

Designing a Home for Puppy: Grade 3

Lesson Overview

In this lesson, students will classify and recognize materials as conductors and insulators. They will apply their knowledge in making a home for puppy that will keep him cool in the summer heat. This lesson is designed to be taught together with Math lesson “A Pen for Puppy.”

Alignment

Standard/Indicator Addressed

SC Science Standards

3.P.2A.5 Define problems related to heat transfer and design devices or solutions that facilitate (conductor) or inhibit (insulator) the transfer of heat.

Standards for Mathematical Practice

3.MDA.5: Understand the concept of area measurement.

- a. Recognize area as an attribute of plane figures;
- b. Measure area by building arrays and counting standard unit squares
- c. Determine the area of a rectilinear polygon and relate to multiplication and addition

Science and Engineering Practices

SEP 3.S.1A.8 Obtain and evaluate informational texts, observations, data collected, or discussions to (1) generate and answer questions, (2) understand phenomena, (3) develop models, or (4) support explanations, claims, or designs. Communicate observations and explanations using the conventions and expectations of oral and written language.

**This is new expectation for 2015 Standards

Cross Cutting Concepts

1. Patterns
2. Cause and Effect: Mechanism and Explanation
3. Scale, Proportion, and Quantity
4. Systems and System Models
5. Energy and Matter: Flows, Cycles, and Conservation
6. Structure and Function
7. Stability and Change

These concepts should not to be taught in isolation but reinforced in the context of instruction within the core science content for each grade level or course.

Connections

Disciplinary Literacy Strategies (for Purposeful Reading, Meaningful Writing, and Productive Dialogue)

Card Sort

Computational Literacy (Computer Science)

*Computational thinking (CT) is a problem-solving process that includes (but is not limited to) the following **characteristics**:*

- Logically organizing and analyzing data
- Representing data through abstractions such as models and simulations
- Automating solutions through algorithmic thinking (a series of ordered steps)
- Identifying, analyzing, and implementing possible solutions with the goal of achieving the most efficient and effective combination of steps and resources
- Generalizing and transferring this problem solving process to a wide variety of problems

*These skills are supported and enhanced by a number of dispositions or attitudes that are essential dimensions of CT. These **dispositions or attitudes** include:*

- Confidence in dealing with complexity
- Persistence in working with difficult problems
- Tolerance for ambiguity
- The ability to deal with open ended problems
- The ability to communicate and work with others to achieve a common goal or solution

Content Area (2 or more) Connections

Science and Math are the content areas of focus.

Lesson Plan

Time Required – three-four 60 minute classes

Disciplinary Vocabulary – insulator, conductor

Materials Needed: See daily plans

Formative Assessment Strategies: card sort, evidence from EDP, prototype design

Day 1 - Engage

Can heat (thermal energy) transfer from one object to another?

Materials

- Large insulated container for holding and pouring hot water.
- Styrofoam cups (8 oz.) for holding the hot water
- Tray for each pair to keep materials contained and catch spills
- Large nails or bolts
- Aluminum foil – roll it up into tight straws about 8 inches long
- Craft Stick
- Metal spoon
- Plastic spoon
- Plastic straw

Procedure:

1. Give each pair about $\frac{3}{4}$ cup of hot water in a Styrofoam cup and put the cup in a tray or basin to avoid spills.
2. Give each pair a set of objects to test.
 - a. Craft stick
 - b. Metal spoon
 - c. Plastic spoon
 - d. Aluminum “straw” rolled up
 - e. Plastic straw
 - f. Large nail (or Bolt)
3. Ask the students to partially submerge the objects into the hot water one at a time.
 - a. Once the object is in the water, the person holding the object should decide whether he/she could feel any of the heat in the object while holding it. They can each try it.
 - b. Have them record what they observe on the “What Do You Feel?” worksheet.
 - c. Tell them to leave the last column “Classification” column blank.
4. When they are finished, clean up and discuss their results.
 - a. What did they notice?
 - b. Which items could you feel heat? Not?
 - c. What were the items made of?
 - d. Students should be able to tell you the plastic items did not allow heat to pass through – metal objects did allow heat to travel through

Day 2 - Explore

Materials:

- Card Sort – Preprinted and prepared one set for each pair or group of students (p7-8)

Procedure:

1. Remind students of their investigation yesterday.
2. Give students the cards with pictures printed.
3. Instruct them to sort the cards into groups at least two – do not give them categories or any headings.
4. Once pictures are sorted – ask them to describe each group of pictures or *What it is the rule for this group?*

Explain

Video clip on conductors and insulators

Have students assign these terms to the classification worksheet from day 1 and the card sort categories.

Day 3 – Engage

Materials:

- Thin Wooden Pieces
- Wood Blocks
- Wood Stir Sticks
- Wood Craft Sticks
- Corrugated Cardboard
- Kraft Paper
- Chip board
- Tag board
- Ziploc bags
- Small cups
- Various materials for insulation (cotton balls, aluminum foil, packing peanuts, bubble wrap, cloth, popcorn, etc.)
- Graduated cylinders (or pre-marked medicine cups)
- Stopwatch or clock with second hand
- Ice Cubes To make uniform size cubes, fill small paper cups with 30 or 40 ml of water
- Puppy cut outs (included)

Show students a picture of a puppy or a video of a puppy playing in the yard or do a read aloud about a puppy and dog house.

Set up the problem from the story you select to read or simply describe the situation below:

Trish found a puppy who was not wearing a collar, so she took it home with her. Trish's mom put an ad in the paper hoping that someone would claim the puppy, however, no one did. Trish's parents allowed her to keep the pup, if she promised to be responsible for its care. In addition to building a pen for the puppy, they also decided to build the puppy a house to protect him from the sun on really hot days.

What are some questions the family might ask before building he house?

Questions Brainstorming



Explore

Procedure:

Using any of the materials provided student groups are instructed to build a doghouse for Trish's dog.

Students should use and document their process through the Engineering Design Process. Teachers may wish to review their plan before students can get their materials.

Once complete, test the design as follows:

1. Place an ice cube in a Ziploc bag or cup and place inside the insulated house.
2. Place house in the sunlight for 10-15 minutes.
3. After 15 minutes remove the bag from the house and pour any melted water from the bag into a graduated cylinder.
4. Record the amount of melted water on the class' data chart.
5. Compare your results with that of your classmates.

6. Which ice cube melted more? Did your insulating material slow the melting process? Can you think of any other materials you would like to try or any other questions you would like to investigate?
7. Do any of the materials appear to make better insulators? The ice cube that melted the least was in the more insulated house.

Explain

Read informational text (included and adapted from the SC Support Document) on insulators and conductors. How might you redesign puppy's house?

Other information on this indicator(s) can be found in the support documents/resources on the SC State Department website.

www.ed.sc.gov (Instruction → Standards and Learning → Mathematics or Science → Support Documents and Resources)

Content Area (Disciplinary) Literacy strategies and descriptions can be found on the S2TEM Centers SC website:

s2temsc.org (Resources → Disciplinary Literacy Virtual Library → Strategy Warehouse)



<https://www.amazon.com/>



<https://www.hollandforyou.com/>



<https://www.uline.com/>



<https://www.corningware.com/french-white-1.5-qt-round-casserole>



<https://www.target.com/p/kitchenaid-174-basting-spoon-bamboo/-/A-16603934>



<https://www.foil-pans.com/handi-max-full-size-deep-steam-table-aluminum-foil-pan-70-gauge-extra-heavy-duty-50-cs.html>



<https://www.amazon.com/Chef-Craft-10230-1-Piece-Stainless/dp/B001C26QTY>



<https://www.amazon.in/Generic-Plastic-Drinking-Bendable-Stripes/dp/B00XMWC6BE>



<https://www.snugglymonkey.com/collections/wood-blocks-containers/products/maple-wood-blocks>



<https://www.packari.com/en/Power-Search/PET-plastic-bottle-for-beverage-1000-ml-clear-incl-Screw-cap-PCO-28-white-for-PET-beverage.html>



<https://www.purespadirect.com/Cotton-Balls-Large-1000-per-Bag-X-8-Bags-Case-p/mx-525101.htm>