



Curriculum Units by Fellows of the Yale-New Haven Teachers Institute
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Energetic Energy: A Child's Guide to Responsible Energy Use

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An appreciation for our environment can be fostered at a very early age. Along with that appreciation, and awareness of our responsibility for our environment can be cultivated early in a child's life. Children are naturally curious about the world they live in and can easily become conscious thinkers about their world. Having young children explore their world by experimenting and discovering the effect of pollution on the environment can prepare students for a life of responsibility for their world. A sense of responsibility for their environment can be coupled with a consciousness of the effects of food on their own bodies.

Energetic Energy: A child's guide to responsible energy use introduces students to an important matter that will effect their generation and generations beyond. The issue of pollution and world energy consumption, although not a new problem will become a larger dilemma as their generation grows older and become energy consumers. Although there are advances in alternative energy resources the majority of today's energy still comes from fossil fuels. The use of those fuels poses a threat on the environment and a health hazard to humans. By introducing students to this problem, we can raise their consciousness early in their lives and give them the knowledge to conserve, rather than waste energy and hopefully introduce them to the alternative energy resources so they can develop better ways to "get work done".

By relating energy to work their bodies do, I hope to introduce student to three major points. First, you can't get something from nothing. The first law of thermodynamics states that "Energy is recognized as an entity found in many different and interchangeable forms...but in all its transformations the total amount of it never changes: it is conserved." (Goldstein, 30-31) By understanding this, students can relate that to waste and energy conservation. Secondly, I would like my students to take this idea of waste and relate it to their bodies. By consuming foods that will not give them the optimal energy, they will not get the maximum amount of work. If they choose the right foods they will get the right energy. Lastly, I would like to relate the idea of waste to the environment. If energy is not used wisely, waste in the environment can become a health problem to all organisms.

Teaching Method

In this kindergarten classroom, I have a unique population. I teach in a dual language kindergarten classroom where half my students are learning a second language through content. Throughout the day I must integrate different teaching strategies to make content comprehensible to all students in the classroom. By creating an interdisciplinary unit to explore the concept of energy with my students, I can allow the student to investigate that topic with their diverse and individual learning styles.

One of our main goals of the dual language program is the development of oral language. New words and vocabulary are best learned while the concepts for those words are being experienced. When the students carry out the lesson with the teacher, they are always encouraged to talk about the experiences before, after and during to allow for the greatest manipulation of language. By creating a situation where children learn in a small group I help them gain skills like listening and thinking critically about the process in which they and their peers acquire information.

Sheltered instruction plays a major role in teaching a population of second language learners. Strategies such as instructional conversations, demonstrations and modeling can establish optimal learning of concepts and vocabulary. (Richard-Amato, p.302-303) Sheltered instruction includes other methods like contextualizing a lesson to make it meaningful to a child's life. The use of graphic organizers or hands on activities can help a student gain a better and deeper understanding of the content and the language.

In my classroom, the students work in activity centers for most of the day so the teacher led activities will always have a follow-up center that usually consists of a writing/journal center where they will respond to whatever concept they explore in the teacher led activity center. All concepts and activities need to be clearly presented to the students before hand. All activity plans are written with content and language objective to ensure that information is presented to every student with his/her developmental language levels in mind.

Unit Overview

Introduction

Any child who has had a ride in a car or a bus has a basic understanding that there is something that makes that vehicle go. They understand that you have to turn a key before you push on the pedals to move, and they have probably gone with a parent or caretaker to "gas up" the car so they know that fuel is required to make the car go.

The New Haven Public school science standards states that "students will develop an understanding of personal and community health, of the characteristics of changing populations, of the ecology of and uses of natural resources, of changes in environments, and of the uses of science and technology in addressing present-day local and global challenges" (*section 6.0, New Haven Public Schools Science Curriculum Standards*). *Energetic Energy* introduces students to these and many more concepts through an interdisciplinary unit aimed at engaging students in the scientific process. As they explore throughout the unit,

they will be required to talk, write, draw, measure and calculate the concepts of this unit.

Unit Sequence

1. The students will explore the idea of energy by creating models with the teacher of energy transforming into heat, then energy changing the composition of wood to waste.
2. The students will explore the idea of a need for fuel to make a Stirling engine.
3. The students will explore the idea of a need for fuel for the human body as they learn about different kinds of food and how they affect the body.
4. The students will apply the idea of food converted to energy then to waste. This idea will be further explored as the topic of wood burning that creates waste is reintroduced.
5. The students will briefly explore fossil fuels (oil and coal) and the engines that burn them to gain an understanding of where most of the United States energy comes from.
6. The students will explore alternative energy and compare that with fossil fuels to determine what would be a more responsible choice for energy.
7. Finally, the students will apply the idea of responsible energy choices to choices about the foods they put into their bodies.

Unit Topics, Rationale and Activity Plans

1) Energy, Work and Heat

Goals:

1. The students will explore the idea of energy by creating models with the teacher of energy transforming into heat, then energy changing the composition of wood to waste.
2. The students will explore the idea of a need for fuel to make a Stirling engine.

Background Information

Energy comes in many different forms, from motion that can be seen to the potential for the production of it. There is also chemical energy like that of gasoline to a car engine or stored energy in food. Energy such as heat can be stored and used to make motion. Further, there is nuclear energy of plutonium and hydrogen, to name a few.

While the idea of all these forms of energy may seem distant and abstract to a kindergartner, the idea of energy creating work is not. Work is defined as “the product of a force acting on a body and the distance the body had moved under the action of the force” (Goldstien & Goldstien, p. 11) Work can be an observable action that a student at the kindergarten level can see and respond to. By pushing against a wall, a kindergartener can tell if there is work being done or if the effort is wasted because that wall never moved. The energy is expelled and nothing changes.

As stated earlier, the first law of thermodynamics states that energy cannot be created or destroyed. It always stays constant. When heat is the form of energy students can see and feel what happens to that energy when it is used. More importantly, if students can grasp this concept of energy, even though they may not be able to see energy with their eyes but just what happens in terms of work. The second law of thermodynamics states that although energy does not change, it can be wasted. Although the word “thermodynamics” is a mouthful for a young child, the idea of energy wasted can prime a child to understand the importance of conservation.

Activity Plan: Introduction to Energy and Heat

Content Objective:

The students will predict how they will cause a plastic bag to rise using a hair dryer. The students will observe what happens when the bag rises.

Language Objective:

The students will orally predict what how they will cause the plastic bag to rise. The students will report their observations when the bag rises.

Materials:

Hairdryer

Flimsy plastic bag used for vegetables

Chart Paper

Markers

Introduction: Begin by asking the students what they know about energy. A graphic organizer such as a KWL chart is useful during this portion of the lesson because it can be added to during the unit as the students gain more understanding about the topic. As the students generate ideas explain to the students that energy is in them and everything around them.

Procedure: In a small group, discuss with the students how they think they will get the bag to rise. Stress that they have to make the bag rise without blowing the bag with the hairdryer. The hairdryer must be off and the bag must rise off the hairdryer. Record a few predictions on a large piece of chart paper then demonstrate the experiment. Wrap the plastic bag loosely around the mouth of the hairdryer, and then wrap tape around that. Do not tape the bag to the hairdryer. Holding the bag where you taped it, turn on the hairdryer for a few seconds, just enough to inflate the bag. When you turn off the dryer, let the bag go. As the bag rises, ask the students to tell you what they think is happening.

Explanation: Hot air that is rising is doing work and that work uses up the heat energy that makes the hot air hot. The further up the heat rises, the more it has worked, and the less energy is in it. Without energy the air turns cold and the bag falls.

After this lesson is taught, the students should have a general understanding that heat is energy and this can be applied to an engine. The students can use what they know about energy to observe a coffee cup Stirling engine.

Activity Plan: Coffee Cup Stirling Engine

Content Objective:

The students will gain an understanding of engines and fuel by observing a Stirling Engine.

Language Objective:

The students will discuss observations as they examine a coffee cup Stirling engine.

Materials:

Markers

Chart Paper

Coffee Cup Stirling Engine, From the American Stirling Company.

http://www.stirlingengine.com/ecommerce/product.tcl?product_id=21

Procedure: Ask the students to review what they know about energy. Then ask them to tell you what they know about fuel. Discuss the engine in a car and have the students look under the hood of a car in the parking lot. Point out the engine, and discuss how they get a car to move, guiding the conversation towards having to put gas in a car and then turn the key to make it go. Have the students become familiar with the idea of a need for fuel. Since the students cannot see directly in the engine in the car, use the coffee cup Stirling engine to show them how the engine works. Place the engine on a hot cup of coffee and have the students observe the engine. Encourage them to use vocabulary such as energy, heat, piston, and engine.

Explanation: The heat from the coffee causes the piston in the engine to move, thus causing the propeller to move. This demonstration will allow students to see how fuel is needed to make an engine work, and since food is used to make it work it will allow for students to easily transfer this concept to the nutrition portion of the lesson.

Other activities for introducing energy: On an overhead, use a clear plate to drop food coloring in. Use cold water and hot water to drop the coloring into. The food coloring should disperse faster in the hot water showing that heat is energy; it makes things move faster. Also, have the students observe a candle and a match burn to investigate the idea that heat needs fuel in order to create work. The teacher should have a candle already lit for the students to observe. Try to use a candle with a thick wick so they can really watch what the flame looks like. Ask the students to describe what they see. Ask them what they think is happening, why the flame is still lit, why doesn't it just extinguish after a period of time. Then light a match and ask the students to tell you what is happening with this flame and why it does extinguish after a period of time.

Explain to the students that fuel is needed in both cases to keep the flames going. Also ask the students what happens when the match is extinguished. When the burnt match is cooled, ask the students to touch the waste the match makes and ask them what they think happens to that waste.

2) The Body as an Engine and Responsible Choices About Our Bodies

Goals:

1. The students will explore the idea of a need for fuel for the human body as they learn about different kinds of food and how they affect the body.
2. The students will apply the idea of food converted to energy then to waste

Background Information

Anyone who has ever interacted with a kindergarten-age student knows very well that kindergarteners are energetic, very energetic. Kindergarteners need energy do to what they do all day; run, jump, play, learn, draw and even sleep. If they don't eat, they won't have that energy. Although kindergarten children may not realize their need for energy to do all that they do, kindergarteners are vaguely conscious of their need for food. When they are hungry, they feel tired and they eat. Most children at this age can express this need for food to someone, so they understand they need fuel.

This idea of a need for fuel for our bodies can be outlined to a child as young as kindergarten. These children know they have to eat; they can name their favorite food and can, with disgust, name the foods that they dislike. If you take a random poll of favorite foods of kindergarteners, chances are you will get a list of high fat, high sugar foods. I doubt you will get a child who will, with enthusiasm express his love for wax beans or asparagus. However typical this list of favorite high fat, high sugar foods is, it is still dangerous. Children do not seem to be making healthy choices about the foods they put in their bodies.

There is currently an epidemic of childhood obesity in the United States today. Thirty percent of American children are overweight or at risk for being overweight according to a recent publication in the Journal of American Medicine. Children are unaware of the benefits of healthy food choices on their bodies and in some cases unaware of what those choices are. For example, according to the Dole 5 A Day website, fewer than 15% of elementary children eat the recommended 5 or more servings of fruit and vegetables a day, and a quarter of those "vegetables" they do eat are French fries which are very low in nutrients and very high in fat.

An awareness of the process our bodies go through when we eat can help a kindergartener think about what they eat. When we put a piece of food that is low in sugar and fat but high in protein, the energy lasts longer and we are less likely to feel hungry sooner.

As with engines, our bodies also have an input/output system for energy. We consume fuel, our bodies convert it to energy and our muscles produce work. Some foods are burned more efficiently in our bodies to produce optimal work. There are three kinds of biological work; the work the muscles do to show movement, osmotic work, which is the work the kidneys do to make urea from the blood into urine, and synthetic work which develops large molecules from smaller ones. (Goldstein & Goldstein, 277)

The fuel that the body uses is called carbohydrates, fats and proteins. Most commonly the body uses the carbohydrates or glucose mixed with oxygen during exercise to produce energy. However during long exercise

sessions, the body will use fat. Proteins are used during starvation to give the body energy. Tests can be performed to show how efficiently the body uses these three kinds of fuel, however they really cannot be practically applied in the kindergarten classroom.

Throughout this unit, children will be introduced to food groups, and will be required to look critically at what kinds of food they put in their bodies. Grains, vegetables and fruits will be closely examined because this is where most carbohydrates and glucose comes from. Fatty foods will also be examined to show the adverse effects of those foods on the bodies.

Activity Plan: Burn a Peanut

Content Objective:

The students will become familiar with the idea that food has caloric value.

The students will be introduced to the idea that food can be converted to energy.

Language Objective:

The students will discuss observations when they burn the peanut.

The students will generate ideas as to what are better foods for them to eat.

Materials:

Fresh peanuts

Ring stand with a test tube holder with water in it

Wire

Matches

Pie pan

Procedure: Ask the students to discuss what happened with the Stirling engine when it was placed over a cup of coffee. Tell them that food is fuel for their bodies. Show them the peanut and ask them what the peanut does for their bodies. Then ask them how they can get the water to boil using the materials mentioned above. Set up the test tube so it is over the peanut that is resting on a wire under the test tube. Set the peanut on fire and have the students observe what happens. It should burn for a few minutes allowing the water to boil in the test tube. Guide the students in a discussion about how the food is fuel for their bodies and what responsible food choices are. Have the students think about what foods will burn for a long time and what foods will burn for a shorter amount of time. Relate that concept to energy.

Explanation: Heat from the burning peanut is combustion from the chemical energy stored in the peanut. Your body does the same sort of thing. It converts the energy in the peanut into energy to keep your body running.

Other activities for introducing food energy (nutrition): Have students decide what are nutritious food by creating graphic organizers depicting what are good foods to keep their bodies (engines) healthy, and what foods are poor choices for their bodies.

3) Environmental Responsibilities and Alternate Forms of Energy

Goals:

@OL:1. The students will briefly explore fossil fuels (oil and coal) and the engines that burn them to gain an understanding of where most of the United States energy and waste come from.

2. The students will explore alternative energy and compare that with fossil fuels to determine what would be a more responsible choice for energy.

Background Information

After an understanding of food as chemical energy, student can then begin to think about waste (naturally!). Most children understand that food after it is eaten is converted to waste, but now they know that food is changed into chemical energy and then to waste. This idea can now be transferred to the environment.

The use and consumption of fossil fuels has a detrimental effect on the environment and on humans. From the collection phase, through the transport and finally the combustion phase, these fuels can negatively impact the world around us. When fossil fuels are collected there is a risk of injury to humans, as well as leaks to the environment. When fuels are transported there is also a risk for spill, such as the catastrophic spill of the Exxon Valdez and also by-products that can leak toxins. When fossil fuels are burned, they release chemicals and debris into the air that can lead to environmental decay and possibly global warming. While this concept is relatively heavy for a kindergarteners cognitive process, seeing what could happen to a small environment can contextualize the idea of pollution and a need for energy conservation

As stated earlier, when fossil fuels are burned, they have an adverse effect on the environment. Most car engines, (including Hybrid cars) run on a internal combustion engine which requires fossil fuels to operate. The combustion of those fuels emits a variety of pollutants into the environment, altering the environment. These pollutants also pose a variety of health problems for humans.

Every child is aware of the sun. They can feel and see what the sun does, but don't really think about how important the sun is to our survival. The foods we eat are dependent on the sun. By using solar energy and through photosynthesis the energy is used to make that plant grow. Through many chemical processes, that plant become food which becomes energy for us, all the while causing no harmful effects on the environment. All organisms depend on the sun's energy and heat.

Heating water for use in the home is a major contributor to energy consumption. By using the sun energy to heat water, we create a free and clean way to gain hot water. Home solar water heaters can be used in houses. Collectors can be mounted on roofs to trap the sun's heat. Through a series of pipes it can be transported to a well-insulated water heater where it is stored for later use. Although there are many other forms of renewable energy, the idea of the sun as a heater can be contextualized for young students.

Activity Plan: Pollution in a Micro-system: Terrarium

Content Objective:

The students will be introduced to the idea of pollution.

The students will become familiar with a variety of pollutants.

Language Objective:

The students will discuss the effects of pollution on the micro-system and then that effect on the environment.

Material:

A developed terrarium (a system of soil, water, and plants that can sustain life without human interference.)

The burned peanut

A piece of coal

Matches

Procedure: Discuss with the students the terrarium, and how it is able to sustain life. Relate this idea and guide this discussion towards the environment. Then show the students the burned peanut and the piece of coal, (charcoal is sufficient). Ask the students what they think will happen when the piece of coal is placed in the terrarium and set on fire. Use a small piece of charcoal and light it inside the terrarium. Allow it to burn for a small amount of time, and then extinguish it. Close up the terrarium then observe the environment over the next few days. Discuss with the students what happens to the environment.

Explanation: Use of fossil fuels entails some environmental degradation and also a risk to people. By burning the coal in the terrarium, it has caused the environment to die.

Activity Plan: Warming water with the sun

Content Objective:

The students will be introduced to the sun's energy.

The students will heat water with the sun's energy.

Language Objective:

The students will discuss the sun's energy as they heat water with the sun.

Materials:

A shallow black container

A thermometer

Water

Chart paper

Markers

Procedure: Ask the children how they heat water when they want warm water. Ask them discuss this further and explain to them that they are going to heat the water using just the container and the sun. Ask them to

tell you how they think this can be done. Then take the container to a sunny spot in the room, or outside and take a baseline temperature. Record the temperature of the container on a piece of chart paper and leave the container alone. Return to the container a few hours later, and take the temperature of both containers again. Discuss the results with the class.

Explanation: The sun's energy has heat the water in the container without using a fossil fuel or expelling any waste. It was a clean form of energy that did work (heating the water) and it is completely renewable.

Responsibility and the Environment

Using what they have learned about the need for energy and alternative forms of energy the students will create a murals of two environments: one being an environment where the choice was made to use fossil fuels and engines that create pollution and one of an environment where clean, renewable energy forms were used to create a clean, healthy environment.

Unit Conclusion

With the students, read *The Lorax* and discuss with students what happened to the environment in the story and how they could have conserved energy and saved their world.

Bibliography

Teacher Resources

Berman, Christine, & Jackie Fromer. *Teaching Children About Food: A Teaching and Activities Guide*. California : Bull Publishing Company, 1991.

Fay, James A. & Dan S. Golomb. *Energy and the Environment*. . New York, NY: Oxford University Press, 2002.

Fenn, J.B. *Engines, Energy, and Entropy*. New York: W.H. Freeman and Company, 1982.

Goldstein, I., & Goldstein, M. *The Refrigerator and the Universe*. Cambridge Massachusetts: Harvard University Press, 1993.

Ogden CL, Flegal KM, Carroll MD, Johnson CL. Prevalence and trends in overweight among US children and adolescents, 1999-2000. *Journal of the American Medical Association*. 2002;288:1728-1732

Richard-Amato, Patricia A. *Making It Happen: From Interactive to Participatory Language Teaching, Theory and Practice* . White Plains, NY: Pearson Education, Inc., 2003.

Children's Books

Allcroft, Britt. *Thomas that the Magic Railroad: Little Engines Can Do Big Things*. New York: Random House Children's Books, 2002.

- Thomas is a popular train engine and appears in many books besides this one. This is an excellent book to use when introducing other engines.

Atkins, Jeannine. *Anni and The Tree Huggers* . New York, NY: Lee & Low Books, 1995.

- Anni is a girl from India who throughout this story learns the importance of trees.

Berenstain, Stan and Jan Berenstain. *The Berenstain Bears' Big Book of Science and Nature*. NY: Random House, 1997.

- This book centers around the Berenstain Bears as they learn about science and nature.

Berger, M. *Energy From the Sun. Let's-Read-and-Find-Out Science Books* , NY: Harper and Row, 1976.

- Although the information and vocabulary in this book may be too advanced for kindergarteners, the pictures are good and can offer some research for older students if this unit is adapted for them.

Bingham, Caroline. *The Big Book of Things That Go* . New York, NY: Dorling Kindersley Publishing Inc. 1994.

- There are over 125 color photographs of vehicles that most kindergarteners will find especially stimulating. This book can be used to show how most vehicles have engines.

Bourgeois, Paulette, Catherine Ross & Susan Wallace. *The Amazing Milk Book*. NJ: Pearson Addison Wesley, 1991.

- This book contains activities for teachers and parents to help teach the importance of dairy in our lives. It also explains how milk gets from a cow to our tables.

Bruce, Lisa. *Engines, Engines* . London: Bloomsbury, 2000.

- A colorful counting book that uses trains to teach counting and introduces students to cultural highlights of India. A good book for pre-school to kindergarten students.

Challoner, Jack. *Energy* . New York, NY: Dorling Kindersley Publishing Inc., 2002.

- This book can introduce a second or third grader to many ideas about energy. With adult assistance they can explore and experiment and answer questions such as why matches burn, why recycling makes the most of energy, how waterwheels work, how efficient light bulbs save electricity, and how geothermal energy creates hot water. Pictures and diagrams are good for kindergarten level but more useful if this unit is adapted for higher grades.

Cherry, L. *The Great Kapok Tree*. San Diego, NY, London: Harcourt Brace and Company, 1990.

- This is a story about a man who tries to chop down a tree in the Amazon rainforest. While the man sleeps, animals of the tree and the forest whisper to him the importance of trees in their habitat. This story could be used to teach the students about conservation.

Dineen, Jaqueline. *Energy From Sun, Wind and Tide* . Englewood, Colorado: Teacher Ideas Press, 1996.

- This book teaches about three renewable energy sources with pictures that could be a useful for a teacher to help demonstrate those energy sources. The reading level is above kindergarten but can still be used for it's pictures.

Dr. Seuss. *The Lorax*. NY: Random House, 1971.

- The Lorax is a story about a factory that comes to town and mass produces Thneeds, at the expense of the environment. This

books show what can happen if the environment if it is stripped of it's natural resources (in a Dr. Seuss kind of way!)

Fardon, John. *What Happens When... ?* New York, Ny: Scholastic Inc., 1996.

- Every two pages on this book answers a questions like, "what happens when you mail a letter or order a pizza. This book is included because it contains information about how food is grown, how electricity works and what happens to our garbage.

Gibbons, G. *Recycle! A Handbook for Kids*. Boston, New York, Toronto: Little, Brown and Co, 1996.

- Designed to give children good ideas for recycling and responsibility, this book can also provide good ideas for teachers to create a recycling program with their students.

Hope Fine, Edith. *Under the Lemon Moon*. New York, NY: Lee & Low Books, 1996.

- A Mexican girl learns that someone has been stealing lemons from her lemon tree. While searching for the culprit, she learns that trees provide us with food and that needs to shared with everyone. This is a good book to discuss nutrition, plants, and responsibility with the students.

Lafferty, Peter. *Force and Motion* . New York, NY: Dorling Kindersley Publishing Inc. 2000.

- More textbook like, this book offers many color photographs and diagrams that can appeal to a kindergarten student with the assistance of an adult. A better book for higher grades of the unit is adapted so.

Nikola-Lisa, W. *Summer Sun Risin'* . New York, NY: Lee & Low Books, 2002.

- This book shows a day on a farm as the reader follows an African - American boy throughout his day. This book illustrates the important of the sun and it's role in everything we do.

McGuire, Richard. *Night Becomes Day*. New York, NY : Penguin USA, 1994.

- This book tells the reader about the cycle of the sun and the moon. It is a good book to show how the sun rotates everyday and is an important presence in our lives.

Parker, Steve. *Brain Surgery for Beginners and Other Major Operations for Minors* . New York, NY: Scholastic Inc, 1993.

- A human anatomy book that has great pictures and illustrations of the functions of the human body and the role the brain plays. The pictures in this book are appropriate for kindergarten, and older students can still be interested in it's contents.

Piper, Watty. *The Little Engine That Could* . New York, NY: Grosset & Dunlap, 1976.

- A classic story about how perseverance can overcome any obstacle. The Little Engine overcame a big challenge and managed to triumph! This is also another good story to show engines on trains.

Scarry, Richard *Cars and Trucks and Things That Go*. New York, NY: Golden Books. 1974.

- This book can serve as a good vocabulary builder for both English Language Learners and those who are fluent in English. This book has many illustrations that a kindergartener can independently explore.

Strickland, Paul. *All About Special Engines* . North America: Gareth Stevens, 1990.

- This book is another good vocabulary builder as it shows different trucks that serve special function like a cement mixer or a

garbage truck.

Walker, Richard (2003) *Human Body Encyclopedia* . Dorling Kindersley Publishing Inc. New York, NY

- This reference book for kindergartners introduces human biology in a way that is accessible to an early reader.

Williams, Brian, and Brenda Williams. *The Random House Book of 1001 Wonders Of Science*. London: Grisewood & Dempsey Ltd. 1990.

- Although this book is written for an older audience, it still has concise and brief paragraphs that teacher can paraphrase or read to the students to clarify ideas or concept student may have about engines, energy or the human body.

Useful Websites

<http://beakman.bonus.com/>

- This site is child friendly for research and experiments

- The Dole company website for nutritional health. Has a table for nutritional value for vegetables and fruits. Tips for eating vegetables and fruits.

- Website that explains how anything works in simple terms. Very easy to use, just type in what you want to know, and in information is presented in two or three pages with animations and diagrams.

Materials for Classroom Use

MM-1 Coffee Cup Stirling Engine. 139.00 From the American Stirling Company.

http://www.stirlingengine.com/ecommerce/product.tcl?product_id=21

Appendix: Standards

This unit addresses New Haven Public Schools District K-4 Science Curriculum Standards:

Scientific Standard: *Students will develop abilities necessary to conduct scientific inquiry, including*
1.0 *posing a question, stating a hypothesis, developing an investigation, observing and documenting the process and recording and determining the results.*

In addition this unit addresses performance standards 1.1a, 1.1b, 1.1e, 1.1f

Physical Science: *Students will develop an understanding of properties of objects and matter, position,*
2.0 *motion and forces of objects including light, heat, electricity, and the transfer and conservation of energy.*

In addition, this unit addresses performance standards 2.1a, 2.1b, 2.3c,2.3d,

Life Science: *Students will develop an understanding of the characteristics of organisms, life cycles of*
3.0 *organisms, reproduction and heredity, populations and ecosystems, organisms and their environment and the diversity, interaction and interdependence of organisms.*

In addition, this unit addresses performance standards 3.1a, 3.1c, 3.1d, 3.3a, 3.3b,

Earth Science: *Students will develop an understanding of the structures, properties and dynamic processes of the earth, the solar system, the universe and the galaxy; they will be familiar with the origins, evolution, movements and interaction of these systems.*

In addition, this unit addresses performance standards 4.1a, 4.1d, 4.2a, 4.2b, 4.3c, 4.3c

Technological Science: *Students will develop abilities necessary to distinguish between naturally occurring objects and those of human design, and they will develop an understanding of the roles of science and technology in contemporary society.*

In addition, this unit address performance standards 5.1a, 5.1b, 5.1h, 5.2c, 5.2d, 5.2c, 5.3a, 5.3a

Ecology: *Students will develop an understanding of personal and community health, of the characteristics of changing populations, of the ecology of and uses of natural resources, of changes in environments, and of the uses of science and technology in addressing present-day local and global challenges .*

In addition, this unit addresses performance standards 6.1a, 6.1c, 6.1d, 6.2b, 6.3a, 6.3b, 6.4c, 6.4d

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