Taking A Closer Look at the Effects of Energy and Deciding What Today's Youngsters Can Do About the Environment

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Contents of Curriculum Unit:

Introduction and Unit Synopsis

I have developed a teachable, professional kindergarten unit, which addresses what exactly energy is and how my students can start making their own choices concerning energy conservation. My unit includes fifteen hands-on activities that will touch upon several subject areas such as science, mathematics, reading, art, social studies, and music. Although the unit is divided into sessions, these lessons can be stretched out over a length of time. Both teachers and students will be encouraged to investigate energy sources and issues as well as the physics of energy. I have used the knowledge offered by Dr. Holman, who is a professor of physics at Carnegie Mellon University, and my independent study to adapt it to a primary level of thinking. This unit meets many of the Pittsburgh Public Schools Standards and appeals to all learning styles, which is essential when teaching youngsters of this particular age group.

The seminar discussions, readings, and references were based upon two helpful books. The first is entitled, Energy and The Environment by Robert A. Ristinen and Jack J. Kiraushaar. The other is called, Energy (Second Edition): Its Use and The Environment by Roger A. Hinrichs. These two books gave me a sound educational background of how we measure energy, what laws are involved, what energy sources are in use today, and how air pollution, acid rain, radiation, nuclear waste, global warming, and ozone depletion affects everyone. One objective of this unit is to increase the awareness that even difficult topics can be adapted into simple, meaningful, and beneficial lessons for elementary children. Teaching this unit will involve an exciting and challenging journey for both you and the students you teach. The resources used to produce this unit make it extremely enhancing to the classroom environment.

Student Philosophy, Teacher Background, and Content Information

One cannot begin to help the environment unless they understand the term energy, what it is, and how it is measured. This unit was designed to give elementary students a foundation of energy knowledge for everyday living needs and skills. Most children at the kindergarten age level are aware that energy is a type of food for their body. However, there is a much deeper understanding to the term "energy". We, as human beings, could not exist without energy. The energy from food allows one to run, climb, and swing on the school playground. Energy heats our homes when we are cold. Gasoline is the form of energy we put into our cars when taking a ride to go visit Grandma and Grandpap. These are real situations that a young child can relate to. I am writing this unit in hopes that even a child as young as five years old can start to appreciate the value of our environment and its resources. Richard Balzhiser, President of Electric Power Research Institute, once stated that "Energy is not an end to itself. The fundamental goals we have in mind are a healthy economy and a healthy environment. We have to tailor our energy policy as a means to those ends, not just for this country, but in global terms as well."

Roger A. Hinrichs defined energy as, "the capacity to do work and the product of a force times the distance through which that force acts." Webster's Dictionary defines energy as, "the power of doing work". Hinrichs says work is important because it, "is a way of transferring energy to an object". If one really thinks about these energy definitions, one might ask where this power comes from. What can energy do for us? I am trying to get across the idea that one may not be able to see energy with their eyes, but a teacher can show a young child how energy processes work. These hands-on activities in this unit meet and support these important goals.

Energy comes in many forms. Kinetic energy is the energy of movement or motion. Potential energy is the stored energy that is waiting to be used. These are both known as mechanical energy. I want my students to understand that we can convert energy. As I mentioned earlier, most children at the kindergarten level are aware that energy is a type of food for their body. The analogy and discussion of how eating gives us energy to perform work can be used at this point in time. For example, energy from the sun makes fruits and vegetables grow. When children eat fruits and vegetables, they too grow. They are also able to run, skip, play ball, and do their chores. As stated in Chapter 2 of Hinrich's book, "Other forms of energy include chemical energy, nuclear energy, thermal energy, radiant energy, and electrical energy. The fossil fuels as well as food possess chemical energy. The energy found within the atomic nucleus is nuclear energy. A hot object possesses thermal energy. Radiant energy is also called electromagnetic radiation, and covers everything from radio and television waves to infrared to visible light to X-rays. The earth's most important source of energy is the electromagnetic radiation from the sun, which is known as solar energy. Electrical energy is produced at the electrical power plant or from batteries." These forms of energy are important to discuss with the children because they are all items used during the daily routine of life. Energy is the motion involved when they ride a bicycle. Energy

is what makes their flashlight work in the dark when they are afraid. Energy is the heat given off of their bodies when running on the playground.

If kindergarten children can begin to understand what energy is and what forms energy comes in, they can then start to learn why you can't get something for nothing. In other words, appreciating the first and second laws of thermodynamics and energy conservation. (This is explained in greater detail under sessions 5 and 6.) By teaching this unit, students can learn at an early age how to use energy carefully and not waste it. A major point I want to make here is that everyone needs to do their part in helping to save energy. By teaching this unit to young children, they can start to develop non-wasteful, good habits. These good practices will carry on throughout their entire life once they are learned. The pollution and recycling activities were designed for this unit to further promote conservation. As stated in Hinrich's book, "The maximum possible success of technical fixes for energy conservation is limited by the laws of physics, however, there is still a lot of room for improvement in energy conservation, especially in the efficiency of energy use."

Most energy today comes directly from fossil fuels. Although fossil fuels are still being formed, we are using them up at a much faster rate than what is being produced. Fossil fuels include crude oil, natural gas, and coal. Fossil fuels are nonrenewable energy sources, which causes a big problem for us and the environment. As these resources become less attainable, they become more expensive for us. Oil and natural gas are being used more quickly globally, however, coal is estimated to last only a few centuries longer. The United States is the country that is using the most. Another dilemma we face is the high amount of pollution and gases that are being vented out into the atmosphere when resources are burned. These released gases in addition to the other pollution problems can be extremely harmful to our bodies and the earth. If we expose children to these ideas and thoughts now, perhaps some of the consumption and hazards can somewhat decrease by the future.

It is essential that children realize there are also alternative energy resources. As with any other age group, kindergarten children need to make decisions. I want them to decide now what is/are the best way(s) to increase an affordable energy supply. I believe renewable energy sources may be a part of the solution to this problem. Renewable energy resources include solar energy, tidal energy, and geothermal energy. Solar energy comes from the sun, tidal energy comes from the moon's gravitational pull on the oceans, and geothermal energy comes from the hot core of the earth. As stated in Kiraushaar's book, "All energy sources based on the solar energy incident on earth are renewable. The time to exhaustion depends on the life cycle of the sun itself, certainly far beyond the time period important to any discussion of energy sources for humanity. The rate at which we use solar energy does not affect its lifetime. Whatever solar energy source we put into use will continue to be available, or can soon be renewed." He also states that, "Our harnessing of tidal energy will not reduce the magnitude of the total gravitational energy appreciably within the foreseeable future and the local geothermal energy sites will again become available in several centuries as the earth's inner heat sources supply

heat energy to the geothermal regions near the earth's surface. Students can now understand how effectively these other energy resources give off energy.

These activities in my unit demonstrate and support the goals and ideas which are mentioned above. These activities and topics were chosen to meet the needs of auditory, kinesthetic, and tactile-motor learners. This unit teaches science while reinforcing writing skills, motor skills, exploration, and hand-eye coordination skills just to name a few. These are a must at the kindergarten level. Most importantly, this unit allows the kindergarten child to start thinking about and making their own choices concerning energy issues and effects on the environment.

Sessions 1 and 2

Activity #1

Observe A Balloon Expanding and Deflating

This activity addresses Pittsburgh Public Schools Science and Technology Standards two and six. They state, "All students should demonstrate knowledge of basic concepts and principles of physical, chemical, biological, and earth sciences and all students should develop and apply skills of observation, data collection, analysis, pattern recognition, prediction and scientific reasoning in designing and conducting experiments and solving technological problems." Upon completion of this activity the student will be able to understand what energy means. In addition, the student will be able to observe, discuss, and record what happens to a balloon when baking soda and vinegar are added to a bottle.

The teacher should demonstrate this lesson, with some help from the children. Beforehand, the teacher will need to get the needed materials including a large balloon, a funnel, a measuring spoon, and a thirty-two ounce bottle. Use the funnel to add one and one-half tablespoons of baking soda to the large balloon and set it aside. Pour one-half cup vinegar into the thirty-two ounce bottle. Put the lips of the balloon over the top of the bottle. The students should observe, discuss, and write two or three sentences about what happens. Last, pull the balloon off the lips of the bottle, let it go, and watch it deflate.

By doing this experiment, the students will get a brief introduction as to what potential energy is. Kindergarten students are already aware that balloons can stretch and grow bigger. When blowing into the balloon, the air pushes on the skin. This air pushes on the skin of the balloon and makes it bigger. Within the skin of the balloon, this elastic potential energy is stored. They will be amazed to see how the air that is trapped, which is known as potential energy, pushes into the balloon and makes it bigger. As the balloon deflates, the air inside of the balloon returns to the atmosphere. Your students have just observed potential energy changing into kinetic energy with the movement of the balloon flying through the air.

Activity #2

Make A Water Wheel At the Art Center

The world has relied on the energy in moving water for years. It is one of the most important renewable sources around. Waterfalls from dams turn generators to make electricity in hydro-electric power stations. In addition, waterwheels are used to irrigate the crops we eat in fields. By doing this activity, young students can start to understand these ideas and processes.

First, supply each child with one chopstick or small wooden rod. Each child will make a two by two-inch ball of clay to put around the center of the rod. The teacher should cut two by five-inch rectangles of heavy styrofoam that the students can stick in evenly around the ball of clay and bend at the tips. The rod should be placed on two points over a sink. The teacher, a parent helper, or a reliable student should be put in charge to control the faucet handle and speed of the water. There they can test how running water can be used to turn a wheel, thus making potential energy the result.

Here are some helpful hints! Simple water wheels can be made from a variety of cheap materials such as clay, popsicle sticks, egg cartons, or almost anything you can think of! It is important that the wheel be round and the water can "catch" onto something so that the water flows.

Sessions 3 and 4

Money and Units of Measurement

Activity #3

Measure Energy Meters

Money and coins are tactile items for young children. Parents and teachers should talk to their children/students about turning off unnecessary lights and discuss how their home/school are heated. Kindergarten students can draw pictures demonstrating their ideas. We will discuss wearing extra clothing, closing doors, opening the curtains on a sunny day, and so forth. At this point, the students will be able to use mathematics to understand energy cost issues. Two sample meters should be made in which the students and yourself will study and read. Decide together how much energy is actually being used. Another variation for this activity is to take readings during a warm versus cold day and compare the two. You could also relate how much money it costs to run a light for a minute, an hour, and a day. Then, compare the results. An energy conservation meter or graph can be displayed school-wide for each individual classroom. "Energy Owls", which is a fancy title given to selected responsible students, can be chosen to check and record if each classroom is saving energy. This activity addresses Pittsburgh

Public Schools Mathematics Standard Number Six which states, “All students should be able to evaluate, infer, and draw appropriate conclusions from charts, tables, and graphs showing the relationship between data and real-world situations.

Activity #4

Energy Changing To Heat

Joule showed that heat is a form of energy; meaning it flows from one object at a certain temperature to one at a lower temperature. For example, try dropping several ice cubes into a glass of warm water. Heat actually moves from the water to the ice-cubes, causing them to melt. The water uses up its energy and loses heat as a result.

Through this activity, the students will be able to observe the effects of heat on an object. The point I want to make and have my students understand is that every liquid contains some type of molecules. Moving molecules are present in heat, which is a type of energy. As these molecules move faster, the amount of heat increases. Now try this experiment. First, fill one clear tank with hot water and fill another clear tank with cold water. Choose two students to add two drops of red food coloring to each tank at the same time. Have the class count to three to ensure that the food coloring is added at the exact same time. This is very important. Observe, discuss, and draw what happened to the water in each tank. This activity demonstrates that the molecules are moving faster in the tank with the hot water. This is why the food coloring spread out more quickly.

Sessions 5 and 6

Heat, Thermodynamics, Conduction, Convection, and Radiation

Conduction is the molecular transfer of energy from a hot to cool object. Metals are the best conductors. Convection is the transfer of heat in a gas or liquid by motion of the fluid itself. Heat can be radiated from our bodies and/ or the sun. The transfer of heat involves ways of dumping heat energy from one area to another. It is very unlikely or almost impossible for heat to flow from cold to hot. This supports the second law of Energy Conservation. For example, a refrigerator or an air conditioner will reverse this process. In other words these are really heat engines in reverse because work is being done on the fluid by a compressor. As stated in our readings, “A heat engine is any device that allows heat to flow from a hotter to cooler region, while extracting some useful work from it. Other examples include internal combustion engines and steam engines. This process is actually pretty simple. Heat flows from a hot region transferring its energy to a cooler region. An amount of heat is extracted from the hot region while an amount is exhausted to the cool region. An amount of work is taken from the heat engine. The work done by the engine can be thought of as minus the work done on the engine. Likewise, heat taken out of the engine can be thought of as minus heat added to the engine.” This supports the first law of thermodynamics. It is not so important that we discuss the fine line details here, but make it known that we want to get a close

measure of the efficiency for an engine. Through this process, we can find out "how much work can I get out for the amount of heat I put in". As learned from this course, energy never converts completely. The disordered form comes out as heat. We now have a deep understanding of how heat flows and know there is a motion of molecules that are involved. This heat flow has more kinetic energy, or energy motion. However, the main point I want to make here is that not only do we need to conserve, but we also need to look at this issue in terms of entropy. As stated in our readings, "Entropy is ordered energy that lessens with continued use." Giving your students some insights about this issue will allow them to make better choices concerning conservation and our local environment surroundings.

Activity #5

Coloring and Cutting a Heat Spinner

By making a heat spinner, students will be able to see the effect convection currents have in addition to the energy in the air. The teacher should pass out a large, spiral pattern an oaktag to each child. If oaktag is not available, be sure to use some form of thicker paper. The children can design and color their spinner any way they like. It might be fun for the students to make it into an animal creature, such as a snake or simply make a beautiful rainbow pattern. Next, students should use their scissors to cut on the lines. The teacher should assist all students with this process in addition to tying a piece of yarn at the top for holding. The spinner should be hung over the classroom heater. The students will be amazed to see and share with the class what happened. (You can easily use this same experiment to show Geothermal Energy as well. Just hold a spinner above steam from a teapot to make this link.) This activity will address the Pittsburgh Public Schools Art and Humanities Standard number four, which states, "All students should produce, perform, or exhibit their work in the visual arts, music, dance, or theater, and describe the meanings their work has for them." This activity also addresses the Pittsburgh Public Schools Science and Technology Standard number five which states, "All students should construct and evaluate scientific and technological systems using models to explain or predict results.

Activity #6

Balance That Scale

In this activity, students will be able to balance and measure three ice cubes to a certain number of pennies evenly using a primary scale. (It would be interesting for students to estimate and punch into their student calculators how many pennies it will take to balance the ice, the water, and then the water once it evaporates a little). Once the ice is balanced against a certain number of pennies, the scale should be set aside. Wait until a couple of periods go by and/ or the ice melts first. Examine, discuss, and observe the scale. The scale should still be balanced. Once again, set the scale aside until the next day. Brainstorm what will happen to the scale. Will the scale still balance? Why? After examining the scale the very next day, the students will be able to conclude that

some of the water evaporated into the air causing the pennies to now weigh more. Another example of this would be to add ice to a glass of water. Heat is going into the ice and the ice is actually cooling the water. You could also try picturing the effect that rain has on snow. What happens? It melts, of course! This activity addresses many of the Pittsburgh Public School Standards. The Science and Technology standards met here read, "All students demonstrate knowledge of basic concepts and principles of physical, chemical, biological, and earth sciences and All students develop and apply skills of observation, data collection, analysis, pattern recognition, prediction and scientific reasoning in designing and conducting experiments and solving technological problems". These are standards two and six. In addition to the above, Mathematics Standards one and two are also met. They state that, "All students use numbers, number systems, and equivalent forms (including numbers, words, objects, and graphics) to represent theoretical and practical situations and All students compute, measure, and estimate to solve theoretical and practical problems, using appropriate tools, including modern technology such as calculators and computers.

Session 7

Taking A Closer Look At Fossil Fuels

Coal, oil, and natural gas are the three main fossil fuels, which make up today's main energy resources. Typical fossil fuels contain a lot of hydrogen and carbon since they started out as organic matter. The earlier coal was the best synthetic material to have. It was the coal which was the furthest down in the earth. Economically speaking, it would now be the hardest to get. It is sad to say, but as a nation we tend to take the easy way out of things. Therefore, we use the cheaper coal because it is easier to get. The cheaper coal releases harmful contaminants and pollutants into the air that we breathe.

Oil is the resource I want my students to take a closer look at. Oil was first found in Titusville, PA. during the 1800's. Oil is a mixture of different types of compounds that are vaporized at the bottom of the earth. A fractioning column is what is used to separate the various oil weights. Different additives are added to the fuel we use for driving, such as octane. The main use of oil is to run cars. Whatever is not burned, it is released into the atmosphere. This is known as an energy conversion process. The heat here is generated by particles moving quickly, or the particles being vented in fossil fuel burning.

Today, professionals check for oil by doing explosions. From these explosions, a team can predict from the speed and gauge how much oil there would be in the earth. At this point in time, the oil is drilled. This oil is very hard to get out of the ground. As Professor Holman pointed out, conventional drilling would only get the top fifteen percent out! Shooting water, which is known as a secondary recovery, will help the oil expand and push up somewhat. Still, the best end recovery is only forty-five percent! It is not so much important that we estimate how much of a resource we have, but instead

see how much we can get and use at the same time. What are we going to do as a whole when all of these resources are gone?

Activity #7

Create a Hands-On Oil Spill

A large class should be divided into at least two groups before starting this activity. Dish-pans should be filled with water for the groups and set onto their tables. With teacher assistance, the students should add 2/3 cup of vegetable oil to the water. This is a nice time to have the students feel the oil. Discuss and show pictures of the Exxon Valdez oil spill which occurred in Alaska. Kindergarten children love animals. After the students describe how the oil feels, have them imagine what it would be like for a bird to be stuck in this oil spill. They will immediately be anxious to clean up the spill. A variety of materials and methods can be attempted to try this. Some of my favorites are using the tip of a spoon, a Q-Tip, a sponge, a paper towel, or dishwashing liquid. This activity will get the students interested in certain environmental and ecological issues of concern. Understanding the local, national, and international implications here addresses the Pittsburgh Public Schools standard number five. In addition, this activity incorporates many of the Science and Technology standards. Numbers one, two, and four state that, "All students should explain how scientific principles of chemical, physical, and biological phenomena have developed and relate them to real-world situations; All students demonstrate knowledge of basic concepts and principles of physical, chemical, biological, and earth sciences; and all students develop and apply skills of observation, data collection, analysis, pattern recognition, prediction and scientific reasoning in designing and conducting experiments and solving technological problems.

Sessions 8, 9, and Weekly Center Activities #10

More Energy Sources

More energy sources include natural gas, gasoline, and heating oil to name a few. These sources come to us in many different ways. For example, natural gas must first flow through pipes and a range before a flame can be lit on that stove. A truck must bring gasoline to the gas station before we can pump it into the cars we drive. Electricity must travel through the wire and cord before it can light up the bulb attached to our living room lamp. Heating oil is brought to a tank by truck before we can turn on the furnace to heat our homes. By the end of these lessons, your students should be able to identify which objects are run by each source of energy. Activities eight and nine meet the Pittsburgh Public Schools Science and Technology standard eight which states that, "All students evaluate the impact on current and future life of the development and use of varied energy forms, natural and synthetic materials, and production and processing of food and other agricultural products." They will also meet the Communications standards three and six which state, "All students respond orally and in writing to

information and ideas gained by reading narrative and informational texts and use the information and ideas to make decisions and solve problems and all students exchange information orally, including understanding and giving spoken instructions, asking and answering questions appropriately, and promoting effective group communication."

Activity #8

Identifying Other Energy Sources

Read Story #1 and #2: Katrina Learns About Energy and The Gift of Energy, which are taken from the Brightland Energy Education Unit Story Cards. (A tape and filmstrip are also available to go with these stories). After reading the two stories, have a brief five minute question and answer discussion. Also talk about the story illustrations and find out what they mean to the children. With the help of the children, chart the different types of energy sources discussed. The teacher should add additional ones the children might not be able to think of. Although, you would be surprised to see how much they know and remember. Have the students complete a journal which demonstrates a picture for the energy user that runs on natural gas, (i.e. a dryer and/or stove), gasoline (i.e. a car or truck), electricity (i.e. a toaster or a television), and heating oil (i.e. a water heater or furnace). These journals can be individually shared in class. Parents can work with their child to draw, label, and identify an appliance from each category found in their home for an optional homework assignment.

Activity #9

Name That Source!

Before starting today's lesson, laminate and hang the huge poster entitled, "How Energy Gets To Us", which was taken from the Brightland Energy Source Program. Using this poster, have students identify and review the four sources of energy journaled and discussed during Activity #8. Next, read stories #3 and #4 which are taken from the Brightland Energy Education Unit story cards. After reading and discussing Antonio's First Day of Work and The Energy Elves, distribute one piece of large, white construction paper that was previously divided into four sections to each student. Model and instruct the students to draw pictures of how natural gas, gasoline, electricity, and heating oil get to us. As a wrap up and conclusion, use the picture flash cards as a drill for students to decide what source of energy that object uses. This would be a fun review for the children. These cards can also be sorted by the children into the four separate groups.

Center Activities #10

A Powerful, Renewable Energy Source: The Sun!

Children need to realize that there are other sources of energy besides the ones mentioned above. Some renewable sources include winds, rivers, tides, and waves. These renewable sources provide a great deal of energy for us, however, solar energy is the one of utmost importance. Solar energy helps plants grow, which in turns feeds the animals that we eat. It also heats our homes, is used to make solar cells, and produce electricity just to name a few. These short activities are to be done on a daily rotation of small groups and put into a weekly center. The objectives for these three mini-activities are to review the skills of observation and the scientific method. We want to find out if A.) Will ice melt faster on dark construction paper or white construction paper? And B.) Will a glass of water be heated more quickly in the sun if it is covered with aluminum foil or left uncovered? Later, the students will measure the temperatures of the two glasses of water using a radiometer. It is important to keep in mind that even kindergarten children can become familiar with terms and vocabulary. It would be helpful to keep a word wall in the classroom as a review of old terms and an introduction of new terms, such as radiometer. Another variation for this type of activity would be to make mini "sleeping bags" to find out if heat really rises faster. Work with the students to perform these two experiments and check them later to see if the children's predictions were correct and why.

Before starting the third and final mini-activity, the students will need to collect a variety of leaves from their community to bring into school. The students will be able to then make sun prints using these leaves, a large zip-lock bag and construction paper. The leaf or leaves should be set on a piece of construction paper and put into the clear bag where the sunlight is shining. (Ammonia and a brown paper bag can also be used instead.) This activity addresses the Pittsburgh Public Schools Arts and Humanities standard one which states, "All students describe meanings they find in various works from the visual and performing arts and literature on the basis of aesthetic understanding of the art form."

Although the first couple of activities meet the Pittsburgh Public Schools standards one and eight, the final group activity addresses Mathematics standard number one as well which states, "All students use numbers, number systems, and equivalent forms (including numbers, words, objects, and graphics) to represent theoretical and practical situations." Students will be able to review the objectives of number recognition and following directions by playing a game called "Solar Panel Bingo". The teacher will pass out a card containing twenty-five boxes, some of which are already darkened in. The students can pick and choose to write any numbers from zero through thirty-five in the other blank boxes. A number cannot be used more than once. These numbers will be written on a small piece of paper, folded, and thrown into a hat. Students are to take turns picking numbers from the hat. When a number is chosen, students are to color these numbers in on their Solar Panel Bingo sheet. The first person to color in their whole card wins because they have completed their solar panel.

Sessions 11 and 12

Pollution

Burning fuel leads to residue in our atmosphere. Both nuclear and fossil fuels cause damage to the environment in the forms of air pollution, thermal pollution, radiation, nuclear waste, and global warming. When fossil fuels are burned, sulfur oxides and nitrogen oxides are released into the air. These two oxides are generated usually in highly populated areas. Sulfuric acid is where acid rain comes from. Not only do these oxides cause things such as deforestation, they also interact with the human body. This brings up the next topic of concern. Dr. Holman, professor at Carnegie Mellon University, could not have put it any better himself when he stated, "What happens to our search for energy and the environment? The universe is not worried about us. How are we going to start taking care of this problem?"

Activity #11

Creating An Energy Collage

This activity addresses many of the Arts and Humanities content standards, especially number four. It states, "All students should produce, perform, or exhibit their work in the visual arts, music, dance or theater, and describe the meanings their work has for them." Through this activity, students will be able to paint, draw, color, cut out, and label buildings, streets, and alternative energy sources to address environmental issues of concern. The class could call it, "Saving Energy Is Easy In Our City!" This activity is creative and open-ended. It gives the children a hands-on art experience while reviewing the scientific issues taught. Upon completion of this project, have the students orally describe what it means to them.

Activity #12

Youth Attitude Towards Pollution

There are many stories one could use to address the issue of saving rather than destroying the environment we live in. Two of my favorites, which are written by Dr. Seuss, include The Lorax and The Cat In The Hat Comes Back. To lead the children into a short discussion, preview the pictures throughout the two books. After reading the two stories, ask some insightful questions. Some of these may include, "What lesson did you learn about pollution from the stories?; Who was polluting in each story?; Did anyone try to put a stop to the pollution?; and "How did the pollution finally disappear?" This last question can lead the children and yourself into a discussion on how they can make the world a happier and cleaner place. Brainstorm and chart ways of saving versus wasting energy and energy supplies. Students can pick and choose from this list to make individual posters demonstrating their ideas. These posters can be used to hang and

display in the school halls. Another creative and fun activity the children would really like is to look through magazines, books, and newspapers to find pictures of pollution. The students can paste these photos onto a piece of construction paper. Last, they can write a sentence or orally share with the class what they would do instead of what is showing in the picture. This activity concentrates on the Pittsburgh Public Schools Communications Standards three and four which state, "All students respond orally and in writing to information and ideas gained by reading narrative and informational texts and use the information and ideas to make decisions and solve problems and All students write for a variety of purposes, including to narrate, inform, and persuade in all subject areas." This activity also supports the Environment and Ecology standard five which states, "All students demonstrate an understanding of the local, national, and international implication of environmental and ecological issues."

Sessions 13, 14, and 15

Recycling

Activity #13
Let's Take A Walk to The Park

I want my students to respect the universe we live in. Taking an outdoor walk will allow children to explore our community deeper. They will enjoy seeing nature surroundings that are clean and smell good. Before taking a walk through the environment, students should be divided into groups of four to five. Each group will be given a huge bag to collect garbage. (If you live in the Pittsburgh area, Dennis from Partners-In-Parks will provide the gloves and garbage bags for your students.) It is important to note that the teacher may need to bring in some varied recyclable plastics before starting this activity just in case there is not a lot of litter on the ground. Students must be given explicit instructions to only pick up plastic containers, papers, cans, boxes, and bottles that are not broken. The children will sort the recyclables out. Another idea that can be adapted here would be to count and graph how many of each was collected or students can make a nature picture/ collage from the items collected. The numbered plastic containers can be sorted by the SPI code. The SPI code shows what different types of plastics there are. (I.E. … 1- PETE or polyethylene; 2- HDPE or high density polyethylene; 3- V or PVC which is known as vinyl or polyvinyl chloride; 4- LDPE or low density polyethylene; 5- PP or polypropylene; 6- PS or polystyrene; and 7- OTHER.) Briefly talk about each and which is more commonly/ less commonly recycled. Remind your students to inform their families to buy household items that are recyclable when they go shopping. Another fun and interactive activity would be to start a class compost from their lunches if this is possible at your school. (Once again, if you live in the Pittsburgh area, call Thelma Wodzinski at (412) 441-4442 from the Civic Garden Center to give you some assistance with this activity.)

This activity addresses many of the Pittsburgh Public Schools Standards. It strongly favors the Environment and Ecology standards three and four which state, "All

students think critically and generate potential solutions to environmental issues and All students evaluate the implications of natural resources and the need for conservation, sustainable agricultural development and stewardship of the environment." Sorting the plastic containers by number meets Mathematics Standard number one which states, "All students use numbers, number systems, and equivalent forms (including numbers, words, objects, and graphics) to represent theoretical and practical situations."

Activity #14

Make a Milk Carton Plant and the Life- Cycle Connection

Students will put recycling to practice as they rinse and save their milk cartons from lunch for a very special project. After your students rinse their milk cartons, have them write their names on the bottom using a permanent black marker. Next, have each student cut numerous two by two-inch squares of colorful tissue paper. To save on time, you may want to prepare these ahead of time. This is a difficult task for a kindergarten child. Using glue and the tissue squares, students will love decorating the outside of their cartons. You might want to show your students how to make the tissue paper into a flower using your pencil. After your students are finished decorating the outside of their cartons, they should shovel out approximately _ cup of dirt from the bucket and place it inside their container. At this point, they should choose what type of seed they want to place in the dirt. From my own personal experience, the pea and bean seeds seem to work best. However, a flower seed would really make a cute present for Mom or be a nice addition to the school grounds if you and your students want to transplant them later. It is nice to be able to give something back to the community we live in. After placing the seed in the dirt, have students take _ cup of top-soil to distribute over top of their seed. Last, have each student water their plant using a tablespoon and bowl which are provided.

This is almost the final and culminating activity. It really "ties" the topic of energy and environmental issues together throughout the year. We are all connected in the life-cycle process, therefore this activity will show the children that we are all affected globally. Before starting this activity, the teacher will need to prepare a nine by eleven laminated card for each student in his or her class. The teacher will need to punch a hole on each end of each card so that yarn can be tied onto both ends. In the end, each card will be attached to one another. You and your class should chart items that are alive in the environment. Some of these may include a tree, a bird, a flower, etc. Each student should draw and label a different item on their card. We will then tie them all together, demonstrating the idea that all life is connected. Although this activity meets many of the Pittsburgh Public Schools Standards, it really gives meaning to the Environment and Ecology standard one which states, "All students understand and describe the components of ecological systems and their functions." It also supports the Pittsburgh Public Schools Science and Technology standard one which states, "All students explain how scientific principles of chemical, physical, and biological phenomena have developed and relate them to real-world situations."

Final Activity #15

Make Some Paper and Sing A Song!

Believe it or not, when paper is made in the commercial factories, carbon dioxide and other pollutants are released into the air. Even though paper comes from trees, which are renewable sources, the energy that is being used to make the paper comes from fossil fuels. Fossil fuels are a nonrenewable resource. This activity is a really nice way of reviewing the other objectives taught in addition to having an involved, fun activity to complete the topic of energy and environmental issues.

Prior to starting this activity, recycle any extra paper in the classroom that is normally just thrown into the trash. Explain to the children why they are saving this paper. Start off the activity by finding out whether or not the students know where paper comes from. Ask students how they think it is made in the mills. Now you and your students are ready to make your own paper! Two hours prior to starting this activity with your whole class, choose a small group of students to shred and rip the recycled paper into small two by two inch squares. They should place this paper into a large bowel which is filled half way with luke-warm water. Keep in mind that when working with young children, the temperature of the water cannot be too hot. After the paper soaks in all of the water, you may start. Select a student to pour 2 cups of luke warm water into a blender that holds 5 cups of liquid. Select another student to pour 2 cups of the mushy paper into the blender. A third student can assist you in turning the blender knob to the mix/ liquefy speed. Continue this process until everything is blended fairly well. In the meantime, another small group of students can rip colorful construction paper into many pieces. This colorful construction paper will make the final product turn out a little nicer. If you tried this activity once before, the home made paper usually turn outs a little gray. Therefore, the children will enjoy adding a little color to it. I have also seen items such as flower petals, grass, and vegetable peelings added to mixtures. Adding these items will give the kindergarten child something tactile to feel and touch. The rest of these materials, whichever you choose to use, should be _ cup of the final mixture. Once again, blend everything together.

Choose a third group to grease a large aluminum pan. Scoop the mixture from the blender and squeeze any excess water into the sink. Pour the new mixture into the greased pan and spread it out in an even, thin layer. If the mixture seems a bit too liquefied, adding a drop of Elmer's Glue or a little cornstarch should do the trick. Allow the mixture to sit for forty-five minutes in the pan. Next, have a parent helper or teacher aide flip the mixture onto an old cloth. Place another old cloth on top of the new paper and iron it on the lowest setting possible. The paper is finished! If it sticks to the cloth a little, it should easily peel off. Cut the new paper into one section for each student to take home. I got this secret recipe from a friend of mine, but you may want to try some experimenting on your own first. Perhaps you can come up with a different, easier method. This is the only one I know of. Last but not least, discuss the paper making process with your students. They can make a journal of the steps and processes involved.

Once again, this activity addresses several of the Pittsburgh Public Schools standards in the areas of Ecology, Environment, and the Arts. However, I feel it really touches upon the Science and Technology standard which states, "All students evaluate the impact on current and future life of the development and use of varied energy forms, natural and synthetic materials, and production and processing of food and other agricultural products."

Sing a song sung to the tune of "Mary Had A Little Lamb". The words can go like the following, or you and your students can make up your own.

Protect our planet by Saving Energy,
Saving Energy,
Saving Energy.
Protect our planet by Saving Energy…
The environment will be happy.

The following books contained specific activities that I looked at to adapt and incorporate into my final unit:

Energy and Power by Richard Spurgeon and Mike Flood, Usborne Publishing Ltd., (1990)

Energy and Power by Barbara Taylor, Franklin Watts, (1990)

Rain Forest by Ting Morris, Franklin Watts, NY, (1994)

Reducing, Reusing, and Recycling by Bobbie Kalman, Crabtree Publishing Company, (1991)

The Kids' Earth Handbook by Sandra Markle, Maxwell Macmillan International, NY, (1991)

What a Load of Trash! By Steve Skidmore, The Millbrook Press, Brookfield, Connecticut, (1991)

What We Can Do About Conserving Energy by Donna Bailey, Franklin Watts, NY, NY, (1991)

Children's Picture Books/ Reading List:

Energy From The Sun by Melvin Berger, Let's-Read-and-Find-Out Science Books, Harper and Row, NY (1976)

Follow That Trash! By Francine Jacobs, Grosset and Dunlap, NY, (1996)

For the Love of Our Earth by P. R. Hallinan, Forest House Publishing Company, Lake Forest, Illinois, (1992)

Mother Earth by Nancy Luenn, Maxwell Macmillan International, NY, (1992)

Recycle!: A Handbook for Kids by Gail Gibbons, Little, Brown, and Co., Boston, NY, Toronto, Canada, (1992)

The Berenstain Bears' Big Book of Science and Nature by Stan and Jan Berenstain, Random House, NY, (1997)

The Great Kapok Tree by Lynna Cherry, A Gulliver Green Book, Harcourt Brace and Company, San Diego, NY, London, (1990)

The Lorax by Dr. Suess, Random House, NY, (1971)

Filmstrip and Children's Tapes:

Brightland!, Brightland Energy Source Education Council, (1984)

Dr. Suess: The Hoober-Bloob Highway (Sing Along Classics)

Teacher's Books/ Readings:

Acid Rain: Eye On The Environment by J. M. Patten, Ed. D., The Rourke Book Company, Inc., Vero Beach, FLA, (1995)

Brightland, Energy Education Company, (1984)

Energy All Around by Tillie S. Pine and Joseph Levine, Pongrid Productions, (1975)

Energy and Environment by Norman F. Smith, Stecks Vaughn Co., Austin, Texas, (1974)

Energy and Power by L. Sprague De Camp, The Golden Library of Knowledge, Golden Press, NY (1962)

Energy and Inertia by Hal Hellman, M. Evans and Co., Inc., New York, (1970)

Energy From Fossil Fuels by Dale Rice, Raintree Publishers Inc., New York, Milwaukee, (1983)

Energy From Sun, Wind, and Tide by Jaqueline Dineen, Enslow Publishers, Inc., NJ, (1988)

Facts on Fossil Fuels by Clint Twist, Aladdin Books, Ltd., (1990)

Facts on Water, Wind, and Solar Power by Guy Arnold, Aladdin Books Ltd., (1990)

From This Earth: Oil, Coal, and Gas by William Russel, The Rourke Corporation, Inc., Vero Beach, Florida, (1994)

Geothermal Energy by Graham Rickard, Gareth Stevens Children's Books, Milwaukee, WI, (1991)

Living Treasure: Saving Earth's Threatened Biodiversity by Lawrence Pringle, Morrow Jr. Books, NY, (1991)

Oil Rigs by R. J. Stephen, Franklin Watts Ltd., NY, NY, (1986)

Our Endangered Planet-Tropical Rain Forests by C. Mutel and Mary Rodgers, Lerner Publications Co., Minneapolis, (1991)

People In The Rain Forest by Saviour Pirotta, Raintree Steck-Vaughn Publishers, Austin, TX, (1999)

Polluting The Air by Tony Hare, Gloucester Press, NY, NY, (1992)

Pollution by Herta S. Breiter, Raintree Children's Books, Milwaukee, (1998)

Saving Energy by Jaqueline Dineen, Raintree Steck-Vaughn Co., Austin, Texas, (1995)

The New True Books by Darlene R. Stille:
- The Ozone Hole, Children's Press, Chicago, (1991)
- The Greenhouse Effect, Children's Press, Chicago, (1990)
- Water Pollution, Children's Press, Chicago, (1990)
- Air Pollution, Children's Press, Chicago, (1990)
- Recycling, Children's Press, Chicago, (1991)

Wind Energy by Graham Rickard, Gareth Stevens Children's Books, Milwaukee, WI, (1991)

Wind Power by Mike Cross, Gloucester Press, NY: Toronto, (1985)