1ST GRADE CURRICULUM

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Ending project: Testing Cooking with Solar Hot Water

Lesson I: 1st grade

What is Energy?

- Brainstorming activities to begin discussion
- Discussing 4 forms of energy: mechanical, thermal, electrical, chemical

Lesson 2: 1st Grade

Energy Conversion

- Experiments to explore energy conversions, for example:
    - Mechanical energy into thermal energy (rubbing hands together, running in place)
    - Mechanical energy into electrical energy (dynamo flashlight–hand powered flashlight)

Lesson 3: 1st Grade

What is Potential Energy?

- Create Energy Matrix Conversion Charts
- Discuss potential energy of food and sun and their uses in our daily life

Lesson 4: 1st Grade

Energy Conversion: Student Created Experiments

- Supply a variety of everyday objects (jump rope, whistles, musical shakers, wind-up toys, etc) and have students create their own experiments showing cause and effect
- Create Energy Matrix Conversion Charts for their experiments

Lesson 5: 1st Grade

Compiling Data: Creating Flow Charts

- Create flow charts / picture charts to describe experiments from Lessons 2, 3, and 4

Lesson 6: 1st Grade

Heating Water: Brainstorming Different Methods

- Brainstorm what different ways people around the world might heat water
- Introduce International Water Study

Lesson 7: 1st Grade

International Study: Reading Books

- Read 3 books introducing how people live throughout the world (2 books by Ann Morris and 1 book by Barbara Kerly)

Lesson 8: 1st Grade

International Water Study

3 Focus Countries

- Discuss location, climate, daily life, and water use of Kenya, India, and Haiti

Lesson 9: 1st Grade

Solar Hot Water
Comparison Study

- Using a solar hot water bag (Solar Shower) to heat water measure temperature of water every 1/2 hour
- Record and graph findings

Lesson 10: 1st Grade

Solar Hot Water
Making Treats

- Heat water in the solar hot water bag (Solar Shower)
- Make drinks and soup with the heated water

Lesson I: 1st grade
What is Energy?

Lesson Overview: All life and action in the world involves some form of energy.
Lesson Concept: Any physical process that takes place in the world involves mechanical energy.

Materials:

- Large white paper for note-taking
- 4 different colors of construction paper or poster board
- Hand bell (to ring)
- Wooden unit blocks or other large blocks to set up as "dominoes"
- Large plastic tub
- Water toys
- Black marker

Standards:

- English:
  - IX.11.EE.1 (Inquiry & Research: Generate questions about important issues that affect them or topics about which they are curious, and use discussion to narrow questions for further exploration).
- Mathematics:
  - III.1.EE.4 (Data Analysis & Statistics: Identify what data are needed to answer a particular question or solve a given problem, and design and implement strategies to obtain, organize and present those data).
- Science:
  - IV.1.EE.4 (Use Scientific Knowledge from the Physical Sciences in Real-World Contexts: Identify forms of energy associated with common phenomena).

Timeline: 1 class period (30 – 50 minutes)

Class Structure: whole class experiments (body movements)

Assessment Strategy: EEK! Daily Assessment
General Assessment Strategy #1

Lesson I: 1st grade
What is Energy?

This lesson is an introduction and exploration of what is energy. This lesson focuses on physical movement–student's moving their bodies and moving objects with their bodies–as one way of beginning to think about energy.

Lesson Overview: All life and action in the world involves some form of energy.
Lesson Concept: Any physical process that takes place in the world involves mechanical energy.

Supplies Needed:

- Large white paper for note-taking
- 4 different colors of construction paper or poster board
- Hand bell (to ring)
- Wooden unit blocks or other large blocks to set up as "dominoes"
- Large plastic tub
- Water toys
- Black marker

Background Information:

The primary focus is on mechanical energy / our bodies in motion. Often, physical movement is a good starting point for introducing larger–more complex–issues. During this lesson, the focus is for students to realize that 'energy' is an integral part of their life–they cannot live and move without 'energy'.

Mechanical energy can be understood as the moving of any mass through space (air). This basically includes any physical actions that take place in the world. Therefore, using our bodies as examples to demonstrate mechanical energy is a good starting place. But, please do not stress that our bodies are machines. Mechanical does not mean mechanistic. We are much more that machines, even in the world of physics.

CLASS EXERCISE:

I. Brainstorming 'What is Energy?' with the class

Begin the class by asking the question: what do you think energy is?
Write down all the responses on a large piece of paper (we suggest 18 x 24 heavy duty construction paper or poster board) that you can keep posted in the classroom or hang up during the subsequent lessons for reference.

Prompts:

- Does your body use energy? When?
- Where does your energy come from?
- How do plants grow? What do they need in order to grow and be healthy?
- How do animals (other than humans) grow? What do they need in order to grow and be healthy?
- How does your body grow? What do you need in order to grow and be healthy?

II. Forms of Energy

Write the following 4 different forms of energy on 18x24 pieces of construction paper or poster board (use different colors for each form of energy) and place on the board or wall where the class can see them.

4 Forms of Energy:
Mechanical energy
Thermal energy
Chemical energy
Electrical energy

Have the students brainstorm different examples of each form of energy. Write all their answers on white paper and place on the boards.

III. Hands-on experiments

Conduct the following experiments. At this point, we are not introducing energy conversion but just the final form of energy (the end result) in each experiment. Explain that the energy of motion is mechanical energy.

Ask the students what could be happening to make the following experiments occur, encourage short *and* elaborate responses:

1. Listening to sounds: sound energy is mechanical energy. The following explanation is a simplification of the process of hearing sound: Sound waves (vibrations) move through the air, reach the ear, then vibrate the inner ear (this is where sound amplification takes place), and we hear sound.
    a. Hands clapping
    b. Feet stomping on the floor
    c. Ringing a bell
2. Turning on the light switch: electrical energy
3. Moving their bodies: mechanical energy
    a. Jumping in place
    b. Waving hands in the air
    c. Dancing
4. Domino effect: mechanical energy
    a. Set up a row of large unit blocks and demonstrate chain reaction by pushing them over
5. Move objects with falling water: mechanical energy
    a. Set up a large tub filled with water and toys, pour the water from a variety of directions to move the toys

*Teacher's Note: It is very important to use the scientifically accepted language from the very beginning of introducing a concept. Hence, not saying "sound energy", but instead "sound energy is actually mechanical energy because we are moving air with vibrations–we hear these vibrations as sounds."

Lesson 2: 1st grade
Energy Conversion

Lesson Overview: All life and action in the world involves some form of energy conversion.
Lesson Concept: Energy conversion processes are happening in / with our body constantly.

Materials:

- Dynamo flashlight
- Hot plate
- Small pan to heat water
- Tea kettle with a functioning whistle
- 3 different colors of construction paper or poster board
- Black marker

Standards:

- English:
  - IX.11.EE.1 (Inquiry & Research: Generate questions about important issues that affect them or topics about which they are curious, and use discussion to narrow questions for further exploration).
- Mathematics:
  - III.1.EE.4 (Data Analysis & Statistics: Identify what data are needed to answer a particular question or solve a given problem, and design and implement strategies to obtain, organize and present those data).
- Science:
  - IV.1.EE.4 (Use Scientific Knowledge from the Physical Sciences in Real-World Contexts: Identify forms of energy associated with common phenomena).

Timeline: 1 class period (30 – 50 minutes)

Class Structure: whole class experiments

Assessment Strategy: EEK! Daily Assessment
General Assessment Strategy #1

Lesson 2: 1st grade
Energy Conversion

This lesson builds directly on Lesson 1 by discussing energy conversions. Also, students will learn that when we discuss 'energy' we are actually discussing energy conversion. This lesson will introduce a sequence of events for energy conversion–starting point, action(s), result. Potential energy will not be introduced until Lesson 4.

Lesson Overview: All life and action in the world involves some form of energy conversion.
Lesson Concept: Energy conversion processes are happening in / with our body constantly.

Supplies Needed:

- Dynamo flashlight
- Hot plate
- Small pan to heat water
- Tea kettle with a functioning whistle
- 3 different colors of construction paper or poster board
- Black marker

Background Information:

Refer to the Energy Conversion Matrix Chart from the Teacher's Introduction (posted below):

From → To ↓	**Electromagnetic (Solar)**	**Chemical**	**Thermal**	**Mechanical**	**Electrical**
Electromagnetic (Solar)					Light bulb
Chemical	Photosynthesis		Boiling		
Thermal	Solar hot water Solar hot air			Friction	
Mechanical			Steam turbine	Gears	Electric motors
Electrical	Solar cells Solar calculator	Batteries		Dynamo flashlight	Electrical circuit

CLASS EXERCISE:

I. Have the students create the following experiments:

This lesson takes lesson 1 further and begins discussing energy conversions.

1. Rubbing Hands Together–mechanical into thermal
   Rubbing your hands together creates friction. Whenever two 'things' create friction, heat is created.
2. Running in Place–mechanical into thermal
   You run (mechanical) and your body begins to increase in temperature (thermal) and create body heat
3. Dynamo Flashlight–mechanical into electrical
   Pumping your hand on the handle (mechanical) moves gears inside the flashlight (mechanical to mechanical) the gears spark an electrical current (mechanical into electric) and the light turns on as long as you continue to pump the handle.
4. Heating Water on a Hot Plate–electrical into thermal
   The hot plate uses electricity (electrical energy). As the water molecules are excited (mechanical energy) the water becomes hot (thermal energy).
5. Boiling Water in a Kettle–thermal into mechanical
   The boiling water (thermal energy) forces steam (chemical energy) through the whistle on the kettle and produces a sound (mechanical energy).

II. Stating results:

After completing the experiments use 18 x 24 sheets of colored paper to create your own Energy Conversion Matrix Chart. You could designate each color of paper to be one form of energy. For example:

- Blue Paper = Mechanical Energy
- Red Paper = Thermal Energy
- Orange Paper = Electrical Energy

Then, arrange the construction paper to represent the energy conversion of each experiment and write the experiment on each paper.

Experiment #1:	Blue, Red	(Rubbing Hands Together)
Experiment #2:	Blue, Red	(Running in Place)
Experiment #3:	Blue, Orange	(Dynamo Flashlight)
Experiment #4:	Orange, Red	(Heating Water on a Hot Plate)
Experiment #5:	Red, Blue	(Boiling Water in a Kettle)

*Teacher's Note for Pre-Readers: You may want to create symbols with the class that represent each form of energy to use with the words: mechanical, thermal, chemical, and electrical energy.

LESSON WRAP-UP

Ask students to try and explain energy conversion in their own words. One way to explore this is to ask the students to explain what happened in Class Exercise #1–rubbing your hands together. (We begin with our hands at rest, then put them in motion, and then create heat.) One way to explain energy conversion is: "We first begin with one action and then during the action a change takes place and we end up with a result, something different than we started with."

Lesson 3: 1st grade
Potential Energy

Lesson Overview: All 'things' in the world have potential energy.
Lesson Concept: Everything has potential energy but there are many possibilities for how the potential energy is converted into useable energy.

Materials:
- Dynamo flashlight
- Vortex blender*
- Forever flashlight
- Hot plate
- Tea kettle with functioning whistle
- Colored construction paper

Standards:
- English:
  - IX.11.EE.1 (Inquiry & Research: Generate questions about important issues that affect them or topics about which they are curious, and use discussion to narrow questions for further exploration).
- Science:
  - I.1.EE.1 (Construct New Scientific and Personal Knowledge: Generate reasonable questions about the world based on observation).

Timeline: 1 class period (45 – 50 minutes)

Class Structure: whole class or small group experiments

Assessment Strategy: EEK! Daily Assessment
General Assessment Strategy #1
General Assessment Strategy #3

Lesson 3: 1st grade
Potential Energy

This lesson introduces the concept of 'potential energy'. This concept builds on the previous understanding of energy and energy conversion. This day will involve more hands-on demonstrations: revisiting experiments from Lessons 1 or 2 and introducing new ones.

Lesson Overview: All 'things' in the world have potential energy.
Lesson Concept: Everything has potential energy but there are many possibilities for how the potential energy is converted into useable energy.

Supplies Needed:

- Dynamo flashlight
- Vortex blender*
- Forever flashlight
- Hot plate
- Tea kettle with functioning whistle
- Colored construction paper

*Teacher's Note: the hand-crank blender (Vortex blender) experiment is rather messy and requires frozen fruit, juice, and ice. This experiment may be more appropriate for a celebration day rather than within the curriculum.

Background Information:
Everything in the world has potential energy that can be converted into useable forms of energy. Your body, for example, has potential energy. It can move objects, squeeze flashlight handles, jump in the air. Here is another way to think about potential energy: Food has potential energy stored inside of it. We eat the food and are able to run, jump, and think. The sun has potential energy and it can heat objects that absorb its energy.

CLASS EXERCISE:

I. Potential and Possible Results

The chart below lists a few items as potential energy sources and the possible energy results. Discuss the potential and possible result examples. Provide either the 'potential' or the 'possible result' from the examples below and have the students brainstorm the missing counterpart.

Potential	Possible Result
Food	Running, jumping, playing, thinking
Sun	Heating, things get hot
Logs	Burning, fire
Wind	Turns things
Water	Moves things

II. Hands-on Experiments

Create the following experiments (2 are new and 1 is from Lesson 2). Have the students brainstorm the following ideas:

- What might be the potential energy source in each experiment?
- How does the potential energy convert into another form of energy (energy conversion)?

Experiments:

- *Vortex blender:* make smoothies with fruit and juice
  - Potential energy: their body
  - Energy conversion = mechanical (the motion of turning the crank) into mechanical (turning the gears of the blender)
- *Forever Flashlight:* shake the flashlight and the flashlight comes on
  - Potential energy: their body
  - Energy conversion = mechanical (motion of their hand shaking the flashlight) to chemical (in the batteries) to electrical (producing a light)—mechanical to electrical
- Boil water in a kettle on a hot plate
  - Potential energy: water molecules–just say 'water' for the students–the water molecules get excited as they heat.
  - Energy conversion = thermal (boiling water) to chemical (steam) to mechanical (whistling sound)—thermal to mechanical.

III. Mapping Energy Conversions

Have the students "map" the energy conversion for the new experiments (highlighted in italics) using the same method as in Lesson 2 to create the Energy Conversion Matrix Charts. Using different sheets of colored paper, arrange the sequence of the energy conversion.

Teacher's Note: The experiments in italics–Vortex Blender and Forever Flashlight–are add-ons. If you do not have these materials in your classroom, create potential / conversion maps using the experiments from Lesson 2.

Lesson 4: 1st grade
Energy Conversion: Student Created Experiments

Lesson Overview: Emphasize cause and effect (energy potential and energy conversion).
Lesson Concept: Everything has potential energy but there are many possibilities for how the potential energy is converted into useable energy.

Maerials:
- 5 jump ropes
- 5 whistles
- 3 musical shakers
- 1 bag of carrots
- 5 small wind-up toys
- 5 big plastic bowls (if wanting to encourage water use with toys)

Standards:
- Science:
  - I.1.EE.1 (Construct New Scientific and Personal Knowledge: Generate reasonable questions about the world based on observation).
  - IV.1.EE.4 (Use Scientific Knowledge from the Physical Sciences in Real-World Contexts: Identify forms of energy associated with common phenomena).

Timeline: 1 class period (45 – 50 minutes)

Class Structure: whole class or small group experiments

Assessment Strategy: EEK! Daily Assessment
General Assessment Strategy #1
General Assessment Strategy #2
General Assessment Strategy #3

Lesson 4: 1st grade
Energy Conversion: Student Created Experiments

This lesson is a more deeply student-directed follow-up to Lesson 3. The students will invent their own experiments with common household items.

Lesson Overview: Emphasize cause and effect (energy potential and energy conversion).
Lesson Concept: Everything has potential energy but there are many possibilities for how the potential energy is converted into useable energy.

Supplies Needed:

- 5 jump ropes
- 5 whistles
- 3 musical shakers
- 1 bag of carrots
- 5 small wind-up toys
- 5 big plastic bowls (if wanting to encourage water use with toys)

Background Information:

Item	Potential Acts	Energy Conversion	Energy Potential
Rope	Use as a jump rope	Mechanical energy to mechanical energy: moving their hands to move rope (mechanical), the rope moves through the air (mechanical), the rope makes a sound as it hits the floor (mechanical), jump over the rope (mechanical) Mechanical energy to thermal energy: As the students jump-rope (mechanical), their bodies heat up (thermal)	Their bodies store the energy potential in the form of ehemical energy from the foods they eat.

Item	Potential Acts	Energy Conversion	Energy Potential
Rope	Use as a "snake" across the floor	Mechanical energy to mechanical energy: moving their hands and arms to move the rope (mechanical), the rope wriggles along the floor (mechanical)	Their bodies store the energy potential in the form of chemical energy from the foods they eat. **What If?:** What happens if they move their hand(s) faster or slower? Does the speed of the rope change? Why? (the mechanical energy transfer of the movement of their hand to the movement of the rope is a fairly direct transfer of energy and can be seen with this experiment.
Whistle	Blow through the whistle and make a sound	Mechanical energy to mechanical energy: blowing air out of their mouths (mechanical), the air passes through an opening in the whistle (mechanical), and makes a sound (mechanical)— the sound waves travel across the room and reverberate in your ear	Their bodies store the energy potential in the form of chemical energy from the foods they eat.
Shaker	Move their hands and make sounds with the shaker	Mechanical energy to mechanical energy: moving their hands (mechanical), shaking the rattle (mechanical), makes the "rattlers" inside the instrument move (mechanical), creating a sound (mechanical)— the sound waves travel across the room and reverberate in your ear	Their bodies store the energy potential in the form of chemical energy from the foods they eat.

Carrots	Eat the carrots	Mechanical energy to chemical energy: When the students eat the carrots (mechanical), this produces the digestive process in their bodies (chemical)–– Living creatures use the potential energy from the digested food to stay alive (continue basic body functions) and also store potential energy until it is needed (as in a burst of "energy").	The carrot stores the potential chemical energy.
Wind-up toys	Wind the toys and play with them in a water bath, if available, or across desks	Mechanical energy to mechanical energy: Using their hands and fingers to wind the toys (mechanical), gears turn inside the toys (mechanical) to make them move (mechanical).	Their bodies store the energy potential in the form of chemical energy from the foods they eat. What If?: What is the energy conversion that is taking place within the toy to make it move? How could the toy move faster or slower? The toy moves faster or slower depending on the amount of mechanical energy that is forcing them to move. So, if the toy is wound tightly, it will move more quickly.

CLASS EXERCISE:

I. Place the following items out on a table:

- Jump rope
- Whistle---1 for each group
- Musical shaker
- Carrots
- Wind up toys
- Big plastic bowls (if using wind up water toys)

II. In small groups, have the students invent their own experiments using the materials listed above. Have each student choose 1 item at a time and then and either write down what they will "make happen" with their object or discuss it as a group.

III. After finishing their experiments:

- Map the energy conversion for their experiment.
- State what the potential energy was in the experiment.
- Report results and hypotheses. Include these in the Energy Matrix Chart from Lessons 2 & 3.

Student Energy Conversion Chart

From → To ↓	**Mechanical energy**	**Thermal energy**	**Chemical energy**	**Electrical energy**
Mechanical energy	Jumping rope Using a rope as a 'snake' Blowing a whistle Using a music shaker Using wind-up toys	Tea kettle whistling		
Thermal energy	Friction: rubbing hands together Running in place			Heating water
Chemical energy	Eating carrots	Boil water		
Electrical energy	Dynamo flashlight			

Lesson 5: 1st grade
Compiling Data: Creating Flow Charts

Lesson Overview: All life and action in the world involves some form of energy conversion.
Lesson Concept: All life and action in the world involves some form of energy conversion.

Materials:
- White construction paper
- Markers / crayons / pencils
- Energy Matrix Chart created from Lessons 2, 3, and 4 (on the wall or in view of all the students)
- Student hand-out: Arrow page
- Scissors
- Glue
- Student hand-out

Standards:
- Mathematics:
  - III.1.EE.1 (Data Analysis and Statistics: Collect and explore data through counting, measuring an conducting surveys and experiments).
  - III.3.EE.2 (Data Analysis and Statistics: Conduct surveys, samplings and experiments to solve problems and answer questions of interest to them).

Timeline: 1 class period (45 – 50 minutes)

Class Structure: whole class project

Assessment Strategy: EEK! Daily Assessment
General Assessment Strategy #1
General Assessment Strategy #2
General Assessment Strategy #3

Lesson 5: 1st grade
Compiling Data: Creating Flow Charts

In this lesson, the students will create flow charts of all the energy conversions from Lessons 2, 3 and 4.

Lesson Overview: All life and action in the world involves some form of energy conversion.
Lesson Concept: All life and action in the world involves some form of energy conversion.

Supplies Needed:

- White construction paper
- Markers / crayons / pencils
- Energy Matrix Chart created from Lessons 2, 3, and 4 (on the wall or in view of all the students)
- Student hand-out: Arrow page
- Scissors
- Glue
- Student hand-out

Background Information:

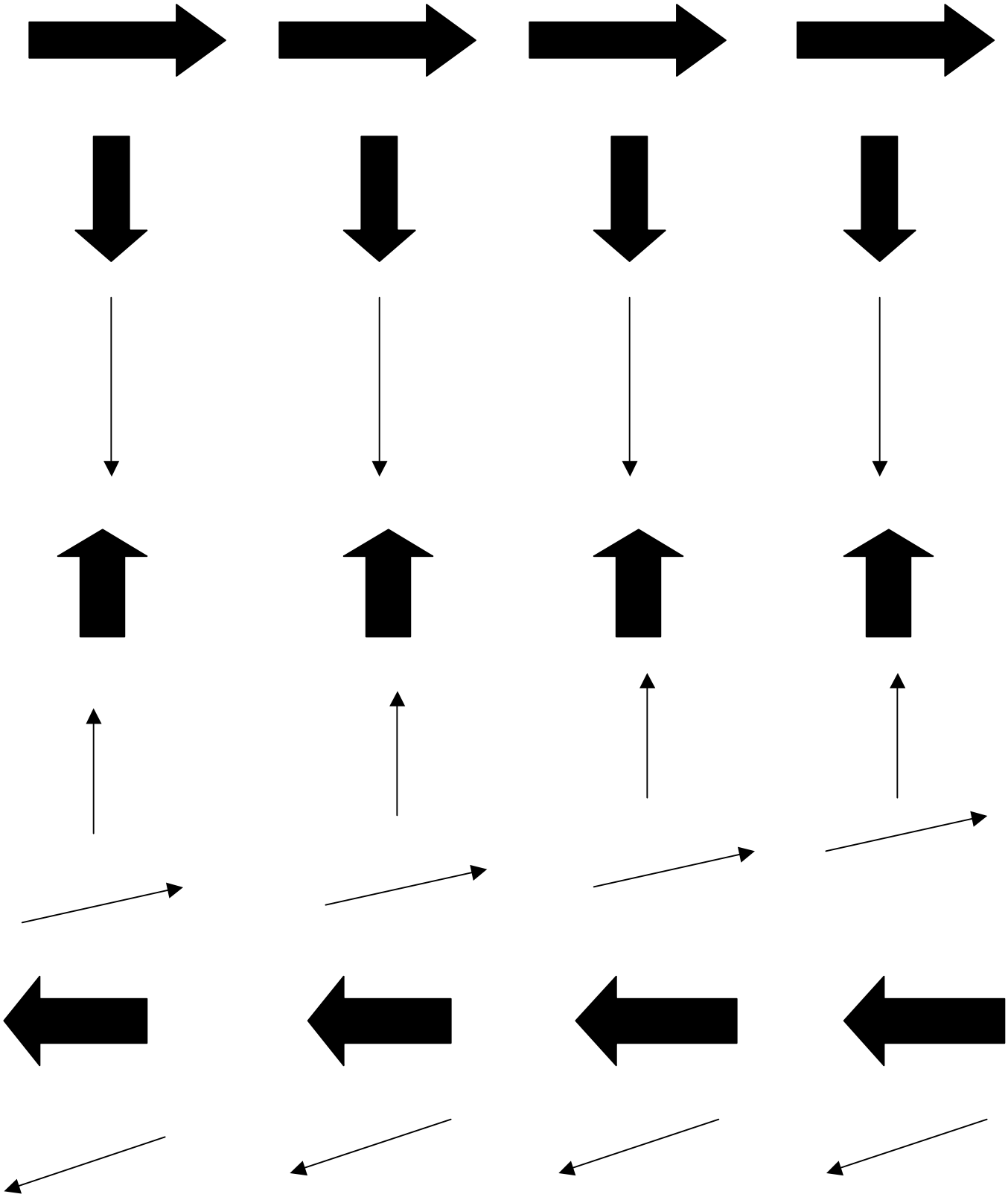
The student hand-out, Arrow Page, is provided within this lesson if you would like the students to cut and paste arrows instead of drawing them within the Flow Charts. The goal of this lesson is to reinforce that energy changes from one form to another (energy conversion) readily and all life and action in the world involves some form of energy conversion. At the end of this lesson, the students will now have their own Energy Matrix Charts (in the form of flow charts) and the class will have a variety of Energy Matrix Charts illustrating the energy conversions within the previous class experiments.

If the students would like to create their own personal symbols to represent the different forms of energy or if the class would like to create them together, this is a good lesson for that exercise.

CLASS EXERCISE:

1. Review the different forms of energy the students have learned thus far (and have them discuss examples for each, or an energy conversion discussing each)–thermal, mechanical, chemical, electrical, electromagnetic (solar).
2. Review the Energy Matrix Charts created from Lessons 2,3, and 4. (The different coloured paper that the students sequenced to represent the energy conversions in their experiments.
3. Encourage students to explain energy conversion–and provide and example–in their own words.
4. Working individually or in small groups, have the students choose at least three experiments to turn into Energy Flow Charts.
5. Create the Energy Flow Charts on large paper for each of the three experiments chosen by the students. Use the symbols, if created, or words (or designate colors) to represent the energy conversions for each experiment.

Student Hand-out
Arrow page



Lesson 6: 1st grade
Heating Water: Brainstorming Different Methods

Lesson Overview: People living all around the world need and use hot water.
Lesson Concept: There are many different ways to heat water. There are many different energy sources used to heat water.

Materials:
- Colored construction paper
- Scissors
- Glue
- Student hand-out

Standards:
- English:
  - IX.11.EE.1 (Inquiry and Research: Generate questions about important issues that affect them or topics about which they are curious, and use discussion to narrow questions for further exploration).
- Science:
  - V.2.EE.4 (Use Scientific Knowledge from the Earth and Space Sciences in Real-World Contexts: Describe uses of water).
- Social Studies:
  - II.2.EE.1 (Geographic Perspective: Describe how people use the environment to meet human needs and wants).
  - II.2.EE.2 Geographic Perspective: Describe the ways in which their environment has been changed by people, and the ways their lives are affected by the environment).

Timeline: 1 class period (45 – 50 minutes)

Class Structure: whole class or small group experiment (brainstorming session)

Assessment Strategy: EEK! Daily Assessment
Pre-module Assessment Questions #1

Lesson 6: 1st grade
Heating Water: Brainstorming Different Methods

This lesson is a brainstorming session to begin considering how people around the world live. The lesson focuses on different ways to heat water.

Lesson Overview: People living all around the world need and use hot water.
Lesson Concept: There are many different ways to heat water. There are many different energy sources used to heat water.

Supplies Needed:
- Colored construction paper
- Scissors
- Glue
- Student hand-out

Background Information:
The three countries that will be discussed in the International Water Study are Kenya, India, and Haiti. The International Water Study will begin in Lesson 8.

CLASS EXERCISE:

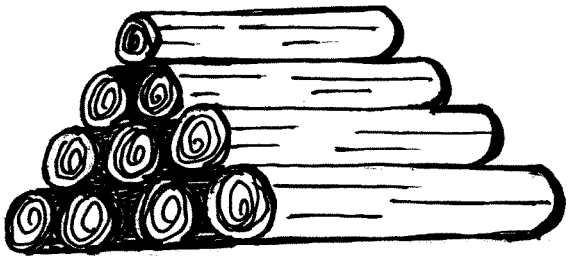
I. Brainstorm different ways to heat water
   a. Write down all the responses from the class
   b. Discuss the energy conversion that takes place in each of the examples
   c. If it hasn't been suggested: suggest heating water over a fire, burning wood

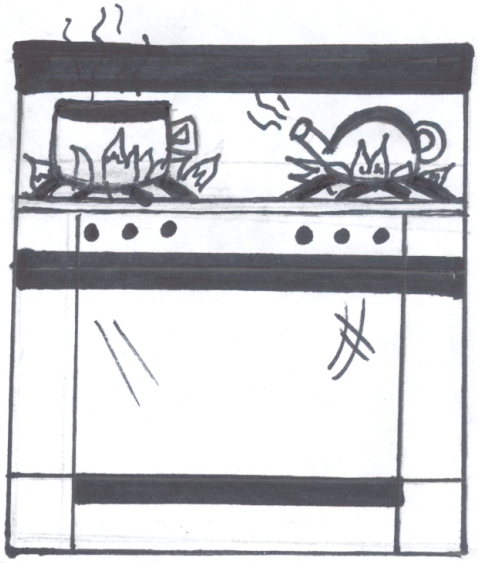
II. Create posters of different ways to heat water
   a. Cut & paste pictures in order: potential and result (pictures of process of heating water: 2 step cause & effect)
   b. Use the Student hand-out of the following images:
      - Logs
      - Fire
      - Gas stove
      - Pans on gas stove
      - Sun
      - Bowl with bubbling liquid

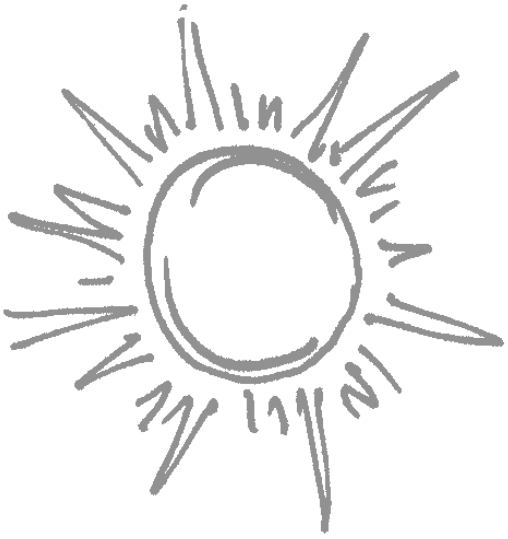
III. Brainstorm why do we heat water?
   a. Write down all the responses from the class
   b. Make food and drink, wash dishes, wash ourselves

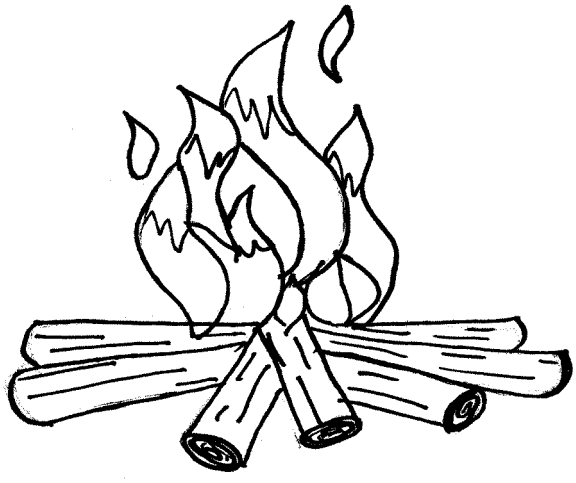
IV. Introduce International Water Study
Mention in the following lessons, the students will be studying water in Kenya, India, and Haiti.

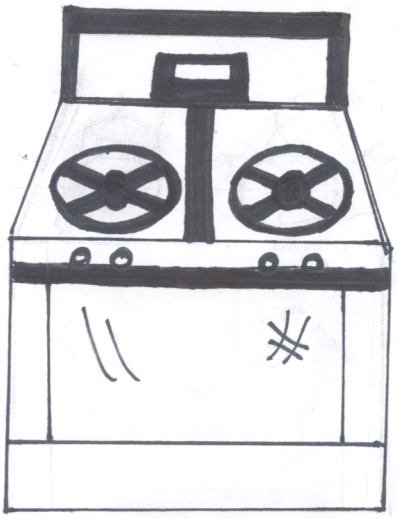
Student Handout











Lesson 7: 1st grade
International Study: Reading Books

Lesson Overview: Everyone around the world is connected through energy use.
Lesson Concept: Everyone around the world needs and uses energy.

Materials:
- *House and Homes* by Ann Morris
- *Bread Bread Bread* by Ann Morris
- *A cool drink of Water* by Barbara Kerly
- *Women in the Material World* by Faith D'Aluisio and Peter Menzel

Standards:
- English:
  - VII.9.EE.1 (Depth of Understanding: Explore and reflect on universal themes and substantive issues from oral, visual, and written texts).
  - VIII.10.EE.3 (Ideas in Action: use oral, written, and visual texts to identify and explore school and community issues and problems, and discuss how one individual or group can make a difference).
  - IX.11.EE.1 (Inquiry and Research: Generate questions about important issues that affect them or topics about which they are curious, and use discussion to narrow questions for further exploration).
- Science:
  - II.1.EE.2 (Reflect on the Nature, Adequacy, and Connections Across Scientific Knowledge: Show how science concepts can be interpreted through creative expression such as language arts & fine arts).
  - II.1.EE.4 (Reflect on the Nature, Adequacy, and Connections Across Scientific Knowledge: Develop an awareness of and sensitivity to the natural world).
  - III.2.EE.4 (Use Scientific Knowledge from the Life Sciences in Real-World Contexts: Compare and contrast food, energy, and environmental needs of selected organisms).
  - III.5.EE.3 (Use Scientific Knowledge from the Life Sciences in Real-World Contexts: Describe the basic requirements for all living things to maintain their existence).
  - III.5.EE.5 (Use Scientific Knowledge from the Life Sciences in Real-World Contexts: Describe positive and negative effects of humans on the environment).
  - IV.1.EE.4 (Use Scientific Knowledge from the Physical Sciences in Real-World Contexts: Identify forms of energy associated with common phenomena).
- Social Studies:
  - II.2.EE.1 (Geographic Perspective: Describe how people use the environment to meet human needs and wants).
  - II.2.EE.2 Geographic Perspective: Describe the ways in which their environment has been changed by people, and the ways their lives are affected by the environment).

Timeline: 1 class period (45 – 50 minutes)

Class Structure: whole class extended circle time

Assessment Strategy: EEK! Daily Assessment, Pre-Module Assessment Question #2

Lesson 7: 1st Grade
International Study: Reading Books

This lesson is an extended Circle Time–reading and discussing the following books with the class. These books are also good for the students to read together in small groups and then come together as a class to discuss.

Lesson Overview: Everyone around the world is connected through energy use.
Lesson Concept: Everyone around the world needs and uses energy.

Supplies Needed:
- *House and Homes* by Ann Morris
- *Bread Bread Bread* by Ann Morris
- *A cool drink of Water* by Barbara Kerly
- *Women in the Material World* by Faith D'Aluisio and Peter Menzel

Background Information:

Teacher's Note: The books that have been chosen show daily life of different people around the world. Kenya, India, and Haiti are included in these books though none of these include photographs of Kenyans cooking or gathering water. Ethiopia, while very different from Kenya, is a neighboring country and there are photographs in *Women In the Material World* showing typical cooking methods from Ethiopia.

The following books have been chosen to introduce different cultures throughout the world. While they all are not discussing water per say, they provide a platform to discuss how we are all connected as people throughout the world. This lesson's main intent is to begin developing empathy and understanding that how we live in the United States may be (and often is) different from how many people throughout the world live. And, we are all equals.

Possible Lead Questions
- Where does water come from? (faucet, sky)
- Where could you find water? (house, puddle, river, ocean, lake)
- Where might you get water if you didn't have running water in your home?
- What do you use water for?
- How often do you use water?
- Is water important? Why?

CLASS EXERCISE:

Read and discuss the following books with the class:
- *House and Homes* by Ann Morris

India and Kenya are included in this book as well as the housing of many other cultures.
- *Bread Bread Bread* by Ann Morris

Breads of India are included in this book as well as breads eaten around the world.
- *A cool drink of Water* by Barbara Kerly

Photographs from India as well as from around the world are included in this book.
- *Women in the Material World* by Faith D'Aluisio and Peter Menzel. Read an excerpt from one country, we suggest Ethiopia, and let the class look through the photographs.

Lesson 8: 1st grade
International Water Study: 3 Focus Countries

Lesson Overview: Everyone in the world needs and uses water.
Lesson Concept: There are many different ways people throughout the world heat water.

Materials:
- World map
- Student hand-outs (3) of average U.S. water use
- *Women in the Material World* by Faith D'Aluisio and Peter Menzel

Standards:
- English:
  - IX.11.EE.1 (Inquiry and Research: Generate questions about important issues that affect them or topics about which they are curious, and use discussion to narrow questions for further exploration).
- Science:
  - III.2.EE.4 (Use Scientific Knowledge from the Life Sciences in Real-World Contexts: Compare and contrast food, energy, and environmental needs of selected organisms).
  - III.5.EE.3 (Use Scientific Knowledge from the Life Sciences in Real-World Contexts: Describe the basic requirements for all living things to maintain their existence).
  - III.5.EE.5 (Use Scientific Knowledge from the Life Sciences in Real-World Contexts: Describe positive and negative effects of humans on the environment).
  - V.2.EE.4 (Use Scientific Knowledge from the Earth and Space Sciences in Real-World Contexts: Describe uses of water).
- Social Studies:
  - II.2.EE.1 (Geographic Perspective: Describe how people use the environment to meet human needs and wants).
  - II.2.EE.2 Geographic Perspective: Describe the ways in which their environment has been changed by people, and the ways their lives are affected by the environment).

Timeline: 1 class period (45 – 50 minutes)

Class Structure: whole class discussion

Assessment Strategy: EEK! Daily Assessment
Pre-Module Assessment Question #3

Lesson 8: 1st Grade
International Water Study: 3 Focus Countries

In this lesson, we will discuss safe drinking water in 3 countries: Kenya, India, and Haiti.

Lesson Overview: Everyone in the world needs and uses water.
Lesson Concept: There are many different ways people throughout the world heat water.

Supplies Needed:
- World map
- Student hand-outs (3) of average U.S. water use
- *Women in the Material World* by Faith D'Aluisio and Peter Menzel

Water Awareness Around the World

1. What is the approximate world population today?
   a) 5 million b) 3 billion c) 6 billion

2. How many people worldwide do not have access to safe drinking water?
   a) 2.1 billion b) 90 million c) 1.5 billion

3. Of all the water on the planet, how much is available for human consumption?
   a) 5% b) 3% c) less than 1%

questions compiled by Population Connection www.popconnect.org 1-800-767-1956 Answers: c, a, c

Background Information: (please refer to UNICEF for further statistics (www.unicef.org))

Kenya's Water:

Water is scarce in Kenya. According to recent statistics from UNICEF, 47% of Kenyans do not have access to safe drinking water sources. When clean, safe drinking water is not available, illnesses increase especially in children and death rates rise.

India's Water:

Today, India has the second highest population (only China has more people) in the world. There are nearly 5 times more people living in India than the United States. In 1997, 19% of the total population did not have access to safe drinking water sources. Today, according to UNICEF, that figure has risen to 26% of the total population. Given the impacts of such population density, India is also on the verge of water stress. Compared to the United States, India has nearly one-half of the available water supply per person (as that of the average American).

Haiti's Water:

As of 1997, 69% of the total population did not have access to safe drinking water sources.
Today, according to UNICEF, that figure has risen to 82% of the total population.
In this lesson, we will discuss safe drinking water in 3 countries: Kenya, India, and Haiti.

CLASS EXERCISE:

I. Mapping

Using the world map, discuss where Kenya, India, and Haiti are located. Use the following lead questions to help the class discussion. After discussing where each country is located on the map with the students, refer to the book, *Women in the Material World,* and show the students pictures of families living in each country.

Possible lead questions:

- Where is each country located in the world?
    - Have students make a mark where each country is located on their hand-outs
- What do you think the climate (weather) is like in each country?
- What do you think the average daily life is like for the children in these countries?
- How might their lives be different from yours?
- Think of a your daily life, what do you use water for? How many times a day do you use water? (*Teachers: compile students' answers on the board and discuss in detail.*)
- Imagine if you didn't have clean water any time you wanted, how would your life be different?
- What do you think is the typical way to heat water?
    - Kenya: wood, charcoal, dung
    - India: wood, gas
    - Haiti: wood, charcoal, dung

II. Average U.S. Water Use

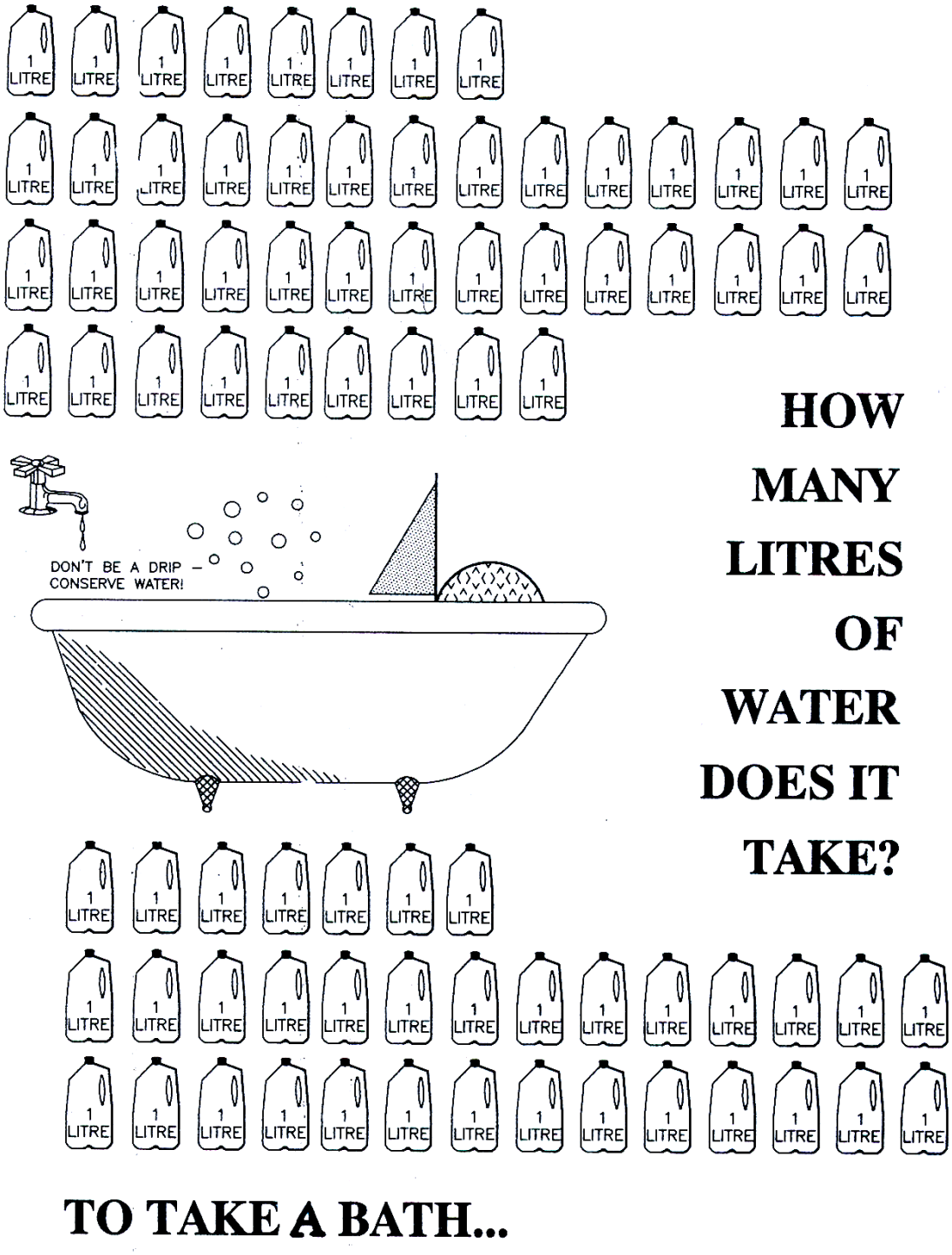
Hold up a 1 litre plastic container and then ask the class, "How much water do you think it takes to:

- fill up your bath?
- spend 1 minute in the shower?
- wash your laundry in the washing machine?

After each question hold up your container and say more than 10 or less than 10 of these containers? Then, hand out Student Handouts #1, #2, and #3 and have the students count how many of litres are on each page and write the amount on the top of the page.

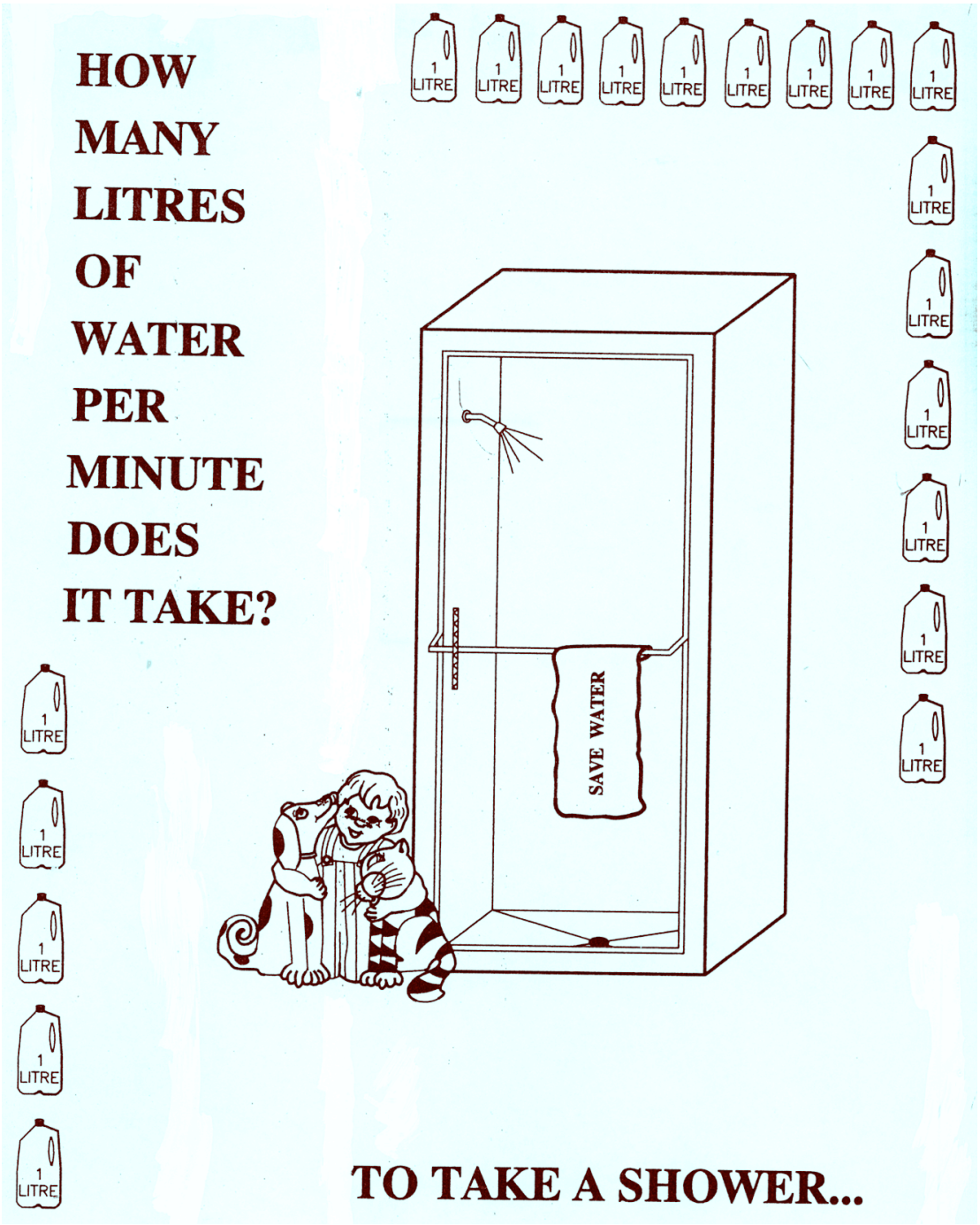
Student Handout #1

This hand-out is from a coloring book originally titled "Learning About Water Usage with Captain Sewer" from the Little Rock Wastewater Utility, Little Rock Arkansas. Illustrator: Evangeline O'Neal. For more information, please contact: Water Environment Federation www.wef.org



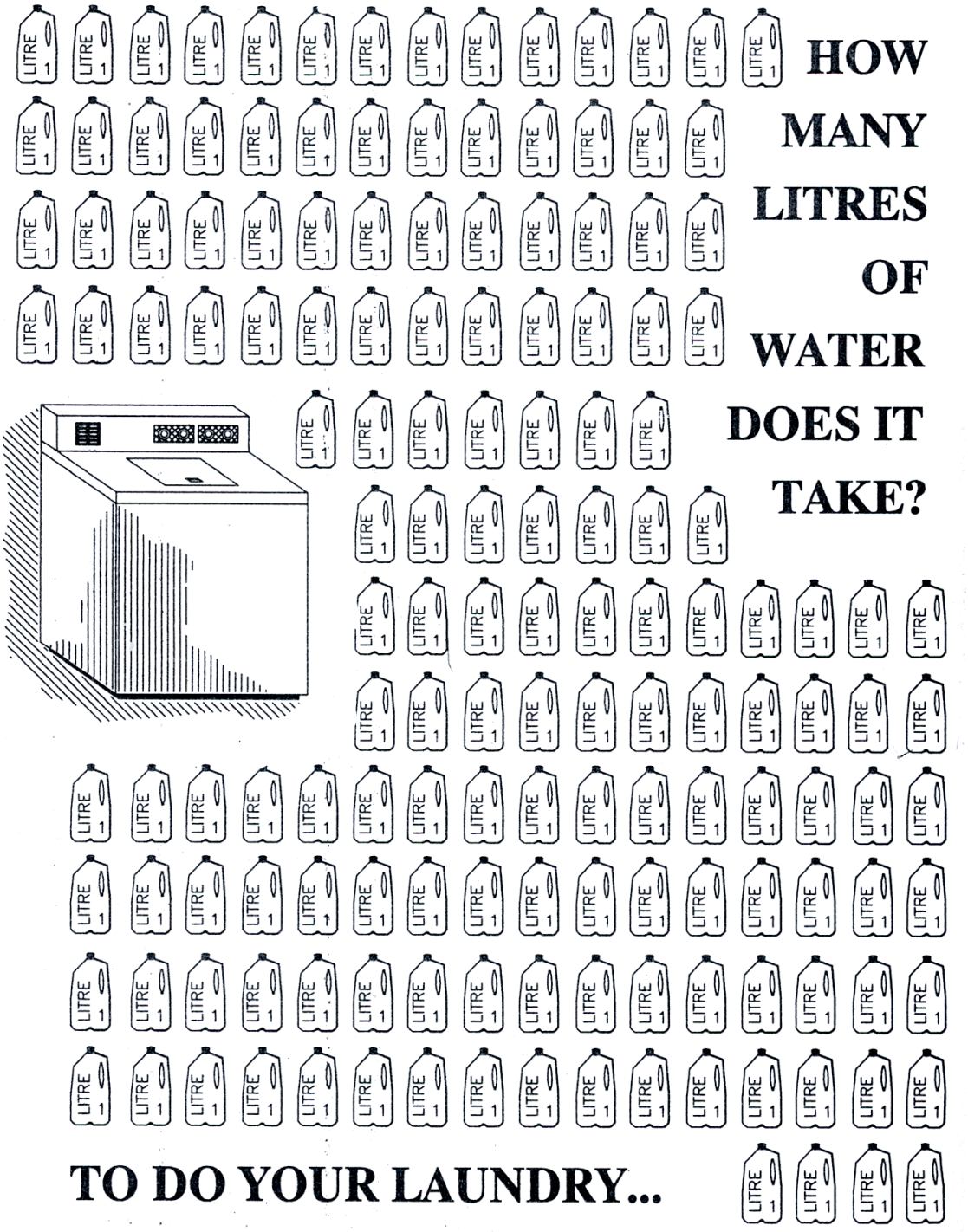
Student Handout #2

This hand-out is from a coloring book originally titled "Learning About Water Usage with Captain Sewer" from the Little Rock Wastewater Utility, Little Rock Arkansas. Illustrator: Evangeline O'Neal. For more information, please contact: Water Environment Federation www.wdf.org



Student Handout #3

This hand-out is from a coloring book originally titled "Learning About Water Usage with Captain Sewer" from the Little Rock Wastewater Utility, Little Rock Arkansas. Illustrator: Evangeline O'Neal. For more information, please contact: Water Environment Federation www.wdf.org



Lesson 9: 1st grade
Solar Hot Water: Comparison Study

Lesson Overview: Measuring water temperature with thermometers.
Lesson Concept: Electromagnetic (solar) energy can be converted into thermal energy–water can be heated with the sun.

Materials:
- Solar hot water bag
- Plastic measuring cup
- Large read thermometers (1 per every 3 students)
- Graph paper
- Pencils

Standards:
- Mathematics:
  - III.1.EE.1 (Data Analysis and Statistics: Collect and explore data through counting, measuring an conducting surveys and experiments).
  - III.3.EE.2 (Data Analysis and Statistics: Conduct surveys, samplings and experiments to solve problems and answer questions of interest to them).

Timeline: 1 full school day (measuring 1x/hr)

Class Structure: whole class experiment

Assessment Strategy: EEK! Daily Assessment
General Assessment Strategy #1
General Assessment Strategy #2
General Assessment Strategy #3

Lesson 9: 1st Grade
Solar Hot Water: Comparison Study

In this lesson students will create a time-data study by measuring water temperature every hour that is heated by solar energy.

Lesson Overview: Measuring water temperature with thermometers.
Lesson Concept: Electromagnetic (solar) energy can be converted into thermal energy–water can be heated with the sun.

Supplies Needed:
- Solar hot water bag
- Plastic measuring cup
- Large read thermometers (1 per every 3 students)
- Graph paper
- Pencils

Background Information:
This lesson can only be successful on a sunny day. If sunny days are scarce, you could also conduct the experiment by heating water on a hotplate and measuring the temperature every minute. But, that method though would not demonstrate the intent of the lesson: to demonstrate the potential energy of the sun.

*Note to Teachers: this is not exact science since the total amount of water will continue to decrease as the experiment progresses, but the students will gain the general idea of increased water temperature over time and can graph how much change occurs from the beginning to the end of the experiment.

CLASS EXERCISE:
I. Fill the solar hot water heater bag and hang in a sunny location
   - Measure 1/2 c of water into a container
   - Have students measure the temperature with a thermometer
   - This will be the baseline temperature

II. Measure the temperature every hour
   - Continue measuring 1/2 c of water every hour
   - Record all temperatures
   - Create a graph detailing findings

Lesson 10: 1st grade
Solar Hot Water: Making Treats

Lesson Overview: Electromagnetic (solar) energy can be converted into thermal energy–water can be heated with the sun.

Lesson Concept: Electromagnetic (solar) energy can be converted into thermal energy–water can be heated with the sun.

Materials:

- solar hot water bag
- 1 cup for every student
- dried soup mix OR
- powdered cocoa mix OR
- any dried treat you can mix & serve using warm water

Standards:

- Science:
  - II.1.EE.4 (Reflect on the Nature, Adequacy, and Connections Across Scientific Knowledge: Develop an awareness of and sensitivity to the natural world).

Timeline: 1 class period (with minimum 4 hours prior to heat the water)

Class Structure: whole class experiment

Assessment Strategy: EEK! Daily Assessment
Post-module Assessment Questions #1,#2. #3

Lesson 10: 1st Grade
Solar Hot Water: Making Treats

This lesson is a day of celebration and can only take place on a sunny day. Fill the solar hot water heater bag and hang in a sunny location early in the day. By the end of the day, you can make tea, cocoa, or dried soups for a solar water heating celebration!

Lesson Overview: Electromagnetic (solar) energy can be converted into thermal energy–water can be heated with the sun.
Lesson Concept: Electromagnetic (solar) energy can be converted into thermal energy–water can be heated with the sun.

Supplies Needed:

- solar hot water bag
- 1 cup for every student
- dried soup mix OR
- powdered cocoa mix OR
- any dried treat you can mix & serve using warm water