Energy in Our World

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This curriculum unit is recommended for:
Third, Fourth and Fifth Grade Science

Keywords: Physical Science, Energy Conservation and Transfer, Basic Forms of Energy, Potential and Kinetic Energy, Thermal Energy, Heat Transfer

Teaching Standards: See Appendix1

Synopsis:

This curriculum unit (CU) will take an in-depth look at the essential standards and the clarifying objectives of Energy in the third, fourth and fifth grade level. After establishing back ground knowledge about Energy, the unit will share how to establish a student centered, learning station based lab that will allow for different learning styles and differential learning to take place.

To make this unit teacher friendly and useful for teachers I will include labs that will be appropriate for each grade level and the standards. I believe this CU will be of benefit to third through fifth grade teachers who are currently struggling with the new science topics (content knowledge) and do not have time to research Energy standards at the other grade levels. This CU will also be a good resource for science lab teachers who wish to take their labs to a new level.

The goal is to make science fun and come alive for students. I want them to be self-directed learners, and this will give them an opportunity to choose different ways to learn about Energy. Students will see practical usage and real world application of the concepts of Energy.

I plan to teach this unit during the coming year in to 270 students in third, fourth and fifth grade in the Science Lab.

Teaching Third – Fifth Grade Students about the Energy in Our World

Cindy Woolery

Overview

Pioneers consumed very little energy. They didn't have cars, televisions or computers. They did not do several loads of laundry a week, nor did they cook using stoves, refrigerators or microwaves. They first type of energy people discovered how to control was fire. They used fire's energy for light, warmth, and cooking.

Today we use vast amounts of many types of energy. Our energy needs are far greater today than ever before. Looking to the future, the students that we teach today will be charged with finding new ways and technologies to supply the world with the ever increasing demand of energy. As educators we need to help our students understand the basic principles and fundamental concepts of energy.

Introduction

Elizabeth Traditional Elementary School (ETES) is an institution that has provided educational training for young children since opening its doors in 1912. Our school has been a Traditional K-5 magnet program since 1977. The school's building structures, name, and curriculum have been altered over the years to meet various demands of a diverse and ever-shifting population. One quality of the school and its staff has remained constant - a commitment to a solid educational foundation for all students.

ETES is located in Charlotte, North Carolina in the urban school district of the Charlotte/Mecklenburg School System, which is the twenty-second largest in the nation. The school serves five hundred and fifty students with fifty-seven percent of the population being Africana American. Thirty-four percent of our students are economically disadvantaged.

Our school is very proud of the fact they have a Science Lab and a full time Science Facilitator. This is one of the seven special features of the Traditional School. The school is a "magnet" school which means parents have to apply to the school and then a lottery takes place to see who is admitted.

I have begun my third year as a full time Science Facilitator at this school. I have followed in the footsteps of an outstanding Science Facilitator who worked for many years to establish a material-rich lab. The school PTA collects a science lab fee from students so that lab materials can be purchased.

The Lab has five tables for group experiments and cooperative working groups as well as a Media Viewing Space (rugged area where a computer, smart board, ladybug document camera, and digital microscope are located). The Science Lab experience is considered a "Special" on the same level as Media Center and Computer classes. Every student in the school comes to the Lab for a fifty-five minute period, rotating on a four day schedule.

Last year my curriculum switched from the North Carolina Standard Course of Study to new State Essential Standards and Common Core Standards. In the new Essential Standards, Energy is taught in third, fourth and fifth grades. The strand of Energy is new for both fifth grade and third grade. In fourth grade, energy will take the place of a unit on Electricity and Magnetism.

For most lessons I use the Five E's (*Explore, Engage, Explain, Elaborate, and Evaluate)* in planning interactive lessons. I have discovered many excellent interactive science web sites where students can perform virtual experiments. Viewing these web sites as a group has had an impact on student learning. Many of my students are lacking in life experiences and the use of the computer gives them background knowledge to be able perform their own discovery experiments.

Rationale

The state of North Carolina has elevated the fifth grade Science test to a "gate-way" test. The Science End of Grade (EOG) test has been placed on the same level as Reading and Math EOG's. Schools are often judged by the public, parents, teachers and others on how the students score on the EOG's.

How teachers are evaluated is rapidly changing. Beginning this year, student ~~sc~~ores, and growth on these scores will be factored into teacher evaluations with the possibility of money being paid to those teachers whose students show the most growth. These facts have had a great impact on the teaching of Science at the elementary level. Testing our students in science is stretching our teaching of science! Science is taught three times per week. Most of the teachers at my school consider the lab time as one of these sessions.

My Curriculum Unit (CU) will take an in-depth look at the essential standards and the clarifying objectives for each of these standards. After establishing back ground knowledge about Energy, I will create a student centered, learning stations based lab that will allow for different learning styles and differential learning to take place.

This summer I was challenged at a week-long professional development conference by my Professors and fellow elementary lab teachers to take a look at how my students spend their time in the lab. Although my students were learning science by watching demonstrations, seeing experiments, and writing in their journals I came to the realization they were not experiencing science as much as I would like them to. I have always been a great proponent of "hands on" learning, but I was so intent on making sure they had the content, I did not provide as many opportunities that I could/should have for student-centered experiments. This CU will be a complete new adventure for me! I will learn how to turn the lab into a student directed hands on lab experience, instead of a teacher directed lab.

To make this unit teacher friendly and useful to my teaching I will include labs that will be appropriate for each grade level and the standards. I believe this CU will be of benefit to third through fifth grade teachers who are currently struggling with the new science topics (content knowledge) and do not have time to see how it is being taught at the other grade levels. This CU will also be a good resource for science lab teachers who wish to take their labs to a new level.

The goal is to make science fun and come alive for my students. I want them to be self-directed learners. My students will see practical usage and real world application of the concepts of Energy.

Objectives/Standards

The NC Science Essential Standards for this unit are as follows: Physical Science: Energy Conservation and Transfer:

Fifth Grade –
Students will explain how the properties of some materials change as a result of heating and cooling. Students in fifth grade will also be able to explain the effects of the transfer of heat (either by direct contact or at a distance) that occurs between objects at different temperatures (conduction, convection or radiation). They will be able to explain how heating and cooling affect some materials and how this relates to their practical applications.

Fourth Grade –
Recognize that energy takes various forms. The students will be able to recognize the basic forms of energy (light, sound, heat, electrical, and magnetic) as the ability to cause

motion or create change. They will also recognize that light travels in a straight line until it strikes an object or travels from one medium to another, and that light can be reflected, refracted, and absorbed.

Third Grade –
Recognize how energy can be transferred from one object to another.
The students will be able to recognize that energy can be transferred from one object to another by rubbing them against each other. They will also recognize that energy can be transferred from a warmer object to a cooler one by contact or at a distance and the cooler object gets warmer.

Scientific Content: Background Knowledge for Teacher

Energy is a physical quantity that follows precise natural laws. Energy comes in different forms and can be divided into categories. There are two categories that energy falls into: kinetic and potential.

Kinetic Energy describes types of energy associated with motion. It is the energy of any moving object and depends on the mass of the object as well as its speed. It is energy that is doing work. Moving water and wind are good examples of kinetic energy. Kinetic energy forms are doing work — like electrical, heat, light, motion, and sound.

Potential energy describes energy possessed by an object or system due to its position relative to another object or system and forces between the two. Potential energy is stored energy. In this stored state it has the potential for doing work. Potential energy comes in forms that are stored including — chemical, gravitational, mechanical, and nuclear. Examples of potential energy are rocks positioned at the top of a steep hill, or water in a lake in the mountains. Potential energy is found in fossil fuels, electric batteries, and the food we eat. This energy is referred to as potential energy, because if/when it is released, it can do work.

Energy can change from one form to another. A good example is a roller coaster. When the roller coaster is at the top of a hill, it has potential (or stored) energy. When it goes down the hill its potential energy is converted to kinetic energy.

Forms of Energy

Kinetic

Thermal energy, or heat energy, is the vibration and movement of the atoms and molecules within substances. As an object is heated up, its atoms and molecules move and collide faster. Geothermal energy is the thermal energy in the Earth Thermal energy is energy that is transferred from one object to another because of temperature

difference between the objects. Matter does not contain heat; matter contains atomic or molecular kinetic energy. Heat flows from one thing to another and always from the warmer body to a neighboring cooler body. Examples would be when you hold a hot cup of coffee the energy from the coffee is transferred to your cold hands, but when you hold an ice cube in your hands the energy passes out of your hand and into the colder ice.

Electric energy is all around us. It is in the lightning and in the spark that flies between your hand and the door knob in the winter. It is what holds atoms together to form molecules. It powers most of our modern devices.

Electrical forces arise from particles in atoms. Atoms are made up of three parts, the protons, electrons and neutrons. Protons are positively charged and electrons are negatively charged and neutrons have no charge. Neutrons are neither attracted nor repelled by charged particles. Electrons are attracted to protons, but electrons repel other electrons. This attracting and repelling behavior is attributed to a property called charge. The fundamental rule of electrical phenomena is: Like charges repel: opposite charges attract.

If an object has unequal numbers of electrons and protons it is electrically charged. An atom that has one more positive charge (proton) than negative charge (electron) is said to be positively charged. If it has more electrons than protons then it is negatively charged.

Electric current is the flow of electric charge that occurs when there is a potential difference across the ends of an electrical conductor. Dry cells, wet cells, and electric generators are voltage sources that maintain a potential difference in a circuit.

Sometimes the electrons of atoms are rubbed off, producing atoms that have a slight positive charge. The object that did the rubbing will accumulate a slight negative charge as it gets extra electrons. During dry weather, these excess charges do not dissipate very easily, and you get static electricity.

Sound is the movement of energy through substances in longitudinal (compression/rarefaction) waves. Sound waves are produced by the vibrations of material objects. High-pitch sounds are produced by sources vibrating at high frequency, while low-pitch sounds are produced by low-frequency sources. Sound can travel through gases, liquids, and solids, but not through a vacuum. Sound travels faster through very dense materials, such as steel. Typically, the energy in sound is far less than other forms of energy.

Light otherwise known as radiant energy is electromagnetic energy that travels in transverse waves. Radiant energy includes visible light, x-rays, gamma rays and radio

waves. Light is one type of radiant energy. Sunshine is radiant energy, which provides the fuel and warmth that make life on Earth possible.

Magnetic energy is similar to electric charges because the both attract and repel without touching one another. Also, like electric charges the strength of their interaction depends on the distance of separation of the two magnets. A magnetic field is produced by the motion of electric charge (an electric current). The earth itself is a magnet.

Potential

Chemical energy is energy stored in the bonds of atoms and molecules. Batteries, biomass, petroleum, natural gas, and coal are examples of stored chemical energy. Chemical energy is converted to thermal energy when we burn wood in a fireplace or mechanical energy when we burn gasoline in a car's engine.

Mechanical energy is energy stored in objects by tension (the energy due to the position or the movement of something). Compressed springs and stretched rubber bands are examples of stored mechanical energy. Mechanical energy may be in the form of either potential energy or kinetic energy.

Gravitational energy is energy stored in an object's height. The higher and heavier the object, the more gravitational energy is stored. When you ride a bicycle down a steep hill and pick up speed, the gravitational energy is being converted to kinetic energy. Hydropower is another example of gravitational energy, where the dam "piles" up water from a river into a reservoir.

Essentials for Fifth Grade - thermal energy, heat transfer and temperature.

Energy can be converted from one form to another. For example, fuel-burning heat engines convert chemical energy to thermal energy; batteries convert chemical energy to electrical energy. The law of conservation of energy states that though energy may be converted from one form to another, it may not be created or destroyed. The total amount of energy never changes.

In the fifth grade this CU will explore the concepts of thermal energy. Thermal energy is the movement of the atoms and molecules within substances. We measure this movement when we measure the temperature of an object. When we move energy from a hotter object to a cooler one, we say there is heat transfer. This is really an energy transfer. What we mean is that that the motion of the atoms in the hotter object will slow a little and the motion of atoms in the cooler object will speed up a little as a consequence of these objects being in close proximity to each other.

Heat flows on its own from a hotter to a cooler substance, regardless of the amount of each substance. Matter does not contain heat; rather, it contains internal energy.

Temperature is the quantity that tells how warm or cold something is. Temperature is a measure of the average kinetic energy of the molecules or atoms within a substance. As scientists we use the Celsius scale. Zero degrees is the temperature at which water freezes, and 100 degrees is the temperature at which water boils.

Fifth Grade Vocabulary

Conduction – A means of heat transfer within certain materials and from one material to another when the two are in direct contact. It involves the transfer of energy from atom to atom.

Convection – A means of heat transfer by movement of the heated substance itself, such as by currents in a fluid.

Radiation –The transmission of energy by electromagnetic waves (light).

Temperature –The property of a material that tells how warm or cold it is with respect to some standard.

Essentials for Fourth Grade

In the fourth grade this CU will explore the concepts of the basic forms of energy – light, sound, heat, and electrical.

Vocabulary:

Energy, light, sound, heat, electrical, magnetic, motion, circuit, thermal energy, transfer, reflected, refracted, absorbed, wavelength, spectrum

Reflected - The bouncing back of light waves when they hit an object with a very smooth and shiny surface, like a mirror, is called reflection.

Refracted - When light passes from a less dense to a more dense substance, (for example passing from air into water), the light is refracted (or bent) towards the normal.

Absorbed - When light hits a non-reflecting surface, the light waves are absorbed by the object. However, the light waves that are the same color as the object are not absorbed. Instead, those light waves bounce off the surface, are transmitted to the human eye, and are interpreted as the color of the object.

Wavelength - One of the characteristics of light is that it behaves like a wave. As a result, light can be defined by its wavelength and frequency. The frequency is how fast the wave vibrates or goes up and down. The wavelength is the distance between two peaks of the wave. Frequency and wavelength are inversely related, meaning that a low frequency wave has a long wavelength and vice versa.

Spectrum - We can only see light within a certain range of wavelengths and frequency. This range is called the visible spectrum.

Essentials for Third Grade

In the third grade we teach basics of energy, kinetic energy, potential energy, transfer of energy (heating and cooling), static electricity, and solar energy.

Vocabulary

Energy, heating, cooling, friction, convection, conduction, conductor, insulator, static electricity, positive charge, negative charge, solar energy, kinetic energy, potential energy.

Energy: The ability to do work.

Heating and cooling: The thermal energy that is transferred from one material to another because of temperature difference between the materials. When we move energy from a hotter object to a cooler one, we say there is heat transfer. This is really an energy transfer. What we mean is that that the motion of the atoms in the hotter object will slow a little and the motion of atoms in the cooler object will speed up a little as a consequence of these objects being in close proximity to each other.

Friction: A force that occurs when one object rubs against another.

Convection and conduction: Please look at Fifth Grade Vocabulary located above for definitions.

Conductor: A material that heat travels through easily.

Insulator: A material that heat doesn't travel though easily.

Static Electricity: Electricity that collects on the surface of something and does not flow as a current and can cause a mild shock if you touch it.

Electrical charges: Atoms start out with the same number of negative charges (electrons), and positive charges (protons). Under certain conditions, electrons can be removed from, or added to atoms. Removing electrons would leave the atom with more positives than negatives, and we call this a positive charged atom. Adding electrons to an atom would result in a negative charged atom. If you do this enough times, you can make an object positive or negative.

Solar Energy: Energy from the sun that is converted into thermal or electrical energy.

Kinetic and potential energy: see above explanation under forms of energy.

Strategies

The first strategy is to bring my students to a basic understanding of energy as it pertains to the standards in their grade level. I will start with my students own questions and personal curiosity about energy. The questions they formulate as they contemplate energy of will be used to guide the unit as well as the Standards. I will limit direct teaching to a ten minute segment will allow students to take full advantage of their lab time.

The second strategy is to help my students to understand Energy through hands-on experiments, activities related to Energy, usages of scientific tools, vocabulary, reading, writing, and use of the computers. I will establish forty learning centers within the lab so that students will be able to select from a variety of choices that they would like to focus on. Each station will have a "mini assignment" to complete. The students will have a "log" book to keep their answers in. This will also be used as a form of organization and grading sheet. These logs will be kept in the lab and shared with the teacher at the end of the grading period. See Appendix 2 for an example.

The third strategy will be that students will keep an Energy Journal where they will record the labs, experiments, drawings, and knowledge gained about Energy. This will help them organize their thoughts and have something concrete to review with. This will also help me to see any misconceptions that the students might have. The Journals will stay with the students and they will be encouraged to add to them anytime they have ideas or learn new information.

Classroom Activities

The first phase of implementing this unit is to educate the students about individual learning stations. Students need to become independent learners who can budget their limited amount of time and perform their tasks with minimum adult interaction.

The first unit for all three grade levels is using the Scientific Method and thinking and acting like a scientist. During previous units we have been practicing skills to be used in the Energy Unit. We have practiced using scientific tools, following directions to complete an experiment and reading scientific text while taking notes that can be used to review. Scientific drawings using the ABCD method (Accurate, Big enough, Correctly labeled, Do your best) are also practiced before the Energy Unit. Students have also practiced being responsible with materials, and leaving the learning stations in good order.

Each learning station will have an overview sheet explaining the objective and giving directions and a simple rubric on how the station will be scored. Twenty-five

learning stations will be on clearly labeled lunch trays due to the fact that the lab has five tables that seat five students each. Four labs will consist of the four table top computers that are in the lab. The remaining eleven stations will be placed on individual student desks, teacher desk, counters, two large tables and the floor.

Learning stations will be grouped with similar type stations. Categories for learning stations are Computer, Observation/Data collection stations, Reading station, Build It stations, Experimentation stations, Scientific Drawing stations, Game stations, and Write/Design/Create stations. See Appendix 3 for a list of learning stations. Appendix 5 and 6 contain websites and books I will use in the Reading and Computer stations. Below I include sample experimental stations for each grade level.

Fifth Grade Learning Stations

Radiation, Station A

5.P.3.1 Explain the effects of the transfer of heat (either by direct contact or at a distance) that occurs between objects at different temperatures (conduction, convection or radiation).

Materials for learning station: 4 bowls, large container of water, measuring cup, 4 thermometers, black and white construction paper, aluminum foil, a watch

The students will observe the effects of incoming solar radiation. They will place four bowls with the same amount of water in the sun. Three bowls will have a different cover – one shiny, one black, and one white. One bowl will be left uncovered to act as a control. The students will leave their bowls in a sunny place for a total of 20 min. They will check and record the temperature of each bowl every five minutes. Students will create a way to show their data in their log books.

Radiation, Station B

Students will have the same materials as station A, only this time they will create their own experiment using the scientific method. After testing for twenty minutes students will record their results in their journals.

Fourth Grade Energy Stations

4.P.3.1 Recognize the basic forms of energy (light, sound, heat, electrical, and magnetic) as the ability to cause motion or create change.

Materials: Snaps Circuit Jr. Kit, science journal

Using the kit create a circuit to light a light bulb and ring a bell. Make a scientific drawing in your log book showing how it works. Answer the following questions. Why does the light come on and the bell ring? What forms of energy does the closed electric circuit create?

4.P.3.2 Light Recognize that light travels in a straight line until it strikes an object

Materials: mirrors, flashlight, clay, poster with 3-4 spots marked, large table, science journal

Students will use the materials to reflect the light from the flashlight onto the poster's marked spots using at least two mirrors (challenge 3 or 4). This center will be for 2 students who will cooperate, collaborate, and take turns holding the flashlight. Students can use the clay to place the mirrors where they need to be in order to complete the task. When the task is completed the students will draw the diagram of their solution in their journals and answer the following questions. How does light travel? What other materials can you think of that would allow the light to travel in the same path?

Third Grade Energy: Conservation and Transfer Stations

3.P.3.1 Recognize that energy can be transferred from one object to another by rubbing them against each other.

Materials: small container (baby food jars work well), uncooked rice, thermometer, timing device, science journals.

Students will fill container half full of rice. Place the thermometer in the middle of the rice and record temperature. Predict what will happen to the temperature when you shake up the rice. Place lid tightly on container and shake for one minute. Open container and place thermometer in the middle of rice and record. Recap rice in container and vigorously shake rice for two minutes. Once again record the temperature. The third time, shake the rice for three minutes. Record and then graph your results in your science journal. Answer the following questions. What did you predict would happen and what did happen? What questions do you have about the results?

3.P.3.2 Recognize that energy can be transferred from a warmer object to a cooler one by contact or at a distance and the cooler object gets warmer.

Materials: Large and sandwich sized baggies, lard, bucket of ice water, science journal

Fill the large plastic bag half full of Crisco or lard. Place your hand inside of the sandwich bag (like a glove) and place your hand inside of the bucket of ice water. Hold it in the water for 10-20 seconds or until you become uncomfortable. Write in your

journal your findings and a prediction of what will happen when you surround your hand with lard. Now place your hand inside of the large plastic bag. Make sure the lard surrounds your hand on all sides then place your hand inside of the ice water again. What do you feel? How do animals use their "fat"?

What did you predict would happen and what did happen? What questions do you have about the results? What did you learn? Why did change happen? How do you know? What did you learn? What caused the change? Why did change happen? How do you know?

Resources

Appendix one contains the North Carolina Essential Standards and Clarifying Objectives that this unit covers. In all three grade levels the topic of Energy is taught, but with a different component emphasized. In third grade students will learn about transfer of energy. In fourth grade students will study basic forms of energy and in particular light. In fifth grade students will learn the ways that thermal heat transfers from one object to another and the change those properties in some materials go through.

Appendix two is a cover sheet for the log book that each student will keep in order for the teacher and student to know where they have been and what is available for them to go to. Students were responsible to make their own log books. The created them by taking 5 sheets of notebook paper, folding them in half (giving the book 10 half sheets of paper) and placing three staples at the top of the book.

The students will use this log book to respond to each of the learning stations in some way and also as a means to know where they will begin when they come into the lab again. Students will mark each number when they first go to the station, when the station is complete the teacher will mark in the space next to the number. Third grade will be based on pass/fail so I will use check marks. Fourth grade students will receive smiley faces depending on answers in the log book. Fifth grade will receive number grades which they will average at the end of the quarter for their final grade in Science Lab. If a student has marked the station, but does not have a grade from the teacher then the student will begin the next class session at the station he/she has not completed. Those that have completed a station will be able to choose a new station.

When a student is absent mark the date on the back of the lab book. When grading, take into consideration the number of classes the student had to complete the learning stations.

Appendix three is a general list of the forty learning stations that I will use for this unit. The format for each class will be ten minutes of concentrated information on an appropriate objective for the grade level then forty minutes for learning stations. Since

I will be using these stations for all three grade levels I will leave them out for half of the day.

Appendix four is a list of suggested books for the teacher who would like to gain knowledge in the area of Energy.

Appendix five is a list of websites that I plan on using in my unit. Also listed are websites that teachers might want to look at to gain additional knowledge.

Appendix six is a list of some of the great books available for your reading and writing center. This is my no means a complete list, but will assist teachers with some great books to begin with.

Appendix 1: Implementing District Standards

Implementing District Standards – Each of the following standards will be addressed through self-selected learning stations. This unit contains examples to get started but learning stations should be selected with your students in mind.

Third Grade Essential Standard: Energy: Conservation and Transfer

3. P.3 Recognize how energy can be transferred from one object to another.

3. P.3.1 Recognize that energy can be transferred from one object to another by rubbing them against each other.

3. P.3.2 Recognize that energy can be transferred from a warmer object to a cooler one by contact or at a distance and the cooler object gets warmer.

Fourth Grade Essential Standard: Energy Conservation and Transfer

4. P.3 Recognize that energy takes various forms that may be grouped based on their interaction with matter.

4. P.3.1 Recognize the basic forms of energy (light, sound, heat, electrical and magnetic) as the ability to cause motion or create charge.

4.P.3.2 Light Recognize that light travels in a straight line until it strikes an object or travels from one medium to another, and that light can be reflected, refracted and absorbed.

What students need to know: Light travels in a straight line. Light can be refracted, reflected and/or absorbed.

Fifth Grade Essential Standard: Energy: Conservation and Transfer

5. P.3 Explain how the properties of some materials change as a result of heating and cooling.

5. P.3.1 Explain the effects of the transfer of heat (either by direct contact or at a distance) that occurs between objects at different temperatures. (Conduction, convection or radiation).

5. P.3.2

Explain how heating and cooling affect some materials and how this relates to their purpose and practical applications.

Appendix 2: Cover Sheet for Learning Logs (40 Learning Centers)

Name							
Teacher							
1		11		21		31	
2		12		22		32	
3		13		23		33	
4		14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Appendix 3: List of Learning Stations

Reading Stations (5)	At each of these five stations two books dealing with the subject of energy will be placed. Students will be responsible to select, read and summarize a book at each of the stations.
Writing Stations (5)	Each station will have a writing prompt or a picture dealing with energy. Students will write in complete sentences. A vocabulary list will be provided at this table for students to use. Each student will need to correctly use at least 2 words from the list.
Computer Stations (4)	Each computer will be set to an interactive website where students will participate. When finished students will record their thoughts in their log book.
Experiment Stations (6)	Each station will be set up with instructions and materials to conduct an experiment. Students will use the Scientific Method and write their results in their Science Journals
Lego Stations (2)	Students will have a set of Legos and create objects that move.
Game Stations (3)	At these stations students will be able to play two person games. This will be located on the far side of the room and students will use quiet voices.
Current Events Stations (5)	Using Dogo.com and Science Magazines each station will have a current event in science on the topic of energy. Students will read the article and summarize the important facts.
Snap Circuits Station (3)	Snap Circuits are electrical kits that come with a book of instructions on how to make 101 experiments.
Scientific Drawing Stations (5)	Each station will have an object or artifact for students to use their scientific drawing skills on. They will be responsible to draw and label the item into their Science Journals. (examples: Newton's Cradle, thermometer, microscope)
Creation Stations (2)	Students will create an artifact to share what they have learned with others. This could be in any form they would like. (examples: mini posters, songs, poems, books)

Appendix 4: Teacher Bibliography

Ball, Jacqueline A., and Lelia Mander. *Nuclear energy*. Milwaukee, WI: Gareth Stevens Pub., 2003.

This book provides an unbiased, simple, well-illustrated explanation of nuclear energy that is both informative and interesting. Although it is written for children, adults should enjoy it as well. I will place this book in my Choice Reading/Writing Learning Station.

Energy: Stop Faking It! Finally Understanding Science So You Can Teach It. Arlington: National Science Teachers Association., 2002.

At the book s heart are easy-to-grasp explanations of energy basics work, kinetic energy, potential energy, and the transformation of energy and energy as it relates to simple machines, heat energy, temperature, and heat transfer.

Hewitt, Paul G.. *Conceptual physics: the high school physics program*. Needham, Mass.: Prentice Hall, 2002.

Breaks down information and uses every day illustrations to help you understand the basic science behind physics. Begins with Scientific Method and walks through six units beginning with Mechanics and ending with Atomic and Nuclear Physics.

Holzner, Steven. *Physics I for dummies*. 2nd ed. Hoboken, NJ: Wiley Publishing, Inc., 2011.

Great reference book for teachers: especially if you have not had a physics class for several years.

Appendix 5: Websites

"Educational Videos, Lessons and Games for K-12 School Kids." Energy Sources.

http://www.neok12.com/Energy-Sources.htm

Awesome Website with free educational videos and games. I will use this in two of the Stations, Computer and Games. The Energy match-up game can be reproduced and used as a quick check to make sure students understand different forms of energy and how their source.

"Energy - Free Science Games, Activities and Homework Help for Kids." Energy - Free

Science Games, Activities and Homework Help for Kids.

http://www.wartgames.com/themes/science/energy.html

Great resource! I liked the Movie Room and teacher resources for Energy. This is a website that has many great ideas, but you will have to spend some time to go through all that it has. I did find some of the links are no longer available.

"Fun Energy Facts for Kids - Solar Power, Wind, Kinetic, Potential, Motion, Joules, Laws." Fun Energy Facts for Kids - Solar Power, Wind, Kinetic, Potential, Motion, Joules, Laws.

http://www.sciencekids.co.nz/sciencefacts/energy.html

Great website with experiments, games, videos, quizzes. I will use this in my Computer Station.

"Kids News - Current Events." DOGO News. http://www.dogonews.com/

My favorite website for current events! The articles are great for vocabulary building while very entertaining. The students enjoy reading the article then watching the short clip. This site helps make science come alive!

"What Is Energy?." EIA Energy Kids -. http://www.eia.gov/kids/energy.cfm?page=1

Great website for both teachers and students! This site answers the questions of Energy Basics and Forms of Energy. Have students take the energy quiz to find their Energy IQ

Appendix 6: Student Bibliography

Biskup, Agnieszka, Cynthia Martin, and Anne Timmons. *The powerful world of energy with Max Axiom, super scientist*. Mankato, Minn.: Capstone Press, 2009.

High interest book for students to learn basic ideas about Energy. I will use this book as part of my science library books that students can read for extra credit or replacement learning station.

Bradley, Kimberly Brubaker, and Paul Meisel. *Energy makes things happen*. New York: HarperCollins, 2003.

This is a stage 2 "Read and Find Out Science" book. This is a great book to use in the Reading Learning Station. Students can read the book, pick their favorite energy form and write about it in their logs.

Drummond, Allan. *Energy island: how one community harnessed the wind and changed their world*. New York: Farrar, Straus and Giroux, 2011.

When most countries are producing ever-increasing amounts of CO2, the rather ordinary citizens of SamsÃ¸ have accomplished something extraordinary--in just ten years they have reduced their carbon emissions by 140% and become almost completely energy independent. A narrative tale and a science book in one. I will use this true story in my Writing Learning Station. Students will read the book and the write about a way they could use less energy.

Green, Jen, and Mike Gordon. *Why should I save energy?*. Hauppauge, NY: Barrons Educational Series, Inc., 2005.

Students take electricity and other energy sources for granted, until one day their community has a power blackout. They come to realize that in lighting homes and keeping houses warm, we are using up natural resources that can't be easily replaced. This book can be a choice book in one of the Read/Write Learning Stations. Students will read the book and write about a day without the use of electricity.

Krohn, Katherine E., Cynthia Martin, and Barbara Schulz. *A refreshing look at renewable energy with Max Axiom, super scientist*. Mankato, Minn.: Capstone Press, 2010.

A great paperback for with sound scientific concepts. This book will be placed in my Choice Reading Learning Station.

McClellan, Dina. *Using energy wisely*. New York, NY: Newbridge Educational Pub., 1999.

A book for fluent readers that is very thought provoking. Students will read about our need for energy, cleaner ways to make electricity and saving energy. The glossary contains seven words including wind turbine. I will use this as one of the reading learning stations.

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