The Sun Does What? Understanding Solar Energy in Kindergarten

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This curriculum unit is recommended for:
Science/Kindergarten

Keywords: Energy, Solar Energy, Kinetic Energy, Stored Energy, Photovoltaic cells, Solar Farm, Solar Trough, STEM, Thermal Energy, Electricity, Renewable Energy

Teaching Standards: See Appendix 1 for teaching standards addressed in this unit. (Insert a hyperlink to Appendix 1 where you've stated your unit's main standards.)

Synopsis: Renewable energy is a part of the future and it is necessary to give our Kindergarten students an introduction to energy and solar energy in particular. This curriculum unit explores different types of energy (stored and kinetic), thermal energy and electricity produced from the solar energy. Students will complete labs in order to gain proficiency of how thermal energy works by heating things up and how we can use a solar panel to create electricity to power multiple items, such as a calculator, watch, or even our homes. Students are allowed to work through their labs in a trial and error way, allowing them to guide their own learning. They will study how sunlight heats up water and how they can use the sun to cook a hot dog. They will also experiment with photovoltaic cells to see how they work. They will also see what happens when they do not get much sunlight or if they get plenty. Throughout the unit, the students will be recording all their thoughts and findings in a science journal. In a culminating activity, students will work in groups to put together a solar car and see how far they can make it travel.

I plan to teach this unit during the coming year in to 20 students in Science/Kindergarten.

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Introduction

I teach Kindergarten at Albemarle Road Elementary School in the Charlotte-Mecklenburg School system (CMS). CMS is one of the largest school districts in the country and has received recognition as being one of America's best. [1] We are a Title-1, Pre-K through 5th grade school with approximately 1300 students. Of those 1300 students, 96% qualify for free and reduced meals. Our population is very diverse, with approximately 44% Hispanic, 42% African American, 5% White and 8% Asian. Also, approximately half of the 1300 students are limited English proficient, which means that they speak another language in the home. Spanish is the language that is predominately spoken, but there are many other languages that can be found in my school. We also have a growing refugee population where we have been getting students from strife-affected areas such as the Sudan, Congo, Liberia, Somalia, Eritrea, Ethiopia, Nepal, Bhutan, Burma and El Salvador.

My classroom consists of 20 students currently (we have a highly mobile population with families moving in out of our area apartment complexes and my classroom numbers could fluctuate). Ten of my 20 students are ESL, English as a Second Language. The majority of those students come from families that speak Spanish, but 3 of those students do not. Two of my students are Burmese and 1 is Nepali, which makes it hard to communicate with their parents. Since my school has many staff members on hand that speak Spanish, it makes it easier to communicate with those families since we send home translated handouts and notices every time we send something home and make phone calls as necessary. This year, for the first time, we have access to a translator line that can help us contact parents who speak languages other than Spanish. We are able to call a number and contact a translator who then calls the parent to have a conference call. This way, I am able to inform parents, in their own language, of their student's progress or of any concerns I may have.

Rationale

STEM, or Science, Technology, Engineering and Math was introduced in 2001 by the National Science Foundation(NSF). The NSF defines STEM broadly, incorporating not only those four categories that STEM stands for, but also social/behavioral sciences such as psychology, economics, sociology, and political science as well.[2] Many times science, math and technology are taught separately, with no connection between them, which does not allow students a chance to see how they all interconnect in the real world. STEM

programs connect all of those disciplines into one cohesive unit,[3] giving the students a chance to see how what they are doing could be used in real life.

I want to give my Kindergarten students a chance to work with a topic that they will hear much more about in the coming years and one that they will likely see in their daily lives. Solar energy is a renewable source of energy. It is becoming more common as societies look for alternatives to fossil fuels. To a kindergarten student, the Sun is a constant; always there, and distinguishes between day and night. They have not yet realized just how important the Sun is. I want my students to be able to understand, on a basic level, what the Sun does for us and how we can utilize the Sun's energy to help us. I want them to know how they can use the Sun as an alternative energy source. In this unit we will explore how solar energy works and how we can use it to power cities.

Objectives/Standards

My goal for this unit is to have my students understand what solar energy is and how we can use it in our everyday lives. Throughout the course of this unit of study, we will touch on a North Carolina Essential Standard as well as multiple Common Core Reading, Writing and Speaking/Listening standards.

In order to teach solar energy, we will be reading some books on the Sun and solar energy as well as have many others available to my students so that they may reference them on their own. These types of books are Informational Texts, which my students may not be as familiar with. It gives them a chance to interact with books that are telling them new information, not just entertaining them with a story. Not only can we read in books, there is a very informative website called Energy Kids that I can guide my students through. There is a lot of information and illustrations that are on their level as well as games and riddles that can be used for fun.

We will also be conducting some experiments throughout this unit. In the course of completing the labs, there will be a lot of discussion and talking with partners for my students. Speaking and listening is a very big part of the Common Core and it is necessary to be able to speak in complete sentences as well as be able to hold a conversation with another person. By letting my students, for the most part, take the lead in their learning; they will be able to practice talking to their peers. Since this is a science unit, they will also be using scientific vocabulary in their conversations.

My students will also be covering writing Common Core standards by writing in their science journals. They will be practicing sounding out words and writing in complete sentences by this time. Since they are reading informative texts, they will be able to write their own informative texts. They will be able to tell their writing audience what they did during the experiment and the results of that experiment.

Scientific Content: Overview for Teachers

Renewable energy is a very important topic in today's world as people worry about the depletion of fossil fuels that we use for energy today. There are many types of energy that are renewable, such as "solar, biomass, geothermal, hydropower, and wind"[4] for some examples. For the purpose of this unit, we will only focus on solar power.

Before we begin talking about solar power, we need to talk about energy. There are two types of energy, stored energy and kinetic energy. Stored energy is just like it sounds, energy that is stored. Energy can be stored in plants, wood, and in you. When you eat food, you are storing the energy that you get from food in your body until you need it to walk, kick, run, climb, etc. When you burn wood, you are releasing the energy that has been stored in the wood. Kinetic energy is energy that is being used. When you kick a ball, you are using kinetic energy.

Solar energy is the energy we get from the Sun. There are two ways in which we can use that energy. We can use the Sun to heat water, heat air, use it as a solar cooker, and use photovoltaic cells to convert sunlight into electricity to power our homes. You can also use the sunlight to heat a liquid to produce steam, which turns a turbine to generate electricity that can be used in homes. Photovoltaic cells "change sunlight directly into electricity."[5]You see photovoltaic cells everywhere, in calculators, watches, flashlights, and even on some houses. The bigger the cell, the more electricity can be created from the Sun.

Photovoltaic devices or solar cells change sunlight directly into electricity.[6] Photovoltaic devices are made of silicon which absorbs the photons from sunlight. When enough sunlight is absorbed by the silicon, the electrons in the silicon are dislodged and they travel towards the front surface of the cell. The electrons all have a negative charge and the imbalance that is created from having a lot of negative electrons on one side creates a voltage potential like a battery with positive and negative terminals.[7] When the two sides are connected, a current flow happens and is able to power a device as small as a watch or as big as your house.

Solar farms (as shown here) are a concentration of solar cells or parabolic troughs (as shown here) to absorb as much sunlight as possible to generate as much electricity as possible. Parabolic troughs are the most common that are found on solar farms as they use a reflector to concentrate the Sun's rays onto a bar located on the focal line of the trough (my students will be working with a parabolic trough in one of my lessons). The concentrated sunlight can be used to heat water in pipes that run to a central location. The heated water creates steam, which turns a turbine that creates electricity that can be used in homes. This type of power plant is designed to run on solar power only, but the output is determined by the weather conditions. If necessary, the solar plant can rely on fossil fuels or even batteries to supplement when there is not a lot of sun shining.

There are many benefits of solar energy. The first benefit is that energy can be created without any pollutants being released into the atmosphere. The second benefit to using solar energy is that you could put a photovoltaic cell almost anywhere, even on rooftops, which minimizes the impact on the environment. However, Sunlight is not always consistent (cloudy, rainy days), which makes it hard to use solar energy consistently.

Teaching Strategies

Socratic Seminar

Socratic Seminar, as defined, is "a collaborative, intellectual dialogue facilitated with open-ended questions about a text".[8] The teacher, since they are in Kindergarten, will act as a facilitator to their discussion, guiding their learning by asking open-ended questions. If the students ask you a question, answer them back by asking a question of your own. Have a list of open-ended questions prepared ahead of time based on solar energy and the Sun so that you can help your students start their conversation (with Kindergarteners, this is very important as sometimes they do not know how to begin a conversation connected to a topic) (see appendix for examples).

In order to have these deep conversations, it is necessary to have some procedures in place so that everyone gets a chance to share their information. The first procedure I have is to have all my students come to the carpet and sit in our 'sharing circle'. The sharing circle is when they come to the carpet and sit on a letter (the letters run around the outside edge of the carpet) where they are facing the middle. There are three sides that the students are allowed to sit on because the last side is where I sit so that I can guide the conversation.

Conversation is the most important part of the Socratic Seminar, so there must be steps put into place to ensure that there is a conversation, not just people shouting out. In my class we will utilize the 'Share Bear'. When a student has the 'Share Bear', they are the only one who may share their thoughts, feelings, ideas. In order to get a turn with 'Share Bear', the students must listen to each other and raise their hand only when the first child has finished speaking. That child will then pass the 'Share Bear' on to the next student. Once the students get the hang of waiting for their turn to talk, the 'Share Bear' can be either kept or phased out. Also remind your students to respect each other; there are no bad ideas or thoughts.

Science Journals

Journals give students a chance to process their thoughts about what they have read or what they have discussed. After a Socratic Seminar where a lot of material is covered, it gives the student a chance to process that information and pick the piece that sticks out to them and that they may want to focus on or remember. "Through writing – and drawing as well – students can express and expand their thinking and improve their ability to reflect".[9] The teacher then can assess how well the student understood the topic and guide their lesson for the following day to help them understand the topic.

The students will write down their hypotheses every day in their journal based on questions that I pose to them at the beginning of each lesson. As kindergarten students, I want them to begin predicting what they are going to do in Science, not just when they are reading. After they record their hypothesis, they will conduct the experiment and record the results on the next page in their journal. My students will then be able to see if their hypothesis was correct. On a third page, they will record something that they learned or found interesting during the course of the experiment (or discussion if applicable).

Technology

Technology abounds in nearly every aspect of life nowadays from personal computers, cell phones to iPads or other tablets. With all of this technology around, it is necessary to incorporate it into the classroom to help students learn. I have a Smartboard in my classroom that I will utilize to help my students gain a better understanding of solar energy. I will create Smart Notebook lessons that give the students a chance to come up to the board and interact by moving objects into categories or as a fill in the blank that the students can check to see if they are right by themselves.

I will be able to utilize my school's subscription to Discovery Education which allows me to search for videos that help explain solar energy. Energy is a hard topic to explain to Kindergarten students since they can not see it, but having a video to illustrate it with simple language allows my students to see how energy works. Discovery Education also has interactive labs that the students can interact with. One lab that I found has students try different combinations of batteries with engines to see which combination allows the little car to travel the most laps. Students have a choice between three different sized batteries and three different types of motors. They then can mix and match to see which combination is the best.

Science Labs

By having my Kindergarten students complete labs, it makes the content more concrete for them. There is a quote by Benjamin Franklin that says, "Tell me and I forget, teach me and I may remember, involve me and I learn."[10] Students need a chance to manipulate concepts themselves in order to get full understanding of what is being asked of them.

We will be utilizing some simple labs that will help my students gain an understanding of solar energy. Along with our discussion about thermal energy, my students will complete labs that include measuring water temperature in the shade and direct sunlight and cooking with sunlight. When we talk about electricity, I will have my students interact with photovoltaic cells in flashlights and calculators to determine which kind of light best charges those devices and then use the cells to create a car and see how far that it travels.

Classroom Activities

These lessons, beyond the first day, are intended as science labs in order to let Kindergarten students become familiar with the concepts that I am trying to teach. Since they are labs, which mean that there will be a lot of materials listed that will be needed. A complete list of materials and when to use them is included in the Resource section. My unit has been created to last a week and my lessons and labs will run approximately 40 minutes each day.

Lesson One: Introduction to Energy

I will begin my lesson by bringing all of my students to the carpet. I usually have my students come to the carpet after cleaning up after our previous subject. Once all of my students are seated on the carpet, I will introduce the topic of energy to them by asking them what they know about the Sun. As the students are telling me what they know about the Sun, I will be writing down everything they say in a KWL chart. After they have told me what they know, I will ask them if there is anything that they would want to know about the Sun to add under the W column of our KWL chart (we will revisit this many times throughout the week as we continue to discuss energy and the Sun as they may have come up with more items that they would like to learn about).

After we have completed adding to our chart for the day, I will tell them that for this week, we will be studying the Sun and how we can use the Sun. Before we could talk about the Sun, we will need to talk about energy. We use the Sun to get energy, but we need to know what energy is in order to understand just what the Sun does. To introduce energy, I will show my students clips from a Discovery Education video entitled, "The Language of Science: Physical Science K-2: Force and Motion". I will only show the beginning of this video as it talks about kinds of energy before it goes into types of force

and motion. I will then show another Discovery Education video, "More Science Please: Energy Changes Everything", which talks more about kinetic and stored energy.

Then, I will have a Smart Notebook lesson that I had created ahead of time in order to give my students a chance to sort pictures of energy as kinetic or stored. I will display it on the Smartboard for all my students to see and have them take turns sorting pictures under the categories of kinetic and stored. If students have any problems, I will ask questions so that they can figure it out on their own or they can ask classmates for any help. The last slide in my presentation will be about the Sun and how the Sun gives us energy. I want my students to see that the sun shines down and gives energy to the plants, which helps them to grow. People and animals eat those plants and then the energy is now inside us. We use that energy to move, but we can use the energy from the Sun in different ways, not just to give us energy. I will then tell my students that we will be studying other ways that we can use the Sun's energy throughout the week.

Lastly, I will have my students record in their journal something that they had found interesting from today's lesson and something that they would like to know about or have questions about. For my students, this could consist of some writing or drawing, depending on the level of my students. While they are writing in their journals, I will be walking around the classroom and interacting with students one-on-one to see what ideas stuck with them and what they are interested in knowing more about.

Lesson Two: Thermal Energy

As we do every day, we will begin our lesson by coming to the carpet. I will begin by reading a book, "The Sun" by Elaine Landau to talk about the Sun and what the Sun is. Then I will ask my students what it feels like when they go out in the Sun and when they are in the shade. While my students are telling me what it is like standing in the sunlight or in the shade, I will be taking their answers and putting them on a T chart to compare the answers. After I write down all their answers, I will ask them what they think about their answers. After the discussion, I will ask them, "What would happen if we put a cup of water in the sunlight and one in the shade?" Then, I will fill two clear cups with the same amount of water. We will measure the temperature of the water in each cup using a thermometer. The students and I will put one in direct sunlight and one in the shade of a tree to sit for 10 minutes.

While the cups are sitting, my students will be writing their hypothesis in their science journals. After putting down their hypotheses, I will ask my students to share some of them with the rest of the class and to explain why they thought the way that they did. This will start another discussion of what we had talked about earlier and to see what they think will happen to the water in both situations. I want to just be the facilitator during this discussion because it is important for my student to take the lead in their learning and make it their own, instead of listening to me tell them all the facts.

After 10 minutes, we will get our samples and bring them back into the classroom. We will use two different thermometers to record the temperatures of the two different water samples. We will start out by measuring the water temperature of the water that was sitting in the shade. After we find out what the temperature of the water is, my students will record it, along with a picture, in their science journal. Then we will measure the temperature of the water that was sitting in direct sunlight. We will repeat the same steps as the shade water and record our findings in our journals. Afterwards, we will talk about our findings and what we observed. My students will conclude that the water that was left in the sunlight is much warmer than the water that was left in the shade. I will then tell them that the Sun's energy, which we can't see, has warmed up the water. To reinforce the concept that the Sun's invisible rays heated up the water, I will give my students some Solaractive Pony Beads. These beads change color only when exposed to UV (ultraviolet) rays. This gives the students a chance to 'see' the UV light that heats things up. I will also tell my students that this is the light that if we stay out in the Sun too long, burns our skin.

Lesson Three: Thermal Energy

We begin this lesson with a review from what we learned the previous day. My students will use their science journals to help remember what we have previously discussed. I will then read them a passage from the book, "Solar Energy" by Chris Oxlade that talks about how we capture heat from the Sun. I will then tell them that today we are still talking about thermal energy, but that we are going to use that energy to cook a hot dog. I then want my students to make a prediction on what will happen when we use the sunlight to cook a hot dog. After they record their predictions, we will discuss them briefly as a whole group before moving into their experiment.

The experiment today will be to use a solar hot dog cooker to cook a hot dog (see the appendix for direction). For Kindergarten students, however, you will need to have the solar cooker constructed for them beforehand. I will then pair up all of my students (10 pairs of 2) and have them share a solar cooker between them. They will then put a hot dog on the skewer and carefully put it on the solar cooker. The partners will then cook the hot dog by rotating the skewer until the hot dog is done. When the hot dog is done, they will carefully split the hot dog into two pieces and eat. While eating, the students will record what they did into their science journals.

Next, we will all come back to the carpet to discuss what we have just completed. I will ask my students to think about what had just happened and have them try to explain how the Sun cooked the hot dog. We will then talk about how the aluminum foil acts like a mirror, reflecting the Sun's rays. Since the foil is on a curve, it reflects the Sun's rays to the middle, where the hot dog is. The hot dog is then absorbing all that energy which in turn, cooks the food.

Lesson Four: Electricity

My students will come to the carpet with their science journals and pencils. We will take a few minutes to review what we have previously learned during the week, utilizing the journals to help them remember. I will then show them a calculator that has a small photovoltaic cell on it. I will inform my students that this little 'bar' uses the Sun in order to power the calculator and make it work. I will then ask my students what they think will happen if I cover up the cell. The students will record their hypotheses in their journals. After they have completed writing their hypotheses, we will cover up the photovoltaic cell and see what happens. The students will then record what happens when the photovoltaic cell is covered up.

Then, I will show my students more calculators and flashlights with photovoltaic cells and give them a chance to experiment with using photovoltaic cells. I will tell them to practice to see what kind of light gives them the best charge and how long that it is needed for them to keep their object in the light for the best charge. I will then let them go off and explore on their own. After about 10 minutes, I will ask them to switch objects (if they had a calculator, switch with someone who had a flashlight and vice versa) and let them continue to explore.

When all the students have had time to explore both devices, I will bring them back to the carpet to discuss their findings. I want to hear what they found out by manipulating the devices, what worked for them and what did not work. I will let my students guide the discussion, only interjecting when I think necessary. After our discussion, my students will go back to their seats to record their findings in their journals.

Lesson Five: Electricity

We will begin our lesson on the carpet with a review of what we had done the day before with photovoltaic cells. After our discussion, I will let my students know that today they will take what they know about solar energy and create a car that can travel the farthest on a single charge. My students will then make their hypotheses in their journal about what they need to do in order to help their car travel the furthest distance. When my students are done recording their predictions, I will break my students into five groups of four and show them the car that they will be building.

I will purchase five solar kits that are age appropriate for my students (please refer to the appendix for what I purchased for my students). They will work together as a group to build their car. After building the car, they will spend some time getting acquainted with their car to figure out what they need to do in order to make their car travel the farthest. The student can experiment with how much sunlight the solar panel receives; was it direct or indirect? What would happen if parts of the solar panel were blocked by

a shadow? I want my students to figure out what they can do to get the most power from their solar panels in order to move the car. This day is just for the students to take what they have learned and apply it to their car. After approximately twenty minutes, I will bring my groups back together and have them line up their cars to see which one travels the farthest. We will push all the furniture out of the way in order to let the cars go as far as they possibly can. Then I will have my students (one from each group) bring their car to the starting line and when we say go, release them.

At the end of the race, the winners will have a chance to tell the rest of the class what they did in order to get their car to travel the farthest. As they are talking, I will give the rest of my class a chance to ask questions to figure out what they could have done differently to make their car go further. When the discussion is over, my students will go back to their seats and record their results in their science journals. They will record their own personal results as well as what they could have done to make the car travel farther. Then they will record their favorite lab of the week and why it was their favorite.

Lastly, I will show a Smart Notebook file of solar farms and ask my students what they see. I want my students to be able to recognize that they are solar panels or troughs and they are collecting sunlight in order to create electricity. I will also pose some questions for my students such as, "What would happen on a cloudy/rainy day?" "What would happen on a foggy day?" "What would happen if the solar panel is not facing the sun?" "What would happen on a solar trough if the hot dog was not in the middle?" By the answers that I get from these questions, I will be able to informally assess my students' learning. If they answer my questions, I know that they understood solar energy. If they do not, I can take a few days and review in order to get mastery of solar energy. As a conclusion to the week of learning about solar energy, I will give all my students a mini solar car (they are about the size of a quarter) that they can keep (please refer to the appendix for further information).

Appendix 1
Implementing Common Core Standards:

These are the standards that my unit will address and will be met in multiple ways. The science standard will be met throughout the unit as the students complete their labs. The reading standards will be met through reading science books about the sun and solar energy. The writing standards will be met through their work in their science journals. The rest of the standards are speaking and listening standards. These standards will be addressed throughout the unit as the majority of our time will be spent on discussing our labs and findings.

KE.1.1: Infer that change is something that happens to many things in the environment based on observations made using one or more of their senses.

RI.K.1: With prompting and support, ask and answer questions about key details in a text.

RI.K.2: With prompting and support, identify the main topic and retell key details in a text.

RI.K.3: With prompting and support, describe the connection between two individuals, events, ideas, or pieces of information in a text.

RI.K.4: With prompting and support, ask and answer questions about unknown words in a text.

RI.K.5: Identify the front cover, back cover, and title page of a book.

RI.K.6: Name the author and illustrator of a text and define the role of each in presenting the main ideas or information in a text.

RI.K.7: With prompting and support, describe the relationship between illustrations and the text in which they appear (e.g., what person, place, thing, or idea in the text an illustration depicts).

RI.K.8: With prompting and support, identify the reasons an author gives to support points in a text.

RI.K.9: With prompting and support, identify basic similarities in and differences between two texts on the same topic (e.g., in illustrations, descriptions, or procedures).

RI.K.10: Actively engage in group reading activities with purpose and understanding.

SL.K.1: Participate in collaborative conversations with diverse partners about Kindergarten topics and texts with peers and adults in small and larger groups.

A: Follow agreed-upon rules for discussions (e.g., listening to others and taking turns speaking about the topics and texts under discussion.

B: Continue a conversation through multiple exchanges.

SL.K.2: Confirm understanding of a text read aloud or information presented orally or through other media by asking and answering questions about key details and requesting clarification if something is not understood.

SL.K.3: Ask and answer questions in order to seek help, get information, or clarify something that is not understood.

SL.K.4: Describe familiar people, places, things, and events and, with prompting and support, provide additional detail.

SL.K.5: Add drawings or other visual displays to descriptions as desired to provide additional detail.

SL.K.6: Speak audibly and express thoughts, feelings, and ideas clearly.

L.K.6: Use words and phrases acquired through conversations, reading and being read to, and responding to texts.

W.K.2: Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic.

Resources: Bibliography for Teachers

Breiner, Jonathan M., Shelly SheatsHarkness, Carla C. Johnson, and Catherine M.Koehler. "What is STEM? A Discussion About Conceptions of STEM in Education and Partnerships." *School Science and Mathematics* 112 (2012): 3-11. Print.

This was a great article to read about how STEM is viewed in education since people all have different definitions of what it is. The article also gave an insight into how other teachers/professors view STEM.

Park S.R., Pandey A.K., Tyagi S.K., and Tyagi V.V. 2014. "Energy and exergy analysis of typical renewable energy systems".*Renewable and Sustainable Energy Reviews.*30: 105-123.

This is a good article about renewable energy and its uses do to growing concern of global warming and pollution. In this article, they talk about many different ways to use solar energy as well as biomass cookstoves and how efficient they are.

"Media Room."*Charlotte Mecklenburg Schools*.N.p.,n.d. Web. 1 Nov. 2013. <http://www.cms.k12.nc.us/mediaroom/aboutus/Pages/Didyouknow.aspxyword... >.

This is the website for Charlotte Mecklenburg Schools. It gives great information about our district and the schools that are located within.

Pinnell, Gay Su, and Irene C.Fountas."Writing about Reading."In*The Continuum of Literacy Learning Grades PreK - 8*. 2008. Reprint, Portsmouth: Heinemann, 2011. 74.

This book gives a lot of information about literacy instruction and strategies to use with students to help with reading.

"Energy Kids: Energy Information Administration." *EIA Energy Kids* -.N.p., n.d. Web. 15 Nov. 2013. <http://www.eia.gov/kids/energy.cfm?page=solar_home-basicsword...>.

This is an excellent website that even adults can use. It gives lots of information about energy, how to use and save energy, and energy history. There is even a section for teachers to use and find activities pertaining to energy to teach to their students.

“”Tell me and I forget, teach me and I may remember, involve me and I learn.”." *Goodreads*.N.p.,n.d. Web. 18 Nov. 2013.

<http://www.goodreads.com/quotes/21262-tell-me-and-i-forget-teach-me-and-i-may>.

This website is a good website to look up quotes that you may have heard.

"Science Projects - Solar Hot Dog Cooker." *Science Projects - Solar Hot Dog Cooker*. N.p., n.d. Web. 25 Oct. 2013. <http://www.energyquest.ca.gov/projects/solardogs.html>.

This site has to do with making the solar hot dog cooker. It gives great directions and illustrations on how to create the solar hot dog cooker.

Reading List for Students

Landau, Elaine. *The sun*. New York: Children's Press, 2008. Print.

This book is an excellent book for students to read to gain information about the sun.

Butler, Christine. *Super cool science experiments*. Ann Arbor, Mich.: Cherry Lake Pub., 2010. Print.

This book has solar experiments that students can complete.

Oxlade, Chris. *Solar energy*. Chicago, Ill.: Heinemann Library, 2008. Print.

This book is written from the perspective of the students asking questions. Each chapter is set up as an answer to a question so that it guides students learning about solar energy.

Butler, Christine. *Junior scientists*. Ann Arbor, Mich.: Cherry Lake Pub., 2010. Print.

This book has some interesting solar experiments that students can complete.

Spetgang, Tilly, and Malcolm Wells.*The kids' solar energy book even grown-ups can understand*. Morganville, NJ: Imagine Pub., 2009. Print.

This book is wonderfully illustrated that helps students understand how solar power works.

Examples of Open Ended Questions that can be used:

What would happen if_____?
Why did the author write that?
What could we do differently?
What was your favorite experiment? Why?
If you could change one thing in your experiment, what would you change?
Can you tell me what happened?
Do you have any other ideas?
What did you see?
What did you notice?
What did you learn?
How could we do it differently?

Materials For Classroom Use:

1. Solaractive UV Color Changing Beads
2. Two clear plastic cups
3. Two thermometers
4. Science Journals
5. 10 empty tissue boxes
6. Tin foil
7. Poster board
8. White glue
9. 10 Wooden skewers
10. 10 turkey hot dogs
11. 5 solar powered cars: http://www.amazon.com/Assembly-Assemble-Disassemble-Electric-Charger/dp/B00BGGCLGI/ref=sr_1_31?ie=UTF8&qid=1385360071&sr=8-31&keywords=solar+car+kits
12. Smart Notebook Lessons
13. Discovery Education videos: Discovery Education: More Science Please: Energy Changes Everything and The Language of Science: Physical Science K-2: Force and Motion
    20 tiny solar powered cars:http://www.amazon.com/Solar-Car-Smallest-Powered-Educational/dp/B004FEXUP4/ref=pd_sim_sbs_t_3
14. Solar powered flashlights and calculators

Solar Hot Dog Cooker

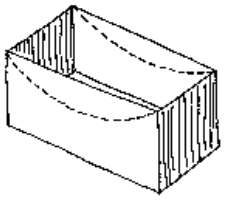
Use the heat of the sun to cook.

This project is for older students or for younger students with adult supervision.

A reflective hot dog cooker can be built from a cardboard box, tin foil, and posterboard. Sunlight hits the reflective surface and focuses on the hot dog held in the center. Students can work in pairs or individually if there are enough materials.

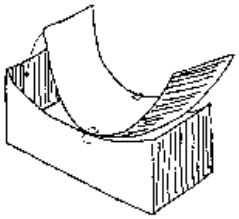
What do you need?

1. A cardboard box
2. tin foil
3. posterboard

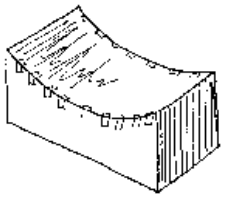


What to do?

1 Select a long narrow box; the longer the box the more heat collection is possible. Choose a focal length between 5" and 10" and design a parabolic curve as seen in the picture. One template could be used for all the cookers. Trace the curve on the open end of the box so that it is centered and straight.

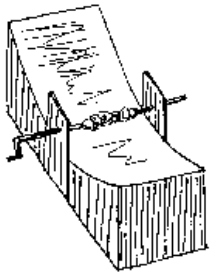


2 Cut out the curve with a utility knife. Stress the importance of being exact. Measure and cut a piece of posterboard that will fix flush against the opening to the box. Attach this with tape beginning at the center and working toward to edges.



3 Cover the curve with white glue and apply aluminum foil shiny side out. Start in the middle and smooth toward the edges. Try not to wrinkle or fold the foil; you want it as smooth as possible.

4 Use two scraps of cardboard taped to each side as supports. Using the sun or a projector light, test the focal point. There should be a bright spot where light is concentrated; mark this spot and punch a hole for the skewer. Use a section of a coat hanger from which the paint has been removed for a skewer.



5 Enjoy your hot dog!

From: http://www.energyquest.ca.gov/projects/solardogs.html