Curriculum Units by Fellows of the Yale-New Haven Teachers Institute
2003 Volume IV: Physics in Everyday Life

Physics- “24”

Curriculum Unit 03.04.09
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This unit is about Physics during a 24-hour period of any given day. The students this curriculum unit is presented to will discover and identify the many areas of physics and science they experience in an average 24-hour day. This unit will be developed for middle school students but could easily be modified to be presented to all students of ages and grades.

It should take an entire marking period for the story to fully develop. Each part of the 24-hour day will be given to a group of students to investigate and explore, hypothesize and predict, test and retest.

Other areas of the curriculum like reading, math, and art are included in this unit. I got the idea for this unit from the hit TV series “24” in which entire season of shows actually occurs in exactly 24 hours. Each show is exactly one hour long and is full of action, excitement, questions, mystery, and suspense. I cannot miss an episode, because so much would be missed that the show would not make sense. The same is true for the every day life of our students, but most of them don’t realize this. I trust this unit will get the students involved and interested in the everyday routine of their lives in a deeper way and to a greater degree.

As I talk to my students this year, it is obvious to me that many of them have forgotten the basic concepts presented and demonstrated earlier this year. It became clear that it was not because of lack of studying, which could be true in some cases, or the material being too difficult, which again could be true for some others, but time and again students were not able to connect concepts to their own lives.

One effective approach teachers use to engage their students in any subject or topic is by tapping into their prior knowledge. The key to this strategy is to allow students to choose the situation and then develop their own explanation for what happens and why it happens, using specific principles discussed in class.

Although physics is the primary focus of this unit, the very strong second focus of this unit will be to improve the reading, vocabulary, and comprehension levels of each student. Many strategies and exercises will be brought out and explained in the unit.

Note: Students should bring or be supplied with a science notebook and pencil or pen.

Background

Tell your students that during this unit they will go through an entire twenty-four hour physics day. This means they will connect physics, and other sciences, to every three-hour period of their typical day. The twenty-four hour period will begin at 6 am and end at 6 am. The class will be broken up into eight different groups that will each cover a three-hour segment of the twenty-four hour day. Each group will be expected to research, discover, and present physics activities in their time period. The greatest challenge may be for the groups that have to identify physics during the sleeping hours.

Prior Knowledge

To begin, ask the students, “What is physics?” If there are no responses, have them all look up the definition in a dictionary or science glossary. Have them write it down in their science notebook and copy this chart in their books as you write it on the board.

Physics activity Scientific Principle(s)

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

Brainstorm some of the activities and put them on the chart: How a clock works, how a thermos keeps things cold or hot, how we drink liquids through a straw, how we get tea from a tea bag, etc.

Below is a vocabulary list you can begin with to cover many of the basic principles. You may need to add to this list depending on the topics investigated by your students. Each word is broken down into syllables to assist those who may have difficulty pronouncing them. They should be displayed around the class on big bumper sticker sized construction paper to reinforce using them. Each child should have these words and the definitions written in their science notebook.

Vocabulary/Glossary (with syllabic breakdown)

Air pressure

Air pres/sure - pressure caused by the weight of air

Conductor

con/duc/tor - a thing that transmits heat, electricity, light, sound or other form of energy

Energy

en/er/gy - ability to work

Force - push or pull that gives energy to an object sometimes causing a change in the motion of the object

Friction

fric/tion - force that acts in the opposite direction of motion; will cause an object to slow down and finally stop

Gravity

grav/i/ty - force of attraction that depends on the mass of two objects and the distance between them; responsible for accelerating an object toward the Earth

Insulator

in/su/la/tor - something that prevents the passage of electricity, heat, or sound

Kinetic energy

ki/net/ic en/er/gy - energy of motion

Mass - the quantity of matter anything contains

Permeable

per/me/a/ble - allowing the passage or diffusion of liquids or gases through it

Potential energy

po/ten/tial en/er/gy - energy of position

Work - force acting over a distance to move an object

Test for Understanding

Have each definition written or typed on a 3”x 5” card and used in a Jeopardy Game. Divide the class into 3 groups. Give a number value to each answer in the category. As the answer is read they must come up with

the question. This should be done once a week as a review of the terms. They will improve each time.

Spelling/Art - Activity

Have the students draw or find drawings and take pictures or find pictures that illustrate the scientific terms shown on the bumper sticker sized spelling cards displayed throughout the classroom. Be sure to place the illustration with the spelling word.

Predict and Preview

Before you have the students read the entire adventure, which is on the page before the Performance Standards, have them read the first paragraph then predict what might happen to the main character. Have them develop questions like

What might happen to _____ by 8AM in the morning?

How do you think this story will end? Will the story end with something expected or the unexpected?

K-W-L Strategy

This is another way to help the students preview the literature. Have a KWL Chart prepared to put on the board. Most students know the first column contains what they already KNOW about a topic. Have them copy the chart and fill it in. Remind them that the middle column will contain what they WANT to know about the topic. Have them put their questions there now. Finally remind them that the last column will contain what they LEARN from this unit which would include answering the questions from the middle column (WANT).

Setting a Purpose

Brainstorm with your students what they want to find out when they read the story, based on their preview and on what they already know about physics and mishaps in their everyday life. Remind the students that setting a purpose for reading gives them a reason for reading and helps them focus on important events and people as they read.

Example: I'm going to read to find out how the main character makes it through the day.

This twenty-four hour period centers around Murphy's Law. So for those who are not familiar with this I have supplied the definition. I'm using the definition found in the World Book Dictionary, 1989 edition.

"Murphy's Law (mer'fez) any one of various humorous rules of thumb. Your reference to Murphy's Law touches on only part of that ancient Irish potentates laws...His set of laws of life refer with circularity to nothing, everything, and anything. They are: 1) nothing is as easy as it looks; 2) everything takes longer than you think it will; and 3) if anything can go wrong, it will.

You see, in the television series “24" everything that could possibly go wrong, shock you, have you on the edge of your seat with your mouth gaping, happened and much more. Your attempts to guess what’s going to logically happen next usually fail.

Goal

The adventure you are about to take your students on through this unit will be just as exciting as “24,” but would directly involve them. As all the mishaps occur, during the various time periods your students can research the problems and their remedies, create other problems and their remedies, plus prepare models/demonstrations to explain the research, remedies, and results they have discovered.

Emphasis must be put on them investigating the science of each discovery. How things work or fail to work, effectively, if at all, should be a focal point of this inquiry.

The steps we will go through in this unit are developmentally appropriate for fifth (5th)-eighth (8th) grade students. They are designed to prepare them to act independently and responsibly and to be successful life-time learners.

Listening Strategy (for students who have to be read to)

Listening /Visualizing. Tell students that they can better understand a story as they listen by creating a mental picture of what is happening. Explain that focusing on what the main characters, one being the student, see, hear, and do will help them visualize the story.

Science Performance Standards Included in this Unit

Science Standards

Performance Standards 1.1 & 1.2

Students will acquire and practice the ability to do scientific inquiry. (a-e)

Students will acquire and practice the ability to understand scientific inquiry. (a-e)

Performance Standards 2.1, 2.2, 2.3,

Students will identify objects and materials with rich verbal description. (a-e)

Students will understand that objects have position and motion and that forces can affect

change over these objects. (a-d)

Students will understand the fundamental concepts of the transfer of energy. (a & c)

Physics- "24": The Adventure

Opening Project (art, carpentry, math)

Lesson Activity 1- Build a house or school

Make arrangements with your school to have the students and you go to Eli Whitney Museum to make carry houses and/or schools. These will help the students visualize the mishaps that will occur in the home and school in the adventure. To make this project may take about two (2) hours each. There is a cost involved. Call Eli Whitney for all the information.

Objective:

Students will make a house or school out of wood.
Students will identify how hinges work and how to attach them.
Students will design the interior of their buildings making the best use of the space.

Materials:

Plywood, 2 hinges, nails, twine, dowels, drill, hammer, wood glue, scraps of material, color markers, etc.

Procedure:

1.Take four (4) pieces of plywood about 21"x 4" (2 for the sides of one box and 2 for the sides of the other box) and take two (2) pieces of plywood about 21" x 12" x 1/4" (1 for the back of each of the boxes and take four pieces of plywood about 12" x 4" (2 for the tops and bottoms of each box) and two flat boards about 3" wide x 11 1/2" long (to separate upstairs from downstairs in each box).
2.Use small 1-1 1/2 inch nails to hammer all this together to make two (2) 3-sided boxes.
3.Get the two hinges and connect them to the joining sides of two boxes. Make sure they are positioned to close the two (2) boxes facing each other. You will need screws to attach these. This all will be provided at Eli Whitney Museum. A small hole made with the drill will be needed to get the screw through the hinge and into the wood.
4.Use the dowels, spare wood pieces, wood glue, and other craft materials to make the furniture

in your houses or schools.
5.Two holes should be drilled half way down the side of each box opposite the side where the hinges are. These will be for the handles to carry your finished project. The teacher should read this adventure story to the students or record it. Copies should also be made so the students can follow along and fill in the necessary information to make themselves a part of the adventure.

Physics- “24”: The Story

6:00am-10:00am

It’s still dark and unusually quiet as the entire family continues to sleep on this particular morning. Why is it so unusually quiet? Because you can’t hear the sound of the second hand clicking on your favorite clock by your bed as it makes its way around the entire face. And...oh no! The alarm didn’t go off! You glance to the left wall across the room at the one clock that runs on batteries. Too bad it doesn’t have an alarm. It’s 6:45am and you are 45 minutes late. “Hey everybody, get up!” is heard throughout the whole house as you yell as loud as you can. Quickly, you jump out of bed and immediately slip on the circular, acrylic, area rug next to the bed. It was like a magic carpet ride with not so pleasant a landing. Grabbing for the door as you slide by it, you suddenly remember that one of its hinges has separated from the wall. How does a hinge work? How can it be fixed? (Refer to the building you made for the Opening Project.)

As you are on your way to the floor you let out a loud shriek and hear a POW!! What a painful ordeal. You just lay there for a bit. Your back and buttocks are throbbing. Trying not to fall probably made it worse. But at least you stopped. Why did you stop?

Friction

Friction is a force that acts in a direction opposite to the motion of the moving object. Friction will cause a moving object to slow down and finally stop. In this case, we are talking about your body on the sliding rug. Friction arises from the fact that objects and surfaces are not perfectly smooth. The lack of friction between the rug and the floor caused your fall this morning.

Slowly you roll over on to your stomach. Then you rise to your hands and knees and come to your feet.

Just then the doorbell rings. Before you get up, you lean over and look at your brother(s), _____ (and/or sister(s), _____) in the next room. He/She/They appear(s) to be fast asleep, even after you shouted for everyone to get up. In fact, no one has moved in the entire house but you. That's peculiar. You go to the door- it’s your best friend, _____. "Why aren't you dressed?" he/she asks. You look down at yourself, shrug your shoulders and say, "Well, after we lost power last night my electric clock didn’t go off, so I got up late. Come

on in.” “I wonder why my parents aren't up yet," you say out loud to yourself. "Wait in the living room," you direct _____ (your best friend). "We didn't lose any power last night," exclaimed _____with a puzzled look on his/her face. You stop for a second taking in what he/she just said and you continue to look for your parents/guardians when you notice a note addressed to you on the message board in the hall. It says,

> Dear _____ (your name),
> At about 3 am we got an emergency call and had to leave. Be sure to get _____ (your sibling(s) up on time so he/she/they won't miss their bus for school. Don't forget to fix breakfast! See you after school.
> Love,
> Mom & Dad/(guardians' name)

You wonder what happened but you realize you only have half an hour to get your sibling(s) up, dressed, fed, and out in time for the bus. Nevertheless, how did your parents know that the actual time they got up was 3:00am? Was their clock the battery operated or the wind up kind? How do they work?

Demonstration

Open and closed circuits, the battery operated kind. Materials needed: small light bulbs,

batteries, bulb holders, insulated wire. Assign this demonstration to 3 students.

Have them use the internet, text books, and encyclopedias to research. Teacher will

supply the materials.

Assignment

Potential and kinetic energy- Research how a wind up clock works! Write an expository essay about it. Please include drawings or photos.

The story continues. There is only one clean pot on the stove and you use it to warm up

yummy leftover stewed apples with brown sugar and cinnamon. Along with a slice of toast and a cup of milk, this would be a great quick breakfast for _____ (sibling(s)). "Wake up _____ (calling their names)! We are going to be late if you don't hurry and get dressed and eat,” you yell nervously. “Thank goodness we all showered the night before” you think to yourself. “I smell something burning,” says your friend from the living room. He/she is right! Oh no! The apples!

You grab the handle of the pot with one hand, turn off the stove with the other, and search speedily around the kitchen for a trivet. You don't see one. What is the problem?

Conduction

You have hot apples in a hotter pot and you are about to put it down on the counter which is cooler. The counter will get hotter, possibly even burn, because the heat will be transmitted from the apples to the pot, and finally to the counter. What do you do?

You make a trivet. A trivet is an object used to create an air space between a hot object like the pot, and a countertop or table, so it will not burn.

Assignment

Research what other items can be used or made to create an air space between objects of different temperatures.

Lesson Activity 2 - Making a potholder, trivet, or rug .

This activity will be done in class and will involve using square knots and fine motor skills. The entire activity will take from 1-4 hours. The rug will take longer time than the trivet.

Materials: Rug yarn, scissors, and more depending on what you are making.

Procedure:

1.Have the students pair up.
2.They will each need 7 inches of rug yarn to make a ring about ½ inch in diameter for the center of the trivet.
3.Cut 32 strands. Each should be six times the width of the trivet or rug from the center to the edge. So, if the trivet is to be 6 inches wide, the distance from the center to the edge would be 3 inches, and each strand would be 18 inches long. It may be started with any number of strands from 20 to 36, not just 32.
4.Double the strands in the middle and loop them over the center ring.
5.Make groups of 4. Number the strands mentally from 1 to 32.
6.Tie eight rows of square knots all the way around the ring.
7.Draw the knots in the first row up tight. Start the first row with strands 1, 2, 3, and 4; start the second row with strands 3, 4, 5 and 6; start the third row with strands 1, 2, 3, and 4 and so on.
8.Space the second row of knots about 1/16 of an inch from the first row. Space the third row about 1/8 of an inch from the second row. Space the fourth row about 3/4 of an inch from the third row. Then space the succeeding rows about 3/8 of an inch from each preceding row.
9.It should be flat. Leave some dangling yarn at the ends.
10.Record this experience in your KWL Chart and science notebook.

The story continues. What can you serve the food on? The sink is filled with every dish in the house. All you need is a clean cup and a plate or bowl of some kind. But you only have a few minutes and you hear your sibling(s) coming towards the kitchen. You must make a bowl and cup. The method we will use to make the plate and cup is called origami. Origami is the art of paper folding handed down from the Japanese culture many years ago.

Lesson Activity 3 - Make a plate and cup (origami style)

This activity will be done in class and will require fine motor skills and paying attention to details. The entire activity should take about 45 minutes.

Materials: Construction paper, waxed paper, scissors, and ruler (optional)

Procedure:

1.To make the paper plate you must use a rectangle sheet of paper.
2.Fold it in half one way. Make a good crease. See Diagram A.
3.Leave it folded and fold what you now have in half again in the same direction you folded it previously. Make a good crease.
4.Open it all the way and now fold it in half the other way. Make a good crease.
5.Leave it folded and fold what you now have in half again in the same direction you folded it previously. Make a good crease.
6.Now open it all the way and lay it flat with all the great creases showing.
7.Have the rectangle in front of you WIDE and bring edge (AB) to the center. Make a crease. Bring the edge (CD) to the center. Make a crease.

(diagram available in print form)

8.Then fold points A and C in to a and c, and points B and D into b and d.
9.The corner flaps of the larger rectangle should be folded diagonally so that point A touches e, B touches f, C touches g, and D touches h. It should look like a box without a top. Crease well.
10.Fold the extra flaps of paper over and secure with tape.
11.Be sure to line with wax paper before putting food inside.

To make the cup:

1.To make the paper cup you must use a square sheet of paper. Start with a rectangle, and fold one corner down so that there is a triangle and an extra rectangle of paper. Remove this rectangle.
2.Hold the triangle with the middle point on top. See Diagram B.
3.Fold point B to point b. It should make a straight line from (b to a).
4.Fold point A to point a. It should make a straight line directly on top of the previous flap.
5.Take the top 2 small triangle flaps (triangle Cba) and fold them down front and back. The front flap should be tucked into the flap from step 4
6.Open the mouth of the cup and line it with waxed paper before drinking out of it.
7.Record this experience in your KWL Chart and science notebook.

(diagram available in print form)

Conclusion and Assessment:

Place a light nutritional snack in your newly made plate and cup, such as water (cup) and some apple slices and whole grain crackers (plate). If your containers hold these items long enough for you to consume them, then you have done excellent work!

The story continues. _____ (sibling(s)) enter(s) the kitchen fully dressed and sit(s) in his/her/their usual seat(s). You give him/her/them a couple of heaping tablespoons of hot stewed apples and a slice of whole wheat toast on your newly made dish. You pour them drinks when they are finished eating. The cup will not stand up on its own.

You hurry to shower and get dressed. As you are on your way back to the kitchen, your eye catches a large yellow vehicle passing the front bay window of your home. Oh no! The bus! “We've missed the bus, _____ (sibling(s)). Please hurry! We're going to have to walk.” Your friend, _____, is still in the living room. "Let's go everybody, " you say. You open the front door and ... what is this? A shiny new bike for each of us, even your friend. Wow! Who knew? You all are going to be late if you don't step on it, right away. You and _____ (friend) are excellent bike riders, but your sibling(s) can't ride that well. With no time to waste, you begin to show him/her/them how to ride the bike(s). What is the key here? Balance.

Balancing Act- What is an Object's Center of Gravity?

(Experiment taken from Science in Seconds for Kids by Jean Potter p.94)

Materials: ruler

Procedure:

1. Hold the ruler vertically with one end in the palm of your hand.
2. Let go of the ruler and balance it upright for as long as you can. Can you feel a force pulling against the ruler?
3. Turn the ruler so it is horizontal.
4. Balance the ruler by placing the middle of the ruler on your finger.

Why does this happen? The steadiness of the ruler depended on how its weight, or amount of downward force, was distributed. In order to balance the ruler, you have to find its center of gravity. The center of gravity is where all of the object's weight is concentrated. It was difficult to balance the ruler when you held it vertically, because most of the ruler's weight is at the top or the bottom. When you turned the ruler to a horizontal position, you could easily balance it on your finger, because the weight was evenly distributed on either side.

Assignment: Research other ways to show balance. Record this and the above information to your KWL Chart and your science notebook.

You try to show your siblings their center of gravity and how to balance, so they can stay on the bike while it is in motion. Eventually you all make it to school. You ask the principal for permission to store the bikes in the school storage room and he agrees.

10:00am - 2:00pm

Our first class is Literature. Your friend, _____, is asked to read, but there is a problem. He/She forgot his/her glasses and without them, he/she is blind as a bat. "Do you want to use mine?" you ask."Ok," he/she smiles. But he/she puts them on and can't see a thing. Why can't he/she see through them?

Eyeglasses Lenses- How do Eyeglasses Help People See Better?

(Demonstration taken from Science in Seconds for Kids by Jean Potter p.101)

Materials: several pairs of prescription eyeglasses, borrowed from friends

Procedure:

1. Try on one of the pairs of eyeglasses. Allow all of your students to try on the same pair.
2. Look at a faraway object and a close up object. How do your eyes focus on these objects?
3. Follow the same procedure with the other pairs of glasses.

Why is the focus different? Each lens helps correct a specific eyesight problem. Concave lenses are used for nearsighted people, who can clearly see objects close to them, but distant objects are blurred. This type of corrective lens is thinner in the middle than around the edges. It bends light rays outward before they reach the eye, so the rays focus on the retina instead of in front of it. A farsighted person can focus well on objects at a distance, but close-up objects are blurred. These people must wear glasses with convex lenses - lenses that are thicker in the middle than around the edges. Convex lenses bend the light rays inward, so they focus on the retina instead of behind it.

Add this information to your KWL Chart and science notebook.

Math Lesson : Have the students take a survey of the glasses worn by students in the class. Graph your findings.

In either case, _____ (friend) couldn't use your glasses, so now you have to read. The next class you have is science. Each student has to show the power of solar energy, so you get your magnifying glass and a jar of your favorite bugs and set each one of them on fire. How does it work?

Sunburst- How Powerful is the Sun's Heat?

(Demonstration taken from *Science in Seconds for Kids* by Jean Potter p.37)

Materials: Magnifying lens, jar of bugs (ants, spiders, roaches, ladybugs, crickets, etc.) and a small jar (like one used for baby food)

Procedure:

1. Take one bug out of the large jar at a time and place it in the small one.
2. Hold the magnifying lens so the sun's rays are focused directly on the bug. Hold the lens there until you see smoke.

Why does this happen? The sun's rays can be very strong. By using the magnifying lens, you concentrate the sun's energy on one spot and intensified the heat. The heat was strong enough to burn the bug and kill it, if you keep the magnifying glass there long enough.

Assignment: Research different ways the sun's energy can benefit people or other living creatures. Make your report a 5-paragraph essay. Be sure to add this information to your KWL Chart and your science notebook.

2:00pm - 6:00pm

The story continues. You get close to your social studies class and remember you are going to be quizzed on the Civil War, but you didn't study. And worse yet, you're going to have a math assessment on estimation next period. Needless to say, your grade on the social studies quiz was not so great, but you are going to make it up by doing a research paper on one of the Generals in the war. Estimation has always given you problems, but you managed to pass the assessment with 81%. Not bad. Lunch was quick, 30 minutes. Then you had band practice. You 're a part of the percussion section.

Assignment: Go on the internet and find how to make at least 2 percussion instruments. Find their origin, what they are usually made of, and how to use them. Make them and bring them to share with the class.

You, _____ sibling(s), and _____ your best friend), meet at the principals storage room at the end of school to get your bikes. On the way home, something tells you not to go down a particular street you usually go down, but its too late now! Before you all can put on your brakes, you ride right into a bunch of pot holes and each of you are thrown off your bikes to the ground.

What happened?

Explanation: Potential and kinetic energy conversions

The bikes moving forward at any given speed have potential energy. When they landed abruptly in the pot holes, the energy was converted to the persons on the bike and caused them to be thrust forward from the bikes. That is kinetic energy.

You all get up quickly because you are not hurt. When you get going again, in the opposite direction you are all startled by a terrifyingly loud siren. As you look in your side-view bike mirror, you see the word AMBULANCE, written the right way, not flipped from the mirror.

How could that be?

Bouncing Light Rays- What is it?

(Explanation taken from Explorabook: A Kid's Science Museum in a Book by John Cassidy)

An efficient, highly organized, light ray bouncer. Man-made organized light ray bouncers have been in use for thousands of years, the first ones were probably made out of polished obsidian, a naturally occurring glassy material. The kind you looked at this morning is a clear piece of glass with a silver coating on the back. The ancient Greeks made mirrors this same way over 2,000 years ago.

Assignment: Have the students bring in small mirrors and work in groups of three.

One member of the group at a time is to write a message that would look correct in a mirror image and the other 2 are to guess what it says using their mirrors. Each person should take a turn writing a message. Writing a mirror message may take some practice. Allow time for this. Record this experience on your KWL Charts and in your science notebooks.

As the adventure continues you all move swiftly to the curb to the right and let the ambulance pass. Then you continue home with your younger sibling(s) and best friend. Your sibling(s) was/were riding a little better in just one day. You’re sure that he/she/they will practice everyday. As you approach home, you can't help but notice the crowd that has gathered on the lawn of your home. You each stop, get off your bikes, and walk through the crowd towards the front porch. Then loud cheering erupts, but for who? You peek at a space through the crowd and notice a photographer taking pictures of your parents. Where have they been? Can you believe it? They inherited a fortune worth $8 million. "We're rich, really rich!" you exclaim. But you hope that they don't come into your house. The kitchen is a wreck and a door is off its hinge. What will the photographers think? It doesn't take long to realize that a lot had changed in our house. There are no dirty dishes because there are no dishes period. The hanging door has also been removed. When the crowd clears

you hug your parents/guardians and ask when and how did this all happen. Your mom says she received a call from her cousin, saying that his father, her favorite uncle, bought a lottery ticket and put it in his and her name and the number came out to $16 million. He was so overwhelmed by the news, he couldn't call until 3:00am in the morning. That's when she and your father got dressed and took off.

6:00pm - 9:00pm

It seems funny not to have any more financial worries. You wonder if your parents will leave their jobs. For right now though, they are going shopping. You'll have to make dinner. What would be quick, easy, nutritious, and tasty? Beans, rice, and steamed broccoli. Make the dry beans in the pressure cooker. But how does it work?

Pressure Cooker

(Taken from Physics Lab in a Housewares Store by Bob Friedhoffer p.61)

The maximum temperature that boiling water can reach at sea level at an air pressure of

14.7 lbs/in2 (1kg/cm2) is 212° F or 100° C. The temperature of water cannot be raised

above its boiling point, no matter how large or hot the fire is that's heating the water, without increasing the pressure placed on the water.

If the pressure on water is less than 14.7 lbs/in2 (kg/cm2), the temperature of boiling water is lower. In Denver, Colorado (the Mile High City), water boils at approximately 203° F or 95° C, because air pressure is lower at higher elevations. If the pressure is greater than 14.7 lbs (1kg/cm2), the boiling point of water will increase.

It is possible to increase the temperature of boiling water by using a pressure cooker. A pressure cooker is a cooking pot made from heavy-gauge metal that can withstand high pressure. It consists of a top and bottom that can be locked together. The device usually has a pressure regulator, and a vent or blowout plug.

The blowout plug is an emergency valve. If the pressure gets dangerously high inside the cooker, it can be released through this plug. Pressure cookers allow the water inside to reach a temperature as high as 250° F (120° C). This way, the beans cook in less than half the usual time, about 30 minutes. It will take you about 40 minutes to cook the brown rice and steam the fresh broccoli and carrots.

Assignment: Plan an entire healthy meal. Be sure to include at least two cooked vegetables, plus one raw vegetable. Corn is a grain, not a vegetable. Describe what you cook the food in, and how it is prepared.

You heard your father mention that they were going to buy some new dishes, a new door with new hinges, a new rug with grip on the bottom, battery operated clocks with spare

Batteries, and some tea bags. When they return you will all have a relaxing cup of peppermint tea. How do we get the tea from the tea bags?

Permeability- What is it?

Permeability is the ability of a substance to pass through pores and openings. Crushed tea leaves are

measured into a filter paper and sealed on all sides. It is placed in a tea cup and boiling water is poured over it. Essential oils and flavors of the tea leaves pass through the porous filter tea bag into the cup. The tea bag is then removed and sweetener is added.

10:00pm

Your parents are back home from shopping and its tea time, then bedtime.

If possible, make a cup of tea for each student.

11:00pm to 6:00am

While you are asleep, there are things still going on in your home. House alarms, refrigerators and more are working. It will be up to you students to discover or create the rest.

Story Follow-up: Follow up Strategy (Cause and Effect)

Have the students complete a “Cause and Effect” Chart. At the end of the unit each student should be able identify many causes and effects from the story. Look back at the KWL.

Conclusion and Assessment:

Place a light nutritional snack in your newly made plate and cup like water (cup)

and some apple slices and whole grain crackers (plate). If your containers hold

these items long enough for you to consume them, you have done great!

Final Project

Have each individual or group of students invent something that could be used to improve or remove the disasters in their time period, or fix or improve something that has already been invented.

Some of the Science Performance Standards that will be included in this unit are listed below.

Science Standards

Performance Standards 1.1 & 1.2

Students will acquire and practice the ability to do scientific inquiry. (a-e)

Students will acquire and practice the ability to understand scientific inquiry. (a-e)

Performance Standards 2.1, 2.2, 2.3,

Students will identify objects and materials with rich verbal description. (a-e)

Students will understand that objects have position and motion, and that forces can cause change to these objects. (a-d)

Students will understand the fundamental concepts of the transfer of energy. (a & c)

@1H:Resources

Teachers Annotated Reading List

Friedhoffer, Bob, *Physics Lab in a Housewares Store* , New York: Franklin Watts, 1978. This book contains easy, environmentally safe, experiments and clear explanations of basic scientific principles.

Hillman, Howard, *Kitchen Science Revised Edition* , Boston: Houghton Mifflin, 1989. This book contains experiments and demonstrations using kitchen objects. In the kitchen there are many opportunities to have teachable science moments.

Macaulay, David, *The New Way Things Work,* Boston: Houghton Mifflin, 1998. This book contains many pictures of gadgets, machines, and other items, and how they all work.

Schmidt, Victor E. and Rockcastle, Verne N., *Teaching Science with Everyday Things* , Fresno, California: AIMS Education Foundation, 1995. This book contains science objectives, skills and habits to be developed, facts and principles to be taught, and attitudes and appreciations to be encouraged.

Students Annotated Reading List

Baker, W. & Haslam, *A. Make it Work! Machines* . New York: Scholastic, 1994. This book contains things the children can build themselves that move.

Cassidy, John, *Explorabook: A Kid's Science Museum in a Book* , Palo Alto, CA.: Klutz Press, 1991

Cobb, V. I See *Myself, Scranton, PA.:Harper Collins, 2002* . This book contains exploration with mirrors, nature, and man-made objects.

Friedhoffer, Bob. *Physics Lab in a Hardware Store, Franklin Watts: New York, NY, 1996* . This book is a resource for the concepts of simple machines.

Lafferty, P. *Eyewitness Science: Force and Motion* . New York: Dorling-Kindersley, 1992. This book contains great photographs and explanations of how and why things move.

Vancleave, Janice. *Physics for Every Kid: 101 Easy Experiments in Motion* , Heat, Light, Machines, and Sound. John Wiley and Sons, Inc., 1991. This book contains detailed, but simple experiments for children.

York, Penny, *Experiment Cards,* New York: DK A Penguin Company.
http://www.scholastic.com/magicschoolbus/games/teacher/sound/print.htm