Hypothermia

Integration: Health (Personal Health, Safety and First Aid); Science

Grade Levels: 4-6

Time: 3-4 class periods

Materials:

- Paper
- Thermometer (s) for measuring air temperature
- Cotton balls
- Rubbing alcohol
- Water
- *Explorer's Clothing* handout
- Crayons, markers, poster board, props (optional materials for the news segment)

Objectives:

Students will:
1. Describe hypothermia and its cause, and symptoms.
2. Discuss the explorers' risk of hypothermia.
3. Describe how they can protect themselves from hypothermia

Lesson:

Full Group

1. Ask students to define what normal body temperature should be (98.6°F or 37°C).

2. Identify why the temperature of the body is important (the body does not function properly if it is too hot or too cold, extreme cold or heat will physically damage tissues and organs, etc.). Remind students of what it feels like to have a fever.

3. Introduce hypothermia.
   a. Hypothermia is a loss of body heat severe enough to cause the body's temperature to fall well below normal.
   b. Hypothermia is associated with exposure to cold temperatures. However, the temperature does not have to be below freezing for there to be a risk of hypothermia. It is common when the temperature is between 30°F and 50°F.
   c. Hypothermia is also common when it is windy or the body is wet because the body becomes more susceptible to heat loss.
      - The wind actually removes more heat from the surface of the body, which causes the body to cool faster.

- When the body or clothes are wet, by rain or from a body of water, the risk of hypothermia is greater because the evaporation of the water removes more heat.

4. Discuss why hypothermia is dangerous.
   a. Damage to tissue
   b. Affects functions of organs including the brain and heart.
   c. Hypothermia can cause a coma and can be fatal.

5. Discuss the symptoms of hypothermia.
   a. Shivering is an attempt by the body to create heat by moving muscles.
   b. Slurred speech
   c. Muscular weakness
   d. Hallucinations
   e. Slowed breathing and pulse
   f. Excessive tiredness and drowsiness
   g. Confusion

6. Tell students that these symptoms are also dangerous because they prevent hypothermia victims from being able to help themselves. Ask students to explain.

Small Group

7. Remind students that they were told that when the body is wet, it is more susceptible to heat loss because of evaporation. Write "evaporation" on the board.

8. Divide students into groups to investigate the role of evaporation in increasing the risk of hypothermia by performing the following experiments.
   a. Evaporation experiment #1 (adapted *from Janice VanCleave's Chemistry for Every Kid* by Janice VanCleave (1989), John Wiley & Sons, Inc.)
      - Allow a thermometer that measures air temperature enough time to display the room temperature (a few minutes). Have each group record this temperature.
      - Have one student blow warm air across the bulb of the thermometer while the group records the results (The temperature reading should rise because the breath is warmer (98.6°F) than the room temperature). This may take some time to bring the temperature up.
      - Next, one student will dip a cotton ball in rubbing alcohol and pull it apart until it is a sheet of cotton. The cotton should be wrapped around the bulb of the thermometer in a thin layer.
        (1) Tell students that alcohol is used because it evaporates faster than water. However, water has the same effect as the alcohol, it would just take longer.
      - Have one student blow across the bulb wrapped in cotton. The group should record what happens (The temperature reading should drop because the evaporation of the alcohol causes heat to be removed).
      - The groups should discuss their results with one another.

b. Evaporation experiment #2
   - This experiment is qualitative. The students will record the comparative feeling.
   - Each student makes a paper fan.
   - The student moves the fan back and forth above the back of the opposite hand. Record how the back of the hand feels (feel the air moving, the temperature feels cool).
   - Next, each student places a small amount of water on the back of one hand. The student fans this hand and, switching the fan from hand to hand, compares it to the dry hand. The students record the differences (the wet hand should feel noticeably cooler).

ALTERNATIVE: Have students work in pairs and perform the fanning exercise on one another.

9. Introduce the risk of hypothermia that Ann Bancroft and Liv Arnesen face during their Expedition across Antarctica. If students have studied about the Expedition and the weather conditions in Antarctica have them supply information about the risk.
   a. The average temperature in Antarctica is -20 degrees Fahrenheit
   b. The winds are constant and they gust up to 100 mph.

10. Ask students what they think Ann and Liv do to prevent hypothermia.
    a. Stay warm by wearing layers of warm clothing.
    b. Stay dry

11. Look at the list of clothes that Ann and Liv wear and discuss the items and how they compare to what students would wear on a typical cold day.

12. Ask students what they can do to prevent hypothermia.
    a. Stay indoors as much as possible when the weather is very cold.
    b. Wear warm clothes that protect the body.
       - How do your clothes differ from Ann and Liv's?
    c. Stay dry. This includes staying out of the rain, bodies of water, and perspiring.

Small group

13. Divide the class into small groups and inform students that they are to work together in their groups to create a news segment on the dangers of hypothermia and how to prevent it.
    a. They should write a script.
    b. They may include skits, role-playing, reporting, and interviewing.
    c. Each report should be no longer than 5 minutes.
    d. They will perform their segments for the rest of the class.

Assessment:

Teachers will assess:

1. Students' understanding of the cause and effects of hypothermia
2. Students' ability to relate the risks of hypothermia in Antarctica.
3. Students' synthesis of information covered to create the news segment.
4. Students' ability to work cooperatively.