

***Chicago del Sol:***  
**An Innovative Solar Energy Education Pilot Program**  
Outreach Lesson 1

**Lesson Introduction and Goals**

This lesson is the first of two outreach lessons to be delivered during the *Chicago del Sol* project. The two outreach lessons will be supplemented by a museum visit and by online learning activities and Webcasts. This first lesson is intended to provide students with a basic introduction to energy sources and forms, and to make the point that all energy comes from the sun. The second outreach lesson will make the connections between the sun, the solar panels on the roof of Reilly Elementary, and the energy provided to the school.

At the conclusion of this lesson, the students will be able to:

- Define energy as action, doing, events, movement, sound, etc.
- Distinguish between energy (i.e., bullet 1) and matter (i.e., things)
- Explain that there are many forms of energy: light, heat, electricity, sound, mechanical
- Understand that energy can change forms many times
- Understand that energy has many sources: wood, oil, coal, water, wind, plants
- Appreciate that the many sources of energy all originate from the sun

**Time Allotment**

50 minutes

**Materials**

- Crayons or markers
- One piece of white paper per student
- 3-4 bundles of inexpensive yellow yarn, cut into eight 30-foot strands
- 35 index cards containing pictures/drawings of forms/sources of energy (e.g., plants, hay, cows, milk, wood, corn, cereal, gasoline, cars, and students running, jumping, singing, eating)

**Advanced Preparation**

- Prepare the index cards by ensuring they create multiple “chains” of energy. For example, one series of 4 cards might be combined to read: hay, cow, milk, student running

**Procedure****A. Tap Prior Knowledge/Pre-evaluation (10 min.)**

Ask the students to draw pictures of the sun and how the sun gives us energy. Tell them that anything they do will be right, that they can't be wrong with their drawings. Give them some additional keywords to think about if they need them: light, heat, plants. Write these words on the board.

**B. Share With Neighbor (5 min.)**

Ask students to share their drawings with the class. Praise the drawings and note when key lesson concepts are reflected in the drawings: energy sources, energy forms, conversions (say “changes”), the role of the sun. If no one volunteers, collect the drawings and share a few with the class. Again, be sure to praise the work. Keep these drawings as they will form the basis of your

pre-evaluation and will enable you to compare them with drawings created at the end of the project. (About 5 minutes)

### C. Hands-On Activity (25 min.)

Pass out the index cards. Ideally, the students will be situated in parallel rows of 4-5 students, one student behind the next facing you. You, the teacher, will be the sun and you will be “passing” energy to light/heat, water, and wind in the front row. They will then pass the energy—the yellow yarn—to the row behind them: plants such as grass, hay, corn. The third row will be animals and energy sources such as wood, oil, and gas. Another row will be people using energy. This is a rough description to give you the idea. With this in mind, pass out the cards accordingly. (One more thought on this: it might work best to have the students sitting cross-legged on the floor if there’s room. If it’s sunny and warm outside, we might even put on our jackets and go outside—we would stand outside.)

Ask the students what they see or feel from the sun. Explain that the sun gives us energy in the form of light and heat. Explain that the sun also heats air to make the winds move and heats water to make it rain (and to power the whole water cycle—if you want to “go there”). With the strands of yellow yarn tied to your wrist, pass one strand to each row—energy to forms of light, heat, wind, and water.

Then ask the second row to read their cards: grass, hay, corn, windmill, waterfall. Ask these students how they get energy from the students in front of them—the only ones that have energy from the sun at this time. With some good answers shared, have the first row pass their balls of yarn (energy) to the second row.

Repeat for the remaining rows, asking each next row how they get energy from the row in front of them.

You might also let each student come up with a physical movement to represent his/her identity (e.g., wave arms to be corn in breeze, make wind noises if you’re wind). Each time energy moves back one row, all students with energy will make move/make noise. This will make the energy *visible*.

When everyone “has energy” and is holding one strand of the yarn, start again with the sun to explain how all this works. Make the energy flow from the sun back through the rows—like “the wave” is done in succession at sporting events.

Note: Before teaching this lesson, I decided to name some of the students as the sun. So the rows and energy flows vertically down from the sun looked like this:

Sun	Sun	Sun	Sun	Sun	Sun	Sun
Hay	Trees	Dinosaur Plants	Corn	Wind	Water	Solar Cells on School Roof
Cows	Wood	Oil	Frosted Flakes	Windmill	Water Wheel	Electricity
Milk & Cheese	Fire	Gas	Eating Cereal	Electricity	Electricity	School Lunch Room
Singing	Light & Heat	Driving Cars	Dancing	Television	Hair Dryer	Food for Kids

### **D. Introduce Scientific Principles (5 min.)**

Almost everything in the Universe is a form of **energy**: light, heat, sound, movement. You can see energy anytime you see action, doing, movement, events. Any “ing” word is a form of energy: jumping, running, playing, singing, eating.

The only thing that isn't energy is **matter**—matter is things: bricks, pencils, desks, chairs, people.

Energy brings matter **to life!**

There are many **sources** of energy: wind, water, electricity, wood, gas, oil, sugar from plants. Another source comes directly from the sun via solar energy—the panels on the roof of the school.

But, as we saw in the energy web activity, all the sources of energy **start** with the sun. The energy might **change into many forms** as it moves down the rows, but it all starts with the sun.

### **E. Relate Activity and Concept (5 min.)**

Tell the students that they can make similar “energy webs” at home with some string. Encourage them to try this, making at least two-point connections.

#### **Assessment**

You can begin to assess student learning during this lesson by:

- Sharing and collecting for later review the student drawings about energy and the sun
- Listening closely to whether the rows about to receive energy know why and how they are getting energy from the rows in front of them
- Looking to see if the students create noises or motions based on the index card items they're representing with an understanding of how energy enables these noises and motions
- Making the “Scientific Principles” portion of the lesson more of a discussion and less of a lecture

#### **Learning Standards Benchmarked**

##### **A. National Education Science Standards**

###### *Physical Science—Content Standard B*

###### *Light, Heat, Electricity, and Magnetism*

- Heat can be produced in many ways, such as burning, rubbing, or mixing one substance with another. Heat can move from one object to another by conduction.
- Electricity in circuits can produce light, heat, sound, and magnetic effects. Electrical circuits require a complete loop through which an electrical current can pass.

###### *Organisms and Their Environment*

- All animals depend on plants. Some animals eat plants for food. Other animals eat animals that eat the plants.
- Humans depend on their natural and constructed environments. Humans change environments in ways that can be either beneficial or detrimental for themselves and other organisms.

**B. Illinois Learning Standards**

STATE GOAL 12: Understand the fundamental concepts, principles and interconnections of the life, physical and earth/space sciences.

B. Know and apply concepts that describe how living things interact with each other and with their environment.

12.B.2a Describe relationships among various organisms in their environments (e.g., predator/prey, parasite/host, food chains and food webs).

C. Know and apply concepts that describe properties of matter and energy and the interactions between them.

12.C.2a Describe and compare types of energy including light, heat, sound, electrical and mechanical.

D. Know and apply concepts that describe force and motion and the principles that explain them.

12.D.2b Demonstrate and explain ways that forces cause actions and reactions (e.g., magnets attracting and repelling; objects falling, rolling and bouncing).