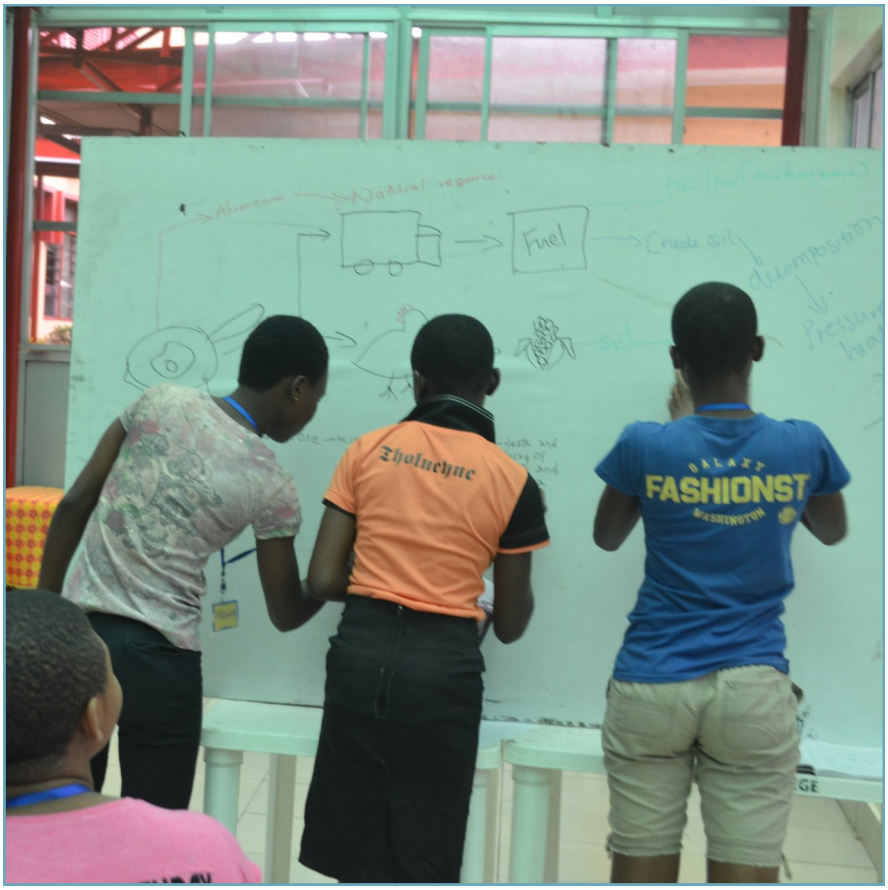
Introduction to Energy

Outreach Program Lesson Plan



WAAW foundation

Working To Advance STEM Education for African Girls

WAAW Foundation is non-profit organization dedicated to bringing hands-on STEM education to girls all over Africa.

Our Mission: To increase the pipeline of African women in Science, Technology, Engineering and Math (STEM) disciplines and to ensure this talent is engaged in African innovation.

Our Vision: To eradicate poverty in African through female education and science and technology innovation.

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Introduction to Energy

Class Description-

In this class, students will work as a whole and in small groups to create an energy map to illustrate basic energy principles. Then they will go on a scavenger hunt to find examples of and explore the different forms of energy.

Total class time: 90 minutes

Class Outcomes-

-Students will learn basic energy concepts: All of earth's energy comes from the sun, and energy cannot be created, only converted.
-Students will be able to identify various forms of energy and provide examples of each form.
-Students will be called to stewardship through analyzing their daily energy choices.

Materials List-

To teach this class you will need:
-A chalkboard, whiteboard, or large sheet of paper
-student notebooks or scrap paper
-pens or pencils

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Pre-Class Preparation and Set-Up

Before teaching this class, create your own Energy Map and try out the scavenger hunt for yourself. Doing these activities will help you be more familiar with the examples that the students might come up with and have questions about.

Arrange chairs and tables to allow for students to work mostly in groups. If your location limits your options for the scavenger hunt, you may want to bring some additional things for students to "find."

Introduction (10 minutes)

Start by asking your students a question: What comes to mind when you hear the word "Energy"? Maybe you think of an object, a place, a phrase, an equation… Generate a quick list for everyone to see.

"Energy" can be a tough idea to grasp. Take a look back at your list. It's difficult to define a concept that can unite all of these different things. In fact, the top scientists in the world are still trying to discover and find ways to test the ways that energy behaves on fundamental levels. Today we hope to take a first look at energy, where it comes from, and how it changes.

Energy Map (30 minutes)

The first question that we need to explore is this: "Where does earth's energy come from?" Every object on earth has energy, but how? In order to find things, sometimes it helps to have a map to show you the way. We're going to create a map to do just that!

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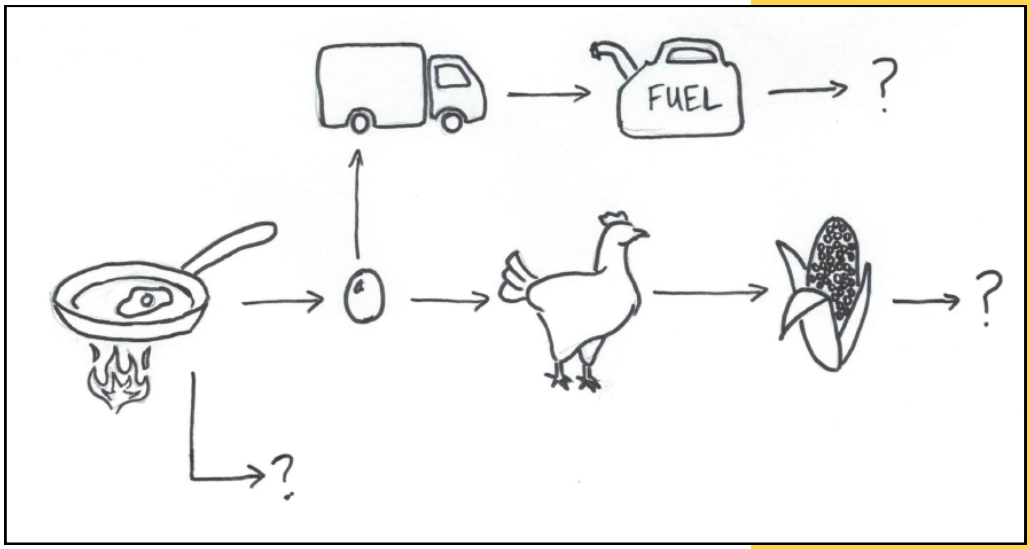
Energy Map (continued...)

We'll start with a simple object: An egg in a frying pan. (Draw it on the black-board.) Ask the students: Before it was a meal, where did the egg get its energy? From a chicken! (Add the chicken to the map with an arrow connecting it to the egg.) Now, where did the chicken get its energy? From chicken feed! (Add it to the board.) You could continue on this line, and you will be asked to in a minute. For right now, let's think about another energy line on our map. Unless the egg was raised right in our backyard, it needed to be transported somehow. (Add a truck to the map with a new line to the egg.) Where did the truck get its energy? Fuel!



Now that they've got the idea, divide students into groups of 3-4. Have each group draw the map that you started together as a class, and continue adding things to it as they see fit. For each new thing on the map, students should ask themselves, "And where did that thing get its energy from?" After 5 minutes or so, start to ask, "Are any of these things eventually getting their energy from the same place?" Ask students from each group to go to the board and add a few things from their map to the big class map. Once the class has created their big, messy energy map, ask the big question again: "Where does all of earth's energy come from?" The answer: THE SUN! If anything has not been traced back to the sun at this point, as a class, try to find a way to get it there!

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Energy Map (continued...)

The energy map can demonstrate another important concept: Energy is not free. Take another look at the map and think about how much energy was needed to get just that one simple fried egg. Now think about all of the things you use in one day, and imagine if you made an energy map for each thing. That's a lot of energy! We all need to do our part to save energy where we can, and not waste the things we use.

Take one last look at the map. Does energy always take on the same form? Next we're going to look at the different types of energy that are out there and where we can find them.

Energy Scavenger Hunt (25 minutes)

We've all heard of and encountered lots of different forms of energy. Can we name some? As students name them off, create a list for everyone to see. Now here is the challenge: Can you find examples of these different forms of energy in and around our classroom? Have students divide into groups of 2-3 and make sure each has a list of the different forms that they are looking for. Give groups 10 minutes to walk around and complete their scavenger hunt. Then, gather everyone back together, and let students add their finds to the list on the board. Listed below are some possibilities:

Kinetic Energy – ex: a ball rolling on the floor, someone running, an object flying through the air

Potential Energy – ex: a book perched on the edge of a table, someone standing on a chair

Chemical Energy – ex: your body breaking down sugars, something burning

Thermal (Heat) Energy – ex: a cup of hot tea, hot pavement

Nuclear Energy – ex: the sun, the center of the earth

Sound Energy – ex: any sound! Voices, music, clapping

Electromagnetic (Light) Energy – ex: sunlight, light from a bulb, flame

Electric (Potential) Energy – ex: computer, flashlight, radio

Electrochemical Energy – ex: battery, fuel cell

Keep in mind that one thing could be an example of multiple forms of energy. For instance, a flame could be used as an example of thermal energy and light energy.

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Energy Conversions (15 minutes)

It's clear that energy is changing forms all the time. For example, as soon as a book on the edge of table starts to fall, its energy begins to change from potential to kinetic. Given the examples that we found on our scavenger hunt, what are some other conversions that you can think of? (Allow students to again work within their groups.)

Some possibilities include:

- Sunlight (light energy) heats up pavement (thermal energy)
- Running electricity through a motor (electric energy) makes something spin (kinetic energy)
- A battery (electrochemical energy) powers a flashlight (electric energy)

Whenever these energy conversions take place however, it is rare that all of the original energy is able to all be converted to just one new form. For example, when we run a current through a motor (electric energy) we get some movement (kinetic energy), but we also get some heat (thermal energy) from the friction created by the moving pieces. All of the energy gets converted, none of it disappears, but it is very difficult for energy to be converted completely from one form to solely another.

With this in mind, that we "lose" energy in other forms every time a conversion takes place, how do we save the most energy? We can limit the number of transitions taking place. In other words, we can be more energy efficient by limiting the number of energy conversions. Take food for an example: Is it more energy efficient to eat meat or vegetables? (Which has less energy conversions?)

How could this knowledge benefit a scientist or engineer? (Engineers can try to limit the number of energy conversions in their designs to make them more efficient.)

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Conclusion (10 minutes)

Review with your students the major concepts that we discovered today:

- All of earth's energy eventually comes from the sun.
- It takes a lot of energy to get all of the things we use every day. We need to use it wisely!
- Energy takes on many different forms and we can find them all around us.
- When energy conversions take place, some energy gets "lost" to forms that we did not intend.
- To be more energy efficient, one thing we can do is limit the number of energy conversions taking place.

Taking these things into consideration, what things can you do in your daily life to use energy wisely? Challenge students to each come up with three things, and discuss them as a class.

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References-

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