
Tools of the Trade

Overview

This lesson and related activities are designed to give students hands-on experience using tools and methods to conduct science inquiry.

Grade: 6

TEKS

Scientific Processes
6.1(A), 6.2 (A) (B),
6.4(A) (B)

Vocabulary

Average
Range
Percent

Materials

Ziploc bags
Compass
Meter sticks
Stopwatch
Balance
Calculators
Graduated cylinders
Flags (location markers)
Paper or plastic cups
Pencils
Masking tape
Plastic spoons
Water
Science journals

Downloadable Sheets

*Orienteering Cards
*Scavenger Hunt Data
Collection Sheet
*Relay Race Data
Collection Sheet
*Writing Prompts for
Journal

Pre-Eastman Classroom Activities

In the forest, students will participate in a compass activity, scavenger hunt, and relay races as they practice collecting data using science tools. They will demonstrate a deep understanding of patterns in collected information.

Compass Activity: In this activity, students will use a compass and meter stick to follow directions on a card. They will travel north, south, east, and west from the starting point in order to arrive at the specified location. (NOTE: If completed successfully, students will end up at their starting point. Do not share this piece of information ahead of time.) Students will need the following skills to complete this activity:

- measuring with a meter stick
- using a compass to locate the four cardinal directions
- walking in a given direction

Scavenger Hunt: In this activity, students will use estimation skills to locate items in the forest with given measurements. They will then find the actual measurements of each item and compare it to the estimate. Students will need the following skills to complete this activity:

- measure length using a metric ruler
- measure mass using a balance
- measure volume of a liquid using a graduated cylinder
- measure volume of a solid using water displacement

Relay Races: In this activity, students will compete in races in which winning is based on a deep understanding of percent, average, and range. Students will need the following skills to complete the races:

- use proportional reasoning to find a percent
- calculate average and range
- use and read a stopwatch
- convert time into seconds

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In The Field

These activities are designed for a class of 24 students. It is recommended that the students are put into two groups with one completing the Compass Activity, while the other completes the Scavenger Hunt. After completing each activity, the groups will switch stations. The class will come together for the relay races.

Set behavior expectations and go over safety issues with students, including the proper treatment of plants in the forest. Remind students not to touch anything without permission.

Compass Activity

Prior to leaving the school, make sure you have the following materials for the Compass Activity:

- Meter sticks (4)
- Compasses (4)
- Flags or other markers (5)
- Orienteering cards

1. Place a flag or other marker in the ground in the center of a large, open area, preferably in the grassy area by the entrance gate. Explain that this will be each group's starting point.
2. Divide students into four groups (that is the most this activity can accommodate).
3. The teacher should demonstrate how to begin and end using the directions *North 3.6 m* and *West 2.1 m*.
4. Distribute a different Orienteering Card, compass, meter stick, and marker to each group.
5. Have each group follow the directions on its card, placing the marker at their ending spot.
6. When all groups have finished, tell them where they should have ended (the starting location). Measure the distance between each group's marker and the starting marker. The group that is closest to the starting marker is the winner.

Scavenger Hunt

Prior to leaving the school, make sure you have the following materials for the Scavenger Hunt:

- Scavenger Hunt Data Collection Sheet for each pair of students
- Ziploc bags
- Paper or plastic cups
- Balance
- Graduated cylinders
- Pencils
- Calculators

1. Divide students into groups of two.
2. Provide each pair with a Scavenger Hunt Data Collection Sheet, Ziploc bag, and a cup for water collection.
3. Explain to the students that they will use their estimation skills to collect items on the Data Collection Sheet. They will find actual measurements upon returning to the station.
4. Remind students to use caution in the forest. Do not touch anything unfamiliar, do not put anything in their mouths, and stay out of mud when collecting the water.
5. Let students collect their items using the Ziploc bag and cup for water.
6. As students return to the station, have them complete the required measurements, recording the information on the Data Collection Sheet. They may use calculators to find the difference between the estimated and actual measurements.
7. After totaling the differences on their Data Collection Sheet, the group with the smallest total difference is the winner.

Relay Races

Prior to leaving school, make sure you have the following materials for the Relay Races:

- Masking tape
- Stopwatch
- Relay Race Data Collection Sheet (one per team)
- Calculators (one per team)
- Pencils (one per team)
- Water (200 mL per team)

1. Use masking tape to mark starting and finishing lines (about 10 meters apart).

1st Race

2. Divide students into teams of four.
3. Each team needs a stopwatch, Data Collection Sheet, calculator, and pencil for the first race. The winner of this race will be the team with the lowest average time. For added practice using stopwatches, this race will be conducted one runner at a time.
4. The first runner for each team will line up at the start as another team member uses the stopwatch to time the run.
5. As the runner returns to the starting line, the timer will stop the stopwatch and record the time for that runner on the Data Collection Sheet.
6. Be sure to reset the stopwatch between runners.
7. Repeat until all four runners have raced.
8. Teams will then convert all time into seconds, and using a calculator to find the average of the four team members' times. The lowest average time will be the winner. (To make the race more challenging, the winner could be determined by the greatest average time. Students who have a true understanding of time and averages will know that this will be the slowest team.)

2nd Race

9. For the second race, prepare a cup containing 200 mL of water for each team at the starting point. Place a graduated cylinder at the finish line for each team (You may want to

move the finish line closer for this race.) Each team will also need a spoon. The object is to fill the graduated cylinder with as much of the water as possible in the allotted time.

10. The students on each team will line up in the order they are racing. The first runner will have a spoon. The timer will begin when the teacher says, "Go". The first runner will fill his spoon with water from the cup. He will race to the other line and put the water from the spoon into the graduated cylinder, then run back and pass off the spoon to the next runner in line. The other runners will repeat the same steps. The students will have 4 minutes to complete the race.
11. At the completion of the race, each team will record the amount of water collected in their graduated cylinders and convert it to a percent of the beginning amount (200 mL). The winner is the team collecting the largest percentage of water.

3rd Race

12. This race will mimic the first race in which time is calculated at the end of each runner. The objective is to be the team with the greatest range of times. Students who understand range will know that they need a very fast time and a very slow time.
13. Have each team line up at the starting line in the order they are racing. Pass out stopwatches to each team. Review the procedure for the race with each team—recording the time of each runner and resetting the stopwatch after each runner. Now announce that the winning team will be the one with the greatest range in times. Do not give the teams any hints, but allow them a minute or two to discuss strategy.
14. Conduct the race using the same procedures as in Race 1. After finishing each team will convert time to seconds and, using a calculator, compute their team's range. Winner is the team with the biggest range.

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Post-Eastman Classroom Activities

Upon returning to the classroom, have students make journal entries using the following prompts:

Compass Activity

Using the compass activity as a guide, design a set of orienteering instructions for a classmate to follow.

Scavenger Hunt

Explain how you found the volume of your rock using water displacement. Write the steps in order, using clear and precise language.

Relay Races

Which race was the most fun? Why?

Which race was the hardest to win? Why?

Did the outcome of one race surprise you? Why?