

**Standards-Based Lesson Planning  
Springfield Schools**

**Standard(s) Science and Technology/Engineering**

**Strand # 1:** Earth and Space Science

**Learning Standard # 3:** Differentiate among radiation, conduction, and convection, the three mechanisms by which heat is transferred (through the Earth’s system).

**Strand # 3:** Physical Science

**Learning Standard # 14:** Recognize that heat is a form of energy and that temperature change results from adding or taking away from a system.

**Standard(s): English Language Arts**

**Strand:** Language

**Learning Standard #2:** Questioning, listening, and contributing – Students will pose questions, listen to the ideas of others, and contribute their own information or ideas in group discussions or interviews in order to acquire knowledge.

**Desired Results**

**Scope and Sequence**

**Topic: Winter Survival:** Heat Transfer in the Earth System; Heat Energy

**Suggested Time Frame:** Two day outdoor environmental education experience at ECOS (Environmental Center for Our Schools) in Forest Park, Springfield, MA

**Essential Questions**

**Content and Skills  
(Progress Indicators)**

Using concepts of heat transfer and heat energy, how can a human stay warm in the winter in a northern climate?

- Define and give examples of radiation, conduction, and convection.
- Explain the process of heat transfer.
- Describe differences between F and C.

**Assessment Evidence**

- Students show and explain how to dress warmly, including dressing in layers, keeping dry, and protecting extremities by demonstration of the clothing they wear to ECOS.
- Using the words, convection, radiation, and conduction, students correctly label a picture of a survival scene. Students will be able to explain radiant heat from the sun and fire, heat from convection of the air currents, heat conducted from the fire into the ground around the fire, and heat transferred into the food and the cooking implements.
- Using the thermometer readings they recorded, students will describe the differences between F and C readings.

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### Learning Activities

- On the first day of the program, students, working in groups, will participate in a winter survival decision making activity. They will practice constructing, lighting, and maintaining a fire using one match and will discuss a reflector fire and various cooking techniques.
- On the second day of the experience, students, working in small groups, will cook a simple meal over their fire. They will record and graph temperatures in C / F by placing thermometers inside and outside shelters, at ground level, and 3 feet above the ground, and also in the woods nearby.
- Throughout the two days, students will conduct an experiment by placing light and dark colored pieces of fabric on the snow in a sunny area. Students will discuss solar radiation and absorption and conduction from the fabric to the snow as they observe the changes in the depth of the snow under the fabric pieces.