north since the earth acts as a very large magnet with two poles, the magnetic North Pole and the magnetic South Pole. Invisible magnetic lines of force exist between and connect these two poles. The magnetic needle on a compass aligns itself with the magnetic lines of force that surround the earth. This is the reason why you can always determine the direction of north with a compass.

Compass skills and knowledge are valuable to people of all ages. The use of a compass may one day enable the user to find his or her way if lost, improve map skills and enhance the enjoyment of outdoor experiences.

Procedure

1. Review the following basic terms or concepts with students:
   - Compass
   - Map
   - Magnet
   - South Pole
   - North Pole
2. Using a Demonstration Compass, review the following parts of the compass with the students:

   Bezel The bezel of the compass capsule is divided into small degree lines. The spaces between the lines equal two degrees, the whole bezel representing 360 degrees. Each twentieth degree is indicated by a number. The initials of the four cardinal points of the compass (North, South, East and West) are also marked on the bezel.

   Base Plate Used when getting a travel direction from a map or measuring distance using a map.

   Capsule Used to obtain bearings.

   Magnetic Needle Indicates direction of North.

   Map Scales Provide direct conversions from map distances to actual distances on the ground.

   Direction Arrows Two parallel red arrows which travel direction is read along. These arrows are drawn parallel to the long side edges of the base plate.

   North-South Arrow and Lines Rotate when capsule is turned. These markings are especially important when obtaining a travel direction from a map.

   Rotating Capsule Attached to the base in a manner by which it can be turned easily.
3. Use individual compasses to practice finding North. The red end of the magnetic needle always turns to North when the compass is held in a level position. The red end of the arrow should line up or lie within the outlined red arrow space. When the students understand the basic parts of the compass and how to find North using the compass, then proceed to the next step.
4. Select the site where you will conduct the activity. You may consider an outside area such as the schoolyard or if an outside area is not available, then use a gymnasium or other large indoor area.
5. Divide your students into groups of 2-4, depending upon your student number. Optimally, each student needs his or her own compass to use. If this is not possible, each pair of students will need a compass.
6. Spread the groups out and direct each group to mark a spot on the ground with stake wire flagging or a stick to note a beginning or starting point.
7. Directing each group to take individual turns, have each student stand over the beginning mark and set their compass at 60° (North 60° East). Each student should have a basic understanding of this after your initial review of the compass, its use and basic parts. For younger student groups, it may prove helpful to have other teachers or older students present who have had prior experience with compass use.
8. Once the compass is set, direct them to turn their body until the red and black arrow lines up with the red arrow outlined on the compass base. They are not to move the dial. They should now be facing 60°. Have them sight a distant object that is in line with the 60° and walk towards it measuring or pacing 50 steps and stop. They will then mark this spot on the ground with the stake wire flagging or a stick.
9. Direct students to turn the compass dial to 180° (South). They should face this direction, sight an object as they did in step 9 and walk another 50 steps. This spot will be marked as previously directed.
10. Direct students to turn the compass dial until it reads 300° (North - 60° - West). Tell them to face this direction and walk 50 steps. If the students have followed the directions, they will have walked back to their starting point.

Note: At all times, students must be reminded to hold the compass level in their hand. This is easily accomplished if the compass is held palm-up, arm stretched outward, and away from the body.

Rubric

- Students should be able to explain the purpose of using a compass.
- Students should be able to find the direction of North by using the compass.
- Students should be able to name and give basic functions of the compass parts.
- Students should be able to successfully complete the basic activity suggested within this plan. (3-4)

Assessment

- Teacher will orally quiz students concerning the function(s) of the basic parts of the compass.
- Teacher will have students demonstrate proficiency in locating the North direction by using a compass.
- Teacher will ask students to explain procedural steps of activity. (3-4)

Further Studies

- Have students explain and demonstrate to other students the basic uses and parts of a compass. Younger students can easily direct a fellow student on how to find the North direction.
- Have students use the school, local library or a guided Internet search to find information concerning the following terms and people:
  - Magnets
  - Huang-ti (ancient Chinese General)
  - Permanent/Temporary Magnets
  - Thales (Greek Mathematician)
  - Lodestone
  - Tuomas Vohlonen
  - Electromagnets
- Mark or "map out" a trail students must follow by using the compass directions you provide. Place a "treasure" at the end of the trail to be found by those who have accurately followed your directions.
- Using the Forestry Suppliers Orienteering F.I.E.L.D. Kit, you may lead older students in an orienteering exercise indoors or outdoors.
- Using Be Expert With Map and Compass you may include further studies to enhance compass and map skills.

These lesson plans are provided for the benefit of science educators and can be freely downloaded from our web site at www.forestry-suppliers.com. If you have an idea or other suggestions for future lesson plans, we'd like to hear from you! Send an e-mail to fsi@forestry-suppliers.com.

Content Standards Covered

A Science as inquiry
- Abilities necessary to do scientific inquiry
- Understanding about scientific inquiry

B Physical Science
- Properties of objects and materials

E Science and Technology
- Abilities of technological design

G History and Nature of Science
- Science as a human endeavor

Additional Materials Needed

Supplied by Teacher/Student(s)

- Overhead projector
- Sticks

Optional Items

Optional items available from Forestry Suppliers that can be used to enhance this lesson plan.

- Stake Wire Flagging, Orange **33501**

Grades 5-8

Background

All of us have been intrigued by the behavior of magnets. Magnets seem to "magically" attract or pull objects to themselves. With ease, a strong magnet can readily move a heavy metallic object. Magnets have many specific uses. For example, electric motors contain electromagnets. Electric motors give power to our refrigerators, washing machines and many other machines that are important in our everyday lives.

Observations concerning the phenomena and behavior of magnets were mentioned in early Chinese writings. The literature makes reference to the "attractive power" of the lodestone. Lodestone was found to be magnetic since it attracted metal objects. Another name for lodestone is magnetite. Magnetite is iron ore which is a "rock" embedded with iron. It has been said that a Chinese general initially used a piece of lodestone as a compass. Since lodestone always points in a north-south direction if allowed to freely rotate, a piece of lodestone might have been placed on a section or piece of wood or in a floating bowl. Placed either way, the lodestone would point north. From these applications, the lodestone was probably used as an early compass. Military commanders during the Han dynasty (206 BC to 220 AD) used compasses. Although lodestone compasses were used for hundreds of years before they were used on ships, during the 1200s Chinese navigators began to use compasses on ships.

Primitive compasses became more accurate when the idea of a compass needle was applied. A strip of metal was magnetized by stroking it with a permanent magnet. Balancing this needle on a pivot allowed for free rotation. After settling, the needle would point to the north. A compass needle will point north because the earth acts as a very large magnet with two poles: the magnetic North Pole and the magnetic South Pole. Invisible magnetic lines of force exist between and connect these two poles. The magnetic needle on a compass aligns itself with the magnetic lines of force that surround the earth. This is the reason why you can always determine the direction of north with a compass.

Compass skills and knowledge are valuable to people of all ages. The use of a compass may one day enable the user to find his or her way if lost, improve map skills and enhance the enjoyment of outdoor experiences.

Procedure

1. Review the following basic terms or concepts with students:
   - Compass
   - Map
   - Magnet
   - South Pole
   - North Pole
2. Using a Demonstration Compass, review the following parts of the compass with the students:

   Bezel The bezel of the compass capsule is divided into small degree lines. The spaces between the lines equal two degrees, the whole bezel representing 360 degrees. Each twentieth degree is indicated by a number. The initials of the four cardinal points of the compass (North, South, East and West) are also marked on the bezel.

   Base Plate Used when getting a travel direction from a map or measuring distance using a map.

   Capsule Used to obtain bearings.

   Magnetic Needle Indicates direction of North.

   Map Scales Provide direct conversions from map distances to actual distances on the ground.

   Direction Arrows Two parallel red arrows which travel direction is read along. These arrows are drawn parallel to the long side edges of the base plate.

   North-South Arrow and Lines Rotate when capsule is turned. These markings are especially important when obtaining a travel direction from a map.

   Rotating Capsule Attached to the base in a manner by which it can be turned easily.
3. Use individual compasses to practice finding North. The red end of the magnetic needle always turns to North when the compass is held in a level position. The red end of the arrow should line up or lie within the outlined red arrow space. When the students understand the basic parts of the compass and how to find North using the compass, proceed to the next step.
4. Select the site where you will conduct the activity. You may consider an outside area such as the schoolyard. If an outside area is not available, use a gymnasium or other large indoor area.
5. Divide your students into groups of 2-4, depending upon your student number. Optimally, each student needs his or her own compass to use. If this is not possible, each pair of students will need a compass.
6. Spread the groups out, directing each group to mark a spot on the ground with a stake wire flag or a stick to note a beginning or starting point.
7. Directing each group to take individual turns, have them stand over the beginning mark and set their compass at 60° (North 60° East). Each student should have a basic understanding of this after your initial review of the compass, its use and basic parts. For younger student groups, it may prove helpful to have present other teachers or older students who have had prior experience with compass use.
8. Once the compass has been set, direct the students to turn their body until the red and black arrow lines up with the red arrow outlined on the compass base. They are not to move the dial. They should now be facing 60°. Have them sight a distant object that is in line with the 60° and walk towards it measuring or pacing 30 meters and stop. They will then mark this spot on the ground with a stake wire flag or a stick.
9. Direct students to turn the compass dial to 180° (South). They should face this direction, sight an object as they did in step 9, and walk another 30 meters. This spot will be marked as previously directed.
10. Direct students to turn the compass dial until it reads 300° (North - 60° - West). Tell them to face this direction and walk 30 meters (use a meter stick or measuring tape).If the students have followed the directions, they will have walked back to their starting point.

Note: At all times, students must be reminded to hold the compass level in their hand. This is easily accomplished if the compass is held palm-up, arm stretched outward, and away from the body.

11. "Map-out" a trail by providing students with compass directions. This may be completed outside or inside.
12. Provide trail directions that will lead students to a treasure that can only be found by following the directions.
13. Have students (when age appropriate) show trail followed by drawing correlated angles to compass directions on grid or graph paper that show the trail followed.

Rubric

- Students should be able to relate information concerning the history of the compass.
- Students should be able to exhibit proficiency in basic compass use and function.
- Students should be able to follow detailed instructions concerning the navigation of a teacher-given trail or set of directions.

Assessment

- Teacher will have students demonstrate proficiency in compass parts, function and use.
- Teacher will give compass directions to each student. Each student must be able to successfully follow these and reach a designated point.
- Teacher will have students show correlated compass directions (using angles, etc.) by drawing on grid or graph paper.

Further Studies

- Have the students complete research on what is meant by the length of a single pace.
- Have students explain and demonstrate to other students the basic uses and parts of a compass. Younger students can easily direct a fellow student on how to find the North direction.
- Have students use the school, local library or a guided Internet search to find information concerning the following terms and people:
  - Magnetic Fields
  - Huang-ti (ancient Chinese General)
  - Permanent/Temporary Magnets
  - Thales (Greek Mathematician)
  - Lodestone
  - Tuomas Vohlonen
  - Electromagnets
  - Tolsa
  - Magnetic Domain
  - William Gilbert Versorium
  - Pierre deMaricourt
  - Declination
  - North Pole
  - Magnetic North Pole
- Using the Forestry Suppliers Orienteering F.I.E.L.D. Kit, you may lead older students in an orienteering exercise indoors or outdoors.
- Using Explore the World with a Map and Compass, you may include further studies to enhance compass and map skills.
- Complete research on what is meant by the length of a single pace.

These lesson plans are provided for the benefit of science educators and can be freely downloaded from our web site at www.forestry-suppliers.com. If you have an idea or other suggestions for future lesson plans, we'd like to hear from you! Send an e-mail to fsi@forestry-suppliers.com.

Content Standards Covered

A Science as inquiry
- Abilities necessary to do scientific inquiry
- Understanding about scientific inquiry

E Science and Technology
- Abilities of technological design
- Understandings about science and technology

G History and Nature of Science
- Science as a human endeavor
- History of science

Additional Materials Needed

Supplied by Teacher/Student(s)

- Overhead projector
- Sticks
- Measuring Stick/Meter Stick or Tape Measure

Optional Items

Optional items available from Forestry Suppliers that can be used to enhance this lesson plan.

- Quadrille Style Grid Paper **45181**
- Cross Section Style Grid Paper **45188**
- Wooden Meter Stick **71166**
- 100/30m Fiberglass Tape **40118**
- Stake Wire Flagging, Orange **33501**

Grades 9-12

Background

Historically, the Chinese exhibited interest in the phenomena and behavior of magnets during the ancient ages. Chinese literature makes reference to the magnetic behavior of lodestone or magnetite, an iron ore. It was said that a Chinese general initially used a piece of lodestone as a compass. Lodestone was found to always point in a north-south direction if allowed to freely rotate. The Chinese used this knowledge to produce an early form of the compass.

Primitive compasses became more accurate with the application of a magnetic compass needle balancing on a pivot for free rotation in a northward orientation. This orientation is due to the presence of magnetic fields surrounding the earth. A magnetic needle on a compass will align itself with these magnetic lines of force.

The proficient knowledge and use of a modern compass is very valuable. Such knowledge and use enable one to find his or her way without roads or a noted trail. Compass use can also open more paths of enjoyment outdoors!

Procedure

1. Review the following basic terms or concepts with students:
   - Compass
   - Map
   - Magnet
   - South Pole
   - North Pole
2. Using a Demonstration Compass, review the following parts of the compass with the students:

   Bezel The bezel of the compass capsule is divided into small degree lines. The spaces between the lines equal two degrees, the whole bezel representing 360 degrees. Each twentieth degree is indicated by a number. The initials of the four cardinal points of the compass (North, South, East and West) are also marked on the bezel.

   Base Plate Used when getting a travel direction from a map or measuring distance using a map.

   Capsule Used to obtain bearings.

   Magnetic Needle Indicates direction of North.

   Map Scales Provide direct conversions from map distances to actual distances on the ground.

   Direction Arrows Two parallel red arrows which travel direction is read along. These arrows are drawn parallel to the long side edges of the base plate.

   North-South Arrow and Lines Rotate when capsule is turned. These markings are especially important when obtaining a travel direction from a map.

   Rotating Capsule Attached to the base in a manner by which it can be turned easily.
3. Use individual compasses to practice finding North. The red end of the magnetic needle always turns to North when the compass is held in a level position. The red end of the arrow should line up or lie within the outlined red arrow space. When the students understand the basic parts of the compass and how to find North using the compass, then proceed to the next step.
4. Select the site where you will conduct the activity. You may consider an outside area such as the schoolyard. If an outside area is not available, use a gymnasium or other large indoor area.
5. Divide your students into groups of 2-4, depending upon your student number. Optimally, each student needs his or her own compass to use. If this is not possible, each pair of students will need a compass.
6. Spread the groups out. Direct each group to mark a spot on the ground with stake wire flagging or a stick to note a starting point.
7. Direct each group to take individual turns standing over the beginning mark and set their compass at 60º (North 60º East). Each student should have a basic understanding of this after your initial review of the compass, its use and basic parts.
8. Once they have set the compass, direct them to turn their body until the red and black arrow lines up with the red arrow outlined on the compass base. They are not to move the dial. They should now be facing 60º. Have them sight a distant object that is in line with the 60º and walk towards it measuring or pacing 30 meters and stop. They will then mark this spot on the ground with stake wire flagging or a stick.
9. Direct students to turn the compass dial to 180º (South). They should face this direction, sight an object as they did in step 9 and walk another 30 meters. This spot will be marked as previously directed.
10. Direct students to turn the compass dial until it reads 300º (North - 60º - West). Tell them to face this direction and walk 30 meters. Use a meter stick or a measuring tape. If the students have followed the directions, they will have walked back to their starting point.

Note: At all times, students must be reminded to hold the compass level in their hand. This is easily accomplished if the compass is held palm up, arm stretched outward, and away from the body.

11. Using the Forestry Suppliers Orienteering F.I.E.L.D. Kit, direct the students to complete one of the orienteering course activities provided in the kit materials.
12. Provide trail directions that will lead them to a treasure that can only be found by following the teacher-given directions.
13. Have students draw correlated angles of the compass directions on grid or graph paper that show the trail they followed.

Rubric

- Students must exhibit proficiency in the understanding of compass function and use.
- Students will be able to follow basic compass directions.
- Students will successfully complete a teacher given orienteering course.
- Students should be able to relate the historical information concerning the creation and development of the compass.
- Students should have a strong understanding of the concepts of magnetism.

Assessment

- Teacher will give a written or oral quiz concerning the identification and functions of each compass part.
- Teacher will ask each student to demonstrate basic use of compass:
  - Find North.
  - Follow compass directions.
  - Follow directions to complete trail by compass use.
  - Complete orienteering successfully, unaided by teacher.
  - Teacher will quiz students concerning history and uses of a compass.

Further Studies

- Have the students complete research on the following related topics and people:
  - Magnetic Fields
  - Huang-ti (ancient Chinese General)
  - Telsa
  - Thales (Greek Mathematician)
  - Gauss
  - Tuomas Vohlonen
  - Geographic North Pole
  - Tolsa
  - Magnetic Domain
  - William Gilbert
  - Versorium
  - Pierre deMaricourt
  - Declination
  - Hans Christian
  - Magnetic North Pole
  - Michael Farraday
  - Ferromagnetic
  - Paramagnetic
  - Diamagnetic
- Research information on the differences between a temporary and permanent magnet and how the modern day compass was developed.
- Research the magnetic characteristics of Iron, Cobalt and Nickel.
- Complete research on what is meant by the length of a single pace.

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