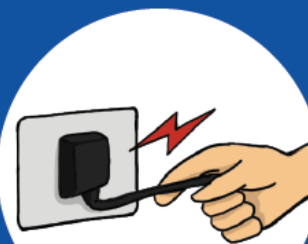
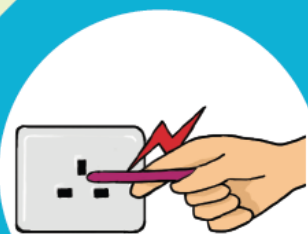


Energy Efficiency Pre-Tertiary School Curriculum Project Materials

School Club Manual – Upper Primary





Energy Efficiency Pre-Tertiary School Curriculum Updates

Energy Efficiency and Conservation Made Easy (A step-by-step guide to the learning of Energy Efficiency & Conservation)

School Club Guide (Upper Primary)

(Final Draft 6)

16th June, 2020

Developed by:

Associates for Change (AfC) in association with the National Council for Curriculum and Assessment (NaCCA), Ministry of Education and Development Environment Services Limited (DESL)

TABLE OF CONTENTS

PREFACE	5
KEY TERMINOLOGIES (GLOSSARY)	6
GENERAL GUIDELINES FOR ENERGY EFFICIENCY AND CONSERVATION-RELATED CLUB ACTIVITIES	7
ACRONYMS	9
MODULE 1: FORMS OF ENERGY	10
1.0 INTRODUCTION.....	10
1.1 LEARNING OUTCOME.....	10
1.2 KEY CONCEPTS	10
1.3 ACTIVITIES	11
1.4 INTERACTIVE WEBSITES - ONLINE RESOURCES, GAMES AND YOUTUBE CHANNELS.	16
MODULE 2: SOURCES OF ENERGY	17
2.0 INTRODUCTION.....	17
2.1 LEARNING OUTCOMES.....	17
2.2 KEY CONCEPTS	17
2.3 ACTIVITIES	17
GREEN SCHOOL-RELATED ACTIVITIES	20
2.4 INTERACTIVE WEBSITES - ONLINE RESOURCES, GAMES AND YOUTUBE CHANNELS.	21
MODULE 3: USES OF ENERGY	22
3.0 INTRODUCTION.....	22
3.1 LEARNING OUTCOMES.....	22
3.2 KEY CONCEPTS	22
3.3 ACTIVITIES	22
3.4 INTERACTIVE WEBSITES - ONLINE RESOURCES, GAMES AND YOUTUBE CHANNELS.	28
MODULE 4: SAFE USE OF ENERGY	29
4.0 INTRODUCTION	29
4.1 LEARNING OUTCOMES.....	29
4.2 KEY CONCEPTS	29
4.3 ACTIVITIES	32
4.4 INTERACTIVE WEBSITES - ONLINE RESOURCES, GAMES AND YOUTUBE CHANNELS.	37
MODULE 5: ENERGY EFFICIENCY	38
5.0 INTRODUCTION	38
5.1 LEARNING OUTCOMES	38
5.2 KEY CONCEPTS	38
5.3 ACTIVITIES	38
5.4 INTERACTIVE WEBSITES - ONLINE RESOURCES, GAMES AND YOUTUBE CHANNELS.	42

MODULE 6: ENERGY CONSERVATION.....	43
6.0 INTRODUCTION	43
6.1 LEARNING OUTCOMES	43
6.2 KEY CONCEPTS/ISSUES.....	43
6.3 ACTIVITIES	45
6.4 INTERACTIVE WEBSITES - ONLINE RESOURCES, GAMES AND YOUTUBE CHANNELS.	47
MODULE 7: RENEWABLE AND NON-RENEWABLE ENERGY SOURCES	48
7.0 INTRODUCTION.....	48
7.1 LEARNING OUTCOMES	48
7.2 KEY CONCEPTS	48
7.3 ACTIVITIES	51
7.4 INTERACTIVE WEBSITES - ONLINE RESOURCES, GAMES AND YOUTUBE CHANNELS.	55
ONLINE RESOURCES	55
MODULE 8: ENERGY TRANSFORMATION	56
8.0 INTRODUCTION	56
8.1 LEARNING OUTCOMES	56
8.2 KEY CONCEPTS	56
8.3 ACTIVITIES.....	60
8.4 INTERACTIVE WEBSITES - ONLINE RESOURCES, GAMES AND YOUTUBE CHANNELS	62
MODULE 9: CLIMATE CHANGE	63
9.0 INTRODUCTION.....	63
9.1 LEARNING OUTCOMES	63
9.3 ACTIVITIES	65
SCIENCE PROJECT: BUILDING ELECTROMAGNET.....	70
SCIENCE PROJECT 2: RECYCLED RHINOCEROS.....	73
REFERENCES	78

Preface

This document is designed to arouse the interest of learners in Energy Efficiency and Conservation (EEC). The Club Manual explores intriguing topics on EEC using creative and fun-based approaches such as compelling and engaging pictures and illustrations, drama / sketch skits, poems, puzzles, debate, games, fun facts, mental games, questions and answers (Q&A), competitions, projects and science and art fairs. This Club Manual is informative and a fun way to learn more about EEC and stimulate a conversation. This way, young readers are introduced to EEC concepts in a way which sparks their interest outside the constraints of the classroom and makes them powerful advocates for change among peers, family members and the wider community.

This manual is meant to trigger learners' interest and passion for developing EEC related knowledge by having them brainstorm on best ways to use energy at home and in school at the individual and group levels. The use of the club platform will provide opportunities for learners to actively participate in learning energy efficiency and conservation topics and concepts and to acquire practical approaches to energy use and management which is expected to bring about attitudinal and behavioral change at the individual and group levels.

Learners are encouraged to participate actively in the EEC Club activities by sharing stories, poems or any creative concept.

This document is currently being reviewed by the NaCCA Curriculum Review Team together with selected classroom teachers to ensure content validity. The document is meant for piloting and is still in its draft stage. Hence, suggestions from the pilot will be incorporated in finalizing the document before its final review and approval by NaCCA to be used in schools.

Key Terminologies (Glossary)

Energy - Energy is defined as the ability to produce change or do work. For example, electricity or oil can do work such as producing light and heat.

Sources of energy - The major energy sources we use today are classified into two broad groups, non-renewable and renewable.

Non-renewable energy - Non-renewable energy sources are natural resources that cannot be readily replaced by natural means at a quick enough pace to keep up with consumption. These include coal, petroleum, natural gas, propane, and uranium. They are used to generate electricity, to heat our homes, to move our cars, and to manufacture products from candy bars to cell phones.

Renewable energy – Renewable energy sources are not depleted when used or are naturally replenished within human lifetime. These include biomass, wind, hydropower geothermal and solar power. They are called renewable energy sources because their supplies are replenished in a short time. In the future they could also include the use of ocean thermal, wave, and tidal action technologies.

Energy Efficiency – Energy efficiency is the practice of using less energy (electricity and/or natural gas) to perform the same function at the same level of quality.

Energy Conservation – Energy conservation is achieved by the practice of greater energy efficiency and also by decreasing the types of applications requiring electricity or natural gas to operate. It is also the effort made to reduce the consumption of energy by using less of an energy service. Using less energy for a constant service, like running a refrigerator, turning out lights when not in use, driving less are important aspect of energy conservation.

Fuel – Fuel is any substance that can be burned to produce heat, as well as materials that can be used in a chain reaction to produce heat.

Electricity – Electricity is the flow of electrons from one atom to another.

Energy Star - A designation given to a product or appliance that shows it meets tough government standards for energy efficiency. Products that have earned this designation have a special sticker on them with the ENERGY STAR name.

Hydropower - Also called “hydro energy,” this is electrical energy that comes from fast moving water

Solar energy (radiant energy) – is energy generated from the sun. Solar energy is generated from the movement of light. Solar energy can be harnessed through photovoltaic cells to generate electricity.

General Guidelines for Energy Efficiency and Conservation-related Club Activities

The EEC project roll-out at the learner level will rely on existing and vibrant clubs at the school level. The focus will be on any of the following approved Clubs: Science Clubs, Environment-related Clubs, Energy Innovators Club (EIC); Clean Energy Champions Club (CECC); Green Economy Clubs (GEC); Eco Brigade Club (EBC); Energy Volunteers Club (EVC), Tourism Society of Ghana (TOSOGHA), Drama Clubs, Reading Clubs, Cultural and Debate Clubs, Health and Red Cross Clubs. With the support of school authorities, the EEC team will identify any of these existing and vibrant clubs to take up the EEC agenda at the school level. Leadership of the identified club will be trained on how to use this EEC Club Manual and how to lead and coordinate ECC and related activities.

By the end of this intervention and beyond, learners should have acquired in-depth knowledge leading to attitudinal and behavioral change with regards to energy efficiency and conservation.

All decisions related to the day-to-day operations of the clubs would be the responsibility of the Club Patron and the Club Leader with support from the club members under the supervision of the headteacher.

Criteria for selecting a vibrant school-based club

1. The club should be one that is sanctioned by the Ghana Education Service (GES) to operate in the public schools.
2. Should have a committed Patron and members not less than 10-learners.
3. Should have a club guide, set of rules and regulations.
4. The club should be one that meets at least once in a week and periodically organizes programmes.

Meetings

1. The club should organize meetings at least once in a week to work on one of the EEC activities in the Club Manual
2. The Club Leader should prepare a meeting agenda before every meeting which should be approved by the Patron and shared with all club members.
3. The Secretary of the Club must take and write-out minutes of every club meeting and activity.
4. Meeting attendance should be taken at every meeting

Guidelines for Patrons

- The Patron should demonstrate commitment and interest in guiding learners through EEC programming.

- Ensure club members adhere to the rules and regulations of the club at meetings.
- Support the learner leadership to come up with innovations regarding EEC and related issues.
- Encourage and support learners to put into practice what they learn at the club level in their daily lives.

Learner guidelines

- Learners must sign in at every club meeting.
- Learners should attend all club meetings.
- Learners should fully participate in all club-related activities and contribute to the success of all EEC programmes.

Acronyms

AFC	Associates for Change
CECC	Clean Energy Champions Club
DESL	Development Environenergy Services Limited
EBC	Eco Brigade Club
EECC	Energy Efficiency and Conservation
EIC	Energy Innovators Club
EVC	Energy Volunteers Club
GEC	Green Economy Clubs
LED	Light-Emitting Diode
NaCCA	National Council for Curriculum and Assessment
Q&A	Questions and Answers
TOSOGHA	Tourism Society of Ghana

Module I: Forms of Energy

I.0 Introduction

This module presents basic information on EEC and related concepts that will set the tone for learners in school-based clubs to learn about energy efficiency and conservation. In this lesson, learners will learn more about what energy is and how they use energy in their everyday lives.

I.1 Learning Outcomes

Learners will:

- identify the different forms of energy resources available in their immediate environment and the across the world.
- demonstrate knowledge of the different and emerging energy sources

I.2 Key Concepts

Energy is used in our daily lives. Energy is the ability to do work. It powers every machine and is necessary for activity. Energy comes in many different forms and we use it in many ways. We use energy to cook, wash, power electrical appliances, heat and cool our homes, schools and businesses. We use energy for lights and appliances. Energy makes our vehicles move, planes fly, a boat sail and machines run.

All living things need energy too. The light from the sun helps plants to grow. Animals and people eat the plants and use the energy that was stored. Food is fuel for our bodies' energy needs like muscle power.

There are many kinds of energy. Energy can be classified in many different ways.

There are **seven** forms of energy. Just remember the name: **MRS CHEN**.

M echanical (kinetic energy) energy	H eat energy /Thermal energy
R adiant or Light energy, sunlight or solar energy	E lectrical energy
S ound energy	N uclear energy
C hemical energy	

Mechanical energy- is moving energy. It is a form of energy that is seen all around us. All moving objects produce mechanical energy. The movements within machines are also mechanical

energy (electrical equipment). There are two main types of **mechanical energy**: kinetic energy and potential energy.

- **Kinetic energy** is the energy associated with the motion of an object. Therefore, any object that moves has kinetic energy. Likewise, there are two types of **potential energy**: gravitational potential energy and elastic potential energy.

Sound energy is produced when an object vibrates. Sound energy travels out as waves in all directions. Sound needs a medium to travel through such as air, water, wood and even metal. Examples: voices, whistles, horns and musical instruments

Chemical energy – is a form of potential energy and is the energy stored in food, gasoline etc. Examples; striking a match, combining vinegar and baking soda to form CO₂ Gas.

Electrical energy – is delivered by tiny charged particles called electrons, typically through a wire. Lighting is an example of electrical energy. Light or heat is produced by an electrical current. This could be from a battery which has stored electrical potential energy. When the current is in motion, it creates electrical energy. An example is the electric coils on a stovetop, when the electric current moves through the coils, it generates heat.

1.3 Activities

1.3.1 Activity 1: How do we get and use energy?

Note: This activity should be carried out using a general discussion approach at your Club meetings with either the club patron, club leader or a science leading the discussions.

Introductory questions:

- Do you love playing outside during break time?
- Do you enjoy watching TV and playing football or playing *Ampe or Oware*?

If you enjoy doing all these things, there is one thing that you need to do all of them - **Energy**. **Energy** is the ability to do work, and energy is happening all around us. It happens as the sun comes up in the morning. It happens as your dog runs and catches a ball or when you ride your bicycle or when you push your wheel chair. It even happens when you turn on the light in your room or light up your stove to cook.

Energy is another word for power. Energy makes things move. It makes machines work. Energy also makes living things grow.

How Do You Get Energy?

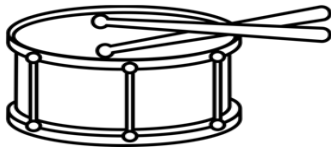
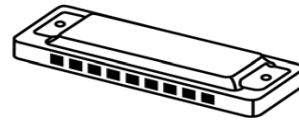
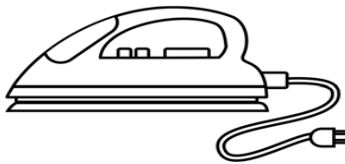
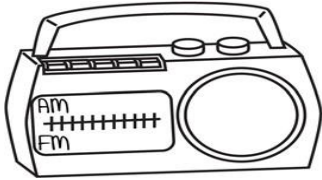
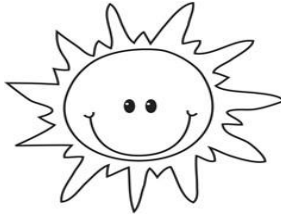
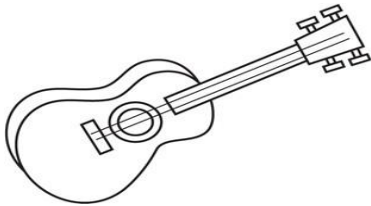
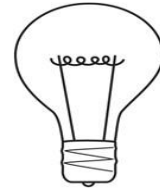
The main source of energy is the sun. The sun's rays are changed into **chemical energy** for the plant to help it grow big and strong. Plants are important because it is how humans and animals get food. We get the energy we need by eating fruits, meats, and vegetables. When we eat food, we have the energy to do things we enjoy. When we use this energy in motion, like riding a bike or walking to school, it is called **kinetic energy**. But did you know that when you rest you still have energy? This energy is called **potential energy** because you're not using it yet.

A) Draw pictures of how you use chemical energy, kinetic energy and potential energy. (Learners should do this as a take home work and present at the next club meeting)

1.3.2 Activity 2a: Identifying Forms of Energy

Under each image, determine if the form of energy is: Heat, Radiant/Light or Sound

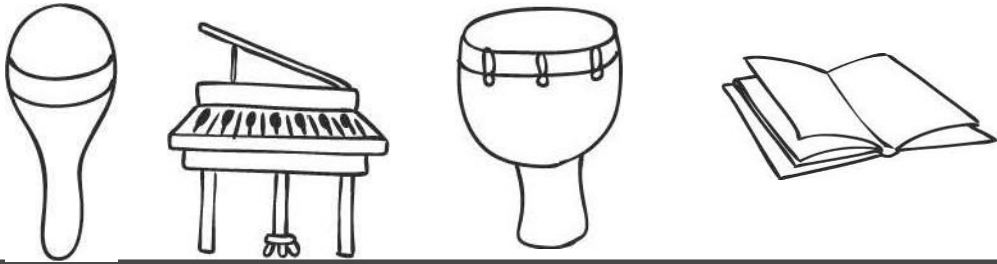
Forms of Energy: Heat, Light and Sound

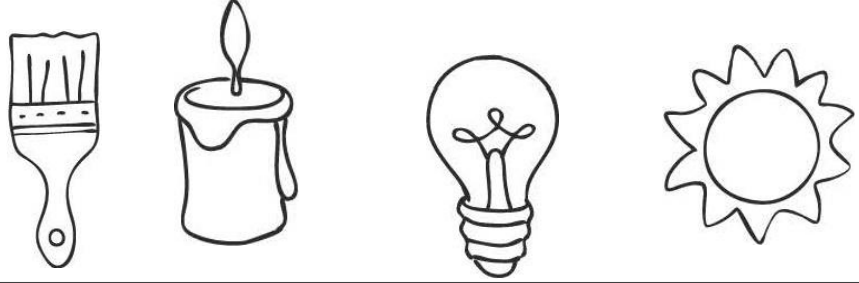


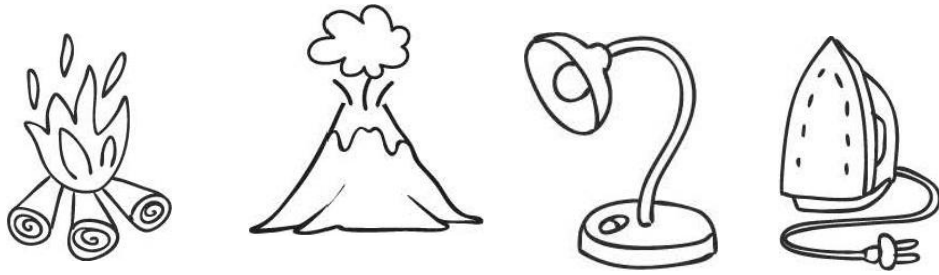
Forms of Energy:
Heat, Light and Sound

1.3.3 Activity 2a: Forms of energy

Circle the picture that does not belong to the group each group

SOUND ENERGY	
-----------------	--

LIGHT ENERGY	
-----------------	---

HEAT ENERGY	
----------------	--

1.3.4 Activity 3: Identifying forms of energy

ACTIVITY

Look at the pictures below and label what form of energy is being used.









Think about the first two images above and write about what electrical devices help us to do these tasks today.

Alternative Approach:

- Ask the learners to kick a ball – (ask the learner to identify the type of energy)
- Ask the learners to carry a bucket of water (now ask what type of energy they are using).

1.3.5 Activity 4: Energy Quiz

Note: This activity should also be a question and answer session in a fun-filled atmosphere.

Procedure:

Make a copy of the questions below by asking each club member to write in their jotter. Choose a colleague to lead by reading the questions for the rest of the club members. Underline the answer. Afterwards exchange paper with colleague and mark yourselves.

1. You are running a race. What type of energy are you using to run?
 - a) Potential energy
 - b) Electrical energy
 - c) Light energy
 - d) Kinetic energy

2. How do animals get energy?
 - a) Animals get energy from eating plants and other animals
 - b) Animals get energy from the light
 - c) Animals get energy from the sun
 - d) Animals get energy from other humans

3. Kwame turns off the light when he leaves a room. This action is an example of.....
 - a) Potential energy
 - b) Kinetic energy
 - c) Thermal energy
 - d) Electrical energy

4. What type of energy do you use to walk with crutches
 - a) Potential energy
 - b) Kinetic energy
 - c) Thermal energy
 - d) Electrical energy

I.4 Interactive websites - Online Resources, Games and YouTube Channels.

Online Resources

- www.study.com - Forms of Energy: Lesson for Kids- Video & Lesson Transcript | Study.com
- www.teacherspayteachers.com - Forms of Energy Activity & Worksheets | Teacher Pay Teachers
- www.scholastic.com - Energy, Light and Sound: 10 StudyJams! Interactive Science Activities
- www.constellation.com - Energy Facts for Kids
- www.makemegenius.com – What is Energy

YouTube Channels:

Channel Name	Title
Learning Junction	Types of Energy Energy Forms Energy Sources and Uses
MooMoo Math and Science	Forms of Energy
Knowledge Platform	Energy and Different Forms of Energy with Examples
Turtlediary	Science Video for Kids: What is Energy?
Kids Academy	What is Energy? Types of Energy: Light, Heat, Water, Electrical and...
the25SDA	What is Energy? - Lesson for Kids-25SDA
Makemegenius	What is Energy – Types of Energy

Module 2: Sources of Energy

2.0 Introduction

This module introduces the sources of energy and energy types that learners are expected to know about at the Upper Primary School level.

2.1 Learning Outcome

- Learners are expected to know about sources of energy and be able to identify and distinguish between the different energy sources.

2.2 Key Concepts

There are 2 main sources of energy – the major energy sources we use today are classified into 2 main groups:

- Non-renewable** energy sources those are that cannot be easily replenished or is finite (can run out). **Non-renewable energy sources** include coal, petroleum, natural gas, propane and uranium. They are used to generate electricity, to heat our homes, to move our cars and to manufacture products from candy bars to cell phones.
- Renewable energy** exists freely in nature and is an energy source that can be easily replenished or exists infinitely (never runs out). **Renewable energy sources** include biomass, geothermal, hydropower, solar and wind. They are called renewable energy sources because their supplies are replenished in a short time. The common renewable energy sources are solar, wind, geothermal, hydro etc.

2.3 Activities

2.3.1 Activity 1 Energy fill in (Individual work)

Energy words to complete the questions below: Renewable, Work, Forms, Electricity, Fossil, Uranium, Nuclear, Generate, Non-renewable

Instructions:

Make a copy of the questions into your jotter and answer them. Afterwards, each member should exchange their jotter and score each other. Use the word provided in the box and place it in the gaps in the sentences.

1. There are two main sources for the energy we use every day:
2. The energy obtained from natural resources that can be replaced, like wind, water and sunshine, is called (.....) energy.

3. Non- renewable energy sources are those that cannot be replaced once they are used, such as the (.....) fuel oil, natural and coal.
4. The Earth’s natural resources are divided into two; -----and -----
5. Some renewable energy resources are -----, -----, -----, -----.
6. Some of the nonrenewable energy resources are -----, -----, -----, -----.

2.3.2 Activity 2 Renewable and Nonrenewable Resources Quiz

Instructions: Each material or item on this list is renewable and nonrenewable natural resources or produced directly from a renewable or nonrenewable source. For each item, mark whether it is from a “Renewable Energy (**RE**) or Non-Renewable Energy (**NRE**). After completing the fill in, the club leader should lead an interactive discussion on linking the materials to the energy type.

Materials	Renewable Energy or Non-Renewable Energy (RE or NRE)
Wind	
Gold Jewelry	
Plastics	
Oil	
Wood	
Ice cubes	
Water	
Paper	
Trees	
Sunlight	
Soda can	

2.3.3 Activity 3: Energy Hunt (Group work).

Form groups within the club--with each group having at least three club members.

Instruction: Before the close of the club activity, club leader puts the members of the club into small groups. Each group is to go on an energy hunt, walk around various homes and the communities; write down things that use energy. Next to the item, tell what energy source the items use. An example is given:

Energy Hunt Sheet:

Object	Source
Clock	Batteries

Alternative: For those learners who cannot move easily within the community, can write down what some of the things which use energy in their home and school. They can also research by asking some community members questions.

GREEN SCHOOL-RELATED ACTIVITIES

Club assessment of school environment:

The club (led by the leader and patron) should do an assessment of their school environment to see if their school is energy-friendly. Depending on the outcome, the club should come-up with initiatives to make the school a green school if not already a 'green school' or maintain the 'green' status of the school if the school is already a 'green school'.

The following are questions that will assist you to assess whether your school protects your environment or not. Also, the questions will prepare you for the way forward.

You should ask yourselves these questions in your club meetings and come up with a solution. You can implement these solutions or give them to your teachers and headteachers.

1. What will make your school environmentally friendly?
2. What activities is your school doing to protect the environment?
 - i. Does your school plant trees?
 - ii. Does your school reuse waste?
3. Why does your school have to protect the environment?
4. What energy does your school use to cook? If any
5. Who collects water in your school? If any
6. How long does it take to collect the water?
7. Do your classrooms have windows?
8. Do you get fresh air through these windows every day?
9. What can you do to help your school to protect the environment?

2.4 Interactive websites - Online Resources, Games and YouTube Channels.

Online Resources

- www.neok12.com - Energy Sources for Kids- Science Games and Videos-NeoK12.
- www.pbslearningmedia.org - Energy Sources | PBS Learning Media

YouTube Channels:

Channel Name	Title
Kids Eduactional Games	Different Sources of Energy,Using Energy Responsibly, Educational Videos for Kids-KidsEduc
Zaffron	What is Energy for Kids Learn about Energy Sources
CBSE Grade: 6 Science	Sources of Energy – Work and Energy

Module 3: Uses of Energy

3.0 Introduction

This Module explains the various uses of energy. Energy use is generally divided into four key sectors: residential, commercial, transportation, and industrial. Lighting homes, schools and office buildings, driving cars and manufacturing the products we rely on in our daily lives are all functions that require energy.

3.1 Learning Outcome

Learners will:

- Use games and group work to demonstrate the various uses of different energy resources.

3.2 Key Concepts

We use energy in our everyday lives for different purposes. We use energy to cook, power appliances, cool our homes, schools and businesses. Energy makes our vehicles move, planes fly, boat sail and machines run.

- A. There are gender issues related to energy production, supply and usage.
- B. There are processes and devices for measuring and metering energy consumption.

3.3 Activities

3.3.1 Activity I: Gadgets Using Energy or Not

Procedure:

- A) Form a group of 3 or more. Make a copy of the image below and give it to each group. Now indicate by writing under the image whether the items “use electricity” or “does not use electricity”. Each group presents their answers to the entire group.

use electricity **does not use electricity**
Write the headings and stick them into your book.

 A green and red flashlight with a yellow lens, shown on a yellow shadow.	 A silver television set with a blue screen.	 A white MP3 player with a blue screen and a silver disc, with a blue cord.
 A blue book with a yellow cover and white wavy lines.	 A black and white soccer ball.	 A yellow desktop computer with a monitor, keyboard, and mouse.
 A yellow lamp with a red base and a yellow shade.	 A yellow notepad with blue lines and a blue pencil.	 A black mobile phone with a yellow screen.

B) Make a copy of the image and give it to each member. Answer the question by drawing a circle around the items in each row that use or need electricity to work.

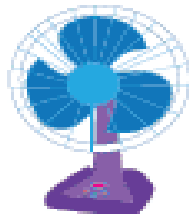
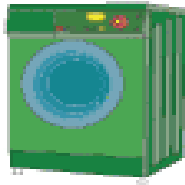
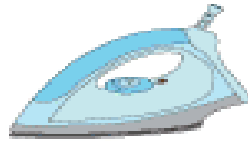


C) 3 Make a copy of the image and give it to each club member. Answer the question by drawing a circle around the items in each row that uses or needs electricity to work.

Name : _____

Electricity

Circle the items powered by electricity.



3.3.2 Activity 2: Energy Hunt (Group work)

Form groups with each group having at least three club members. Go on an energy hunt around the school and then share the results at the next club meeting.

Instruction: Before the close of the club activity, club leader divides the club into groups. Each group is to go on an energy hunt, walk around various homes and the communities and write down things that use energy. Next to the item, tell what energy source the items use and what the energy usage is. An example is given:

Energy Hunt Sheet:

Equipment / Item	Source of energy	Usage
Bulb	Hydro electricity	Lighting the home, school, community etc.

3.3.3 Activity 3: How Much Do You Rely on Electricity? (Individual work)

A) Based on the picture/chart below, list your favourite activities below and determine if electricity was used.

HOW MUCH DO YOU RELY ON ELECTRICITY?



Electricity plays a major part in our everyday lives. We depend on it for nearly everything we do! How much do you rely on electricity? List your favorite activities below and determine if electricity was used.

ACTIVITY	EQUIPMENT I USED	WAS ELECTRICITY USED?
read a book	lightbulb	yes
played video games	TV/gaming system	yes

Alternative: Learners who cannot move easily within the community, can participate fully in the in-school club activities. They can also research by asking some community members questions.

3.4 Interactive websites - Online Resources, Games and YouTube Channels.

Online Resources

- www.sciencenetlinks.com – Power Up!
- www.wartgaes.com – Energy- Free Science Gaes, Activities and Homework Help for Kids- Wartgames.

YouTube Channels:

Channel Name	Title
Educational Video for Kids	Kids Educ.- Kids Educational Games (YouTube)- Different Sources of Energy, Using Energy Responsibly
Learning Junction	Types of Energy Energy Forms Energy Sources and Uses

Module 4: Safe Use of Energy

4.0 Introduction

This module introduces learners to the safe use of energy at school and at home. This is critical in ensuring that learners understand the dangers in using energy the wrong way.

4.1 Learning Outcomes

Learners will:

1. Understand safe ways of using energy
2. Demonstrate safe ways of using energy

4.2 Key Concepts

SAFETY TIPS FOR KIDS!!!!

Electricity is extremely useful. We all use energy safely every day for cooking to power lights in our homes, to keep the computers running in school etc. It can also be dangerous if not used correctly. But there are a few things one should be aware of to make sure you stay safe around electricity. Electricity when handled improperly, can be very dangerous- even deadly. **(See Figure 4.1 on safety tips for children)**

Indoors

- Never turn on light or electrical appliances while you are wet.
- Be careful not to leave electrical cords where people might step on them. Wear and tear on the cord causes it to become unsafe.
- Check electrical cords for exposed wiring before plugging anything in. If you see a worn-out looking cord, point it out to an adult.
- Never put any object other than a plug designed for that purpose into an electrical outlet.
- Ask an adult to help you change light bulbs. Always turn lamps and other light fixtures off before changing a bulb.
- In case of an electrical fire at home get out of the house, then call the fire department
- Never touch electrical outlets with your fingers or with objects.
- Never use water to try to put out an electrical fire-you could be electrocuted.

Outdoors

- Never climb utility poles, transmission towers or fences around electrical plants or substations. If you see other people doing these things, tell an adult you trust right away.
- Stay away from areas or buildings marked with signs that read “**Danger: High Voltage.**”
- If you enjoy climbing trees, avoid trees that are near electrical power lines.
- Never, ever touch an outdoor electrical pole or wire that has fallen to the ground. It is dangerous.
- Stay away from and never touch transformers (usually large metal boxes attached to utility poles or on the ground) or substations. They contain high-voltage equipment that can hurt or kill you.

Figure 4.1: Electrical Safety Tips for Children

ELECTRICAL SAFETY TIPS FOR KIDS



Electricity is helpful. It provides energy that we use to light our homes and operate lots of other things. But electricity can also be dangerous. Lots of people are hurt each year in electrical accidents. We could avoid the accidents by following these simple safety tips...

NEVER stick fingers, toys or other objects into an electrical outlet. You might get hurt by electricity.



NEVER place a hair-dryer, radio or other electronics near the bathtub or shower. Electricity and water are dangerous partners!



NEVER pull a plug from an outlet by its cord. Electricity could jump from the cord and give you a nasty zap.



NEVER place your drinks on top of your video games or other electronics. They could easily spill, and get you zapped by electricity.



NEVER climb trees near power lines. You might touch one by mistake and get zapped.



STAY AWAY from places marked with warning signs. These places are very dangerous, even for adults!



Anytime you need to use something that needs electricity, **ask an adult for help!** Remember, you can never be too safe!

SE
SCHULTZ
ELECTRIC

PA039012

724-228-5869

4.3 Activities

4.3.1 Activity 1: Safety word fill in (*Individual work*)

Make a copy of the questions into your jotter and answer them. Use the following words to help you to fill the gaps in these sentences. Afterwards, each member should exchange their jotter and score each other.

Word: Plug Dangerous Water Damaged

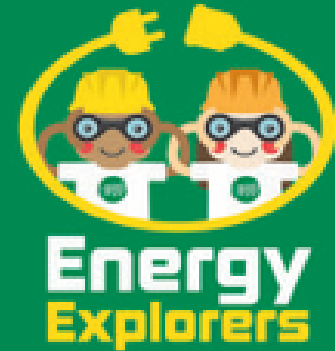
1. Electricity can be very.....
2. You should never use an electrical device that has been
3. Never push anything other than a properinto an electrical socket.
4. Keep electrical devices away from.....

The club leader should lead a discussion on these safety tips as answered by learners.

4.3.2 Activity 2: Home Electrical Safety Inspections (*Group work*)

- A) In pairs, inspect electrical safety around the school. Complete the following table by putting an 'X' in the appropriate column. (20 min.). Share your results with the whole club, making particular note of areas that need attention and submit the list to the school head teacher.
- B) Do a home safety inspection and bring any areas that need attention to an adult in the home.

HOME ELECTRICAL SAFETY INSPECTION



Always remember to use caution when you are near electricity! Ask an adult to help you complete this activity for your home. If you find any hazards, put a under **Needs Work**, and ask an adult to fix them. The safety inspection should be completed by the individual and submitted in the subsequent meetings every week till the next three weeks.

	True	Needs Work
1. Electric outlets are not overloaded.		
2. Electric cords do not run under rugs or furniture legs.		
3. No electric cords are worn or frayed.		
4. Electric appliances are kept away from water.		
5. There is items to put out fire in the house such as fire extinguisher.		
6. Electric heaters are far away from flammable objects.		
7. Electrical tools are stored in clean dry areas.		
8. All on used plugs are turned off. There covers over plug outlets that are not used		
9. There are no trees near the house that interfere with power lines.		

4.3.3 Activity 3: Electrical Hazard Activity

Circle the electrical hazard in each group.

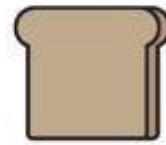
ELECTRICAL HAZARD ACTIVITY



The Energy Explorers want to remind you to always practice electrical safety! Remember, electricity can be dangerous, so make sure to avoid electrical hazards.

DIRECTIONS: Circle the item that doesn't belong. **HINT:** If all three items in the row were combined, which would make the situation an electrical hazard?

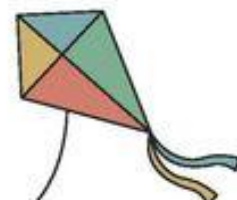
1



2



3



4.3.4 Activity 4: Safety Ambassador Checklist (Individual work)

SAFETY AMBASSADOR CHECKLIST



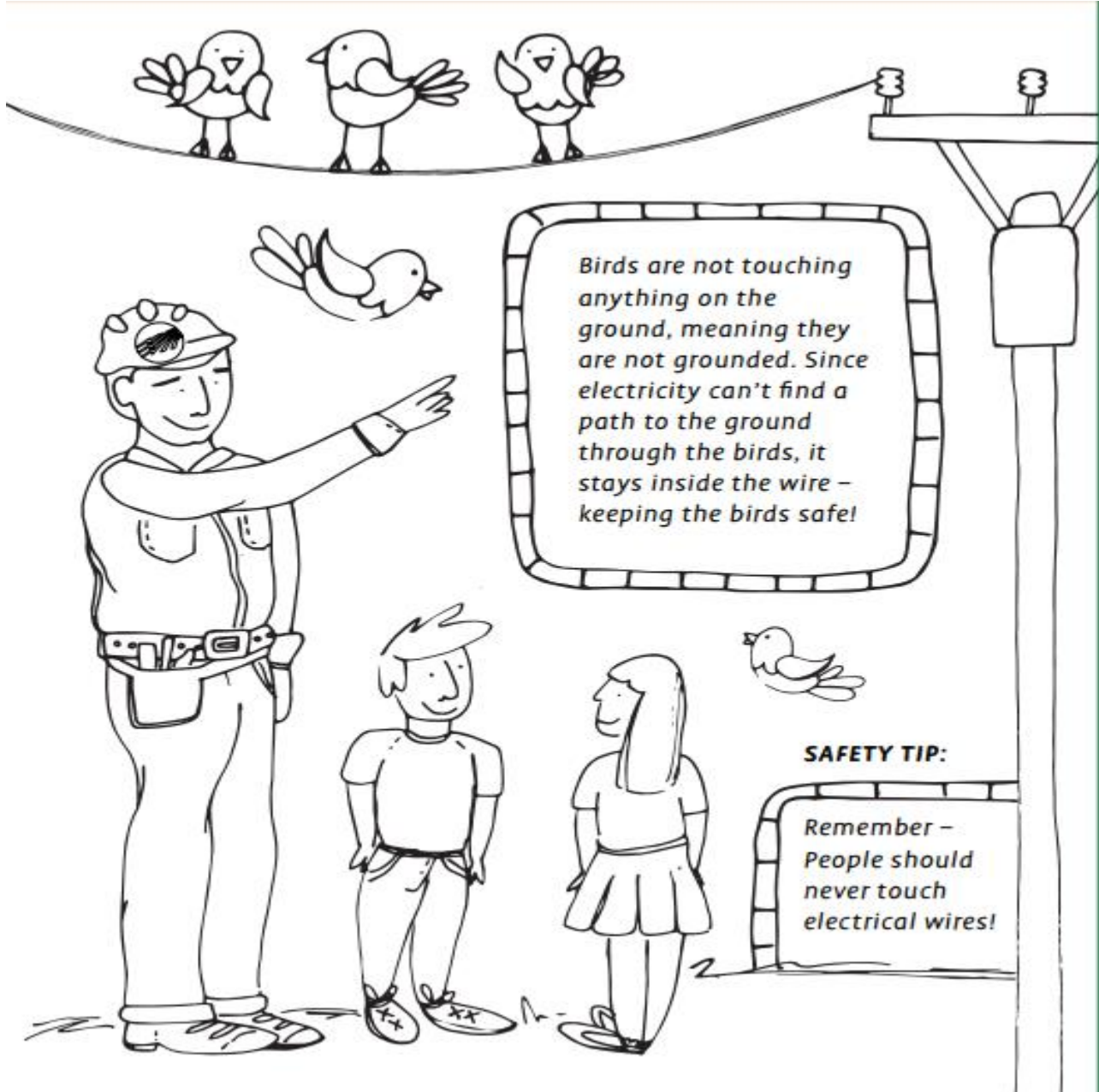
Practicing electrical safety can save lives, and we would like you tell your friends and family the message of safety. You can be a Safety Ambassador by completing the cheklisks below:

	TASK	COMPLETED
	With the help of an adult, make sure all electrical cords are out of the path of traffic in your home. Cords can be damaged when stepped on, creating a shock hazard.	Use a check mark <input type="checkbox"/>
	Test all light switches in your home to make sure they work properly. If a switch doesn't work, tell an adult so they can have the problem corrected.	<input type="checkbox"/>
	With the help of an adult, make sure all outlets in your home have faceplates covering all wiring. Exposed wiring is a shock hazard.	<input type="checkbox"/>
	Tell one friend why electrical safety is important to you.	<input type="checkbox"/>

After completing all tasks, you've become an *Electrical Safety Ambassador*! Cut out your badge here:



4.3.5 Activity 5: Why birds are not electrocuted when they are on a powerline
Colouring (Individual work)



4.4 Interactive websites - Online Resources, Games and YouTube Channels.

Online Resources

- www.ergon.com.au - Electricity Safety Games and Activities- Ergon Energy (puzzle and maze)
- www.switchedonkids.org.uk – Electricity Safety in your home- Switched on Kids

YouTube Channels:

Channel Name	Title
StraightTalkAlert	Electrical Safety Tips for Kids
Toronto Hydro	Kids Safety- Tips to keep children safe around electricity
OG&E	Kids Safety

Module 5: Energy Efficiency

5.0 Introduction

This module introduces learners to what energy efficiency is and practical ways of using energy in a very efficient way. The first step is to teach kids why it is important to conserve energy.

5.1 Learning Outcome

Learners will:

- Demonstrate practical methods/ways of using energy efficiently

5.2 Key Concepts

Energy Efficiency- Using less energy (electricity and/or natural gas) to perform the same function at the same level of quality.

Energy Saving: Refers to reducing the amount of energy required to provide products and services

Energy wastages: Using or consuming energy resources when there is no need to. It also means using energy resources in a negligent way.

5.3 Activities

5.3.1 Activity I: Saving Energy

A) Energy Checklist:

Assign each club member to make a **CHECKLIST** of gadgets and appliances that use electricity with the support of an adult at home or school. E.g. Fans, lights...etc.

B) Before you leave the house:

- Turn off all the lights and electronics. This includes television, computer, and video games.
- Listen to / hear if there's any water running. This can be a simple check for audible drips.
- Close curtains to block the sun. You may want the curtains open for light while you're home, but there's no need to let energy escape while you're away.

C) Throughout the day:

- Close the refrigerator door after use. Leaving the door open allows cold air to escape, which causes the refrigerator to work harder to maintain its cold temperature.
- Take shorter showers or bathe with less water. Try shaving two minutes from your total shower time or fill the tub halfway instead of full.
- Ask an adult to replace burnt-out bulbs with energy-saving rated bulbs. Energy-efficient bulbs use up to 80% less energy than incandescent light bulbs
- Turn off the water when brushing your teeth. Save water by turning the faucet off when it's not in use.
- Turn off lights whenever you are the last person to leave a room.

D) Daily or Weekly

Assign an energy monitor (a club member). This person will be in charge of making sure everyone sticks to the checklist and does their best to conserve energy throughout the day.

E) Energy Efficient Items and Appliances and Their Benefits

- Energy efficiency appliances enable you save a lot of money otherwise spent on paying bills. Energy costs money. So the less energy we use, the more we save. One way to do this is to buy energy-efficient products, for example the ones with the ENERGY STAR label.

Examples of Energy Efficient Appliances and Gadgets

LED lights

Solar Battery Charger

Make a list of all energy efficient and ENERGY STAR appliances in your home and what their rating is.



- Compare your findings with other club members.
- Make a list of recommendations for your family.

5.3.2 Activity 2: Energy Efficiency.

1. Form groups of about three (3)
2. Make copies of the chart below for each group
3. Each group is to cut the labelled equipments and place them either 'hurtful' or 'helpful'.
4. Present their results to the entire club for discussions

Name: _____

Directions: Cut out the images along dotted lines and paste them in boxes as helpful or hurtful to the earth.

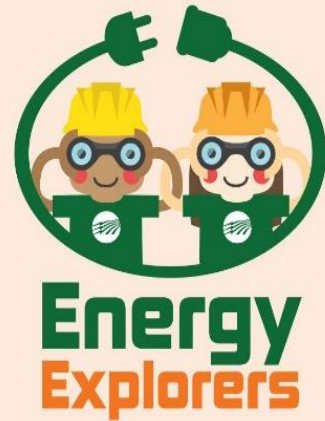
 Helpful	Hurtful 



5.3.3 Activity 3: Energy Efficiency Word Scramble

Note: This activity should be completed by new groups formed for this activity. At least there should be three club members in a group.

ENERGY EFFICIENCY WORD SCRAMBLE



Are you energy efficient? Test yourself by completing the word scramble below – and share these tips with your family and friends!

1. Tell an adult about a leaky _ _ _ _ _ . You don't want the water bill to rise from it. **(efacut)**
2. Wash your full loads of clothes in _ _ _ _ water when possible. **(oldc)**
3. Make sure that _ _ _ is not escaping through cracks in your windows. **(ira)**
4. Set your _ _ _ _ _ _ _ _ _ _ to 68° or lower, and put on a sweater if you begin to feel cold. **(tasmroteht)**
5. Use _ _ _ _ _ _ _ fans to cool down instead of pumping up your air conditioner. **(gclinei)**
6. Use a _ _ _ _ _ _ _ _ _ _ oven instead of the regular oven whenever you can. **(vacimorew)**
7. Turn on the oven _ _ _ _ _ to check on a dish rather than opening the oven door. **(ltihg)**
8. Replace incandescent bulbs with _ _ _ lights. They last much longer! **(DLE)**
9. When you _ _ _ _ _ your homework, do it the efficient way and use both sides of the paper. **(intrp)**
10. When possible, take the bus or ride your _ _ _ _ _ _ _ instead of using a car. **(bccleyi)**

Answers: Faucet (Same as tap), Cold, Air, Thermostat, Microwave, Light, LED, Print, Bicycle.

5.4 Interactive websites - Online Resources, Games and YouTube Channels.

Online Resources

- www.energy.gov -Energy Detectives (3 Activities) Department of Energy

YouTube Channels:

Channel Name	Title
Electric Saver	Energy Efficient Solutions to Teach Kids How to Save
Mississippi Power	Energy Efficiency Education for Kids
Games for Kids	The Responsible Use of Energy

Module 6: Energy Conservation

6.0 Introduction

This module introduces learners to issues and concepts regarding energy conservation.

6.1 Learning Outcomes

- Demonstrate ways of saving/conserving energy in the immediate environment
- Discuss how social and technological innovation affects the amount of energy used by human society

6.2 Key Concepts/Issues

Energy Conservation involves either using technology that requires less energy to perform the same function or decreasing the types of applications requiring energy to operate.

Energy conservation is the effort we make to reduce the consumption of the energy by using less of an energy resource and transitioning to clean, renewable energy. We are always looking for ways to conserve our non-renewable energy resources, like natural gas and oil. Non-renewable means that there is a limited supply. By using renewable energy sources like water for hydropower, and sunlight for solar power among others, we can help conserve our natural resources, so they do not run out.

By changing our behaviours, and doing things like turning off lights at home or in school when you leave, you can help conserve or save energy.

SAVING ENERGY

Saving energy is one of the best ways to conserve natural resources. There are many things you can do at home to help your family become more energy efficient.

Five Easy Ways to Save Energy:



1. **Turn off lights, computers, TV and other electrical stuff** when you aren't using it.



2. **Replace regular light bulbs** with energy saving Compact Fluorescent Light Bulbs (CFL's).



3. **Don't leave the refrigerator door open.** Cold air escapes and this uses a lot of electricity.



4. **Taking a short shower** instead of a long bath can help save energy.



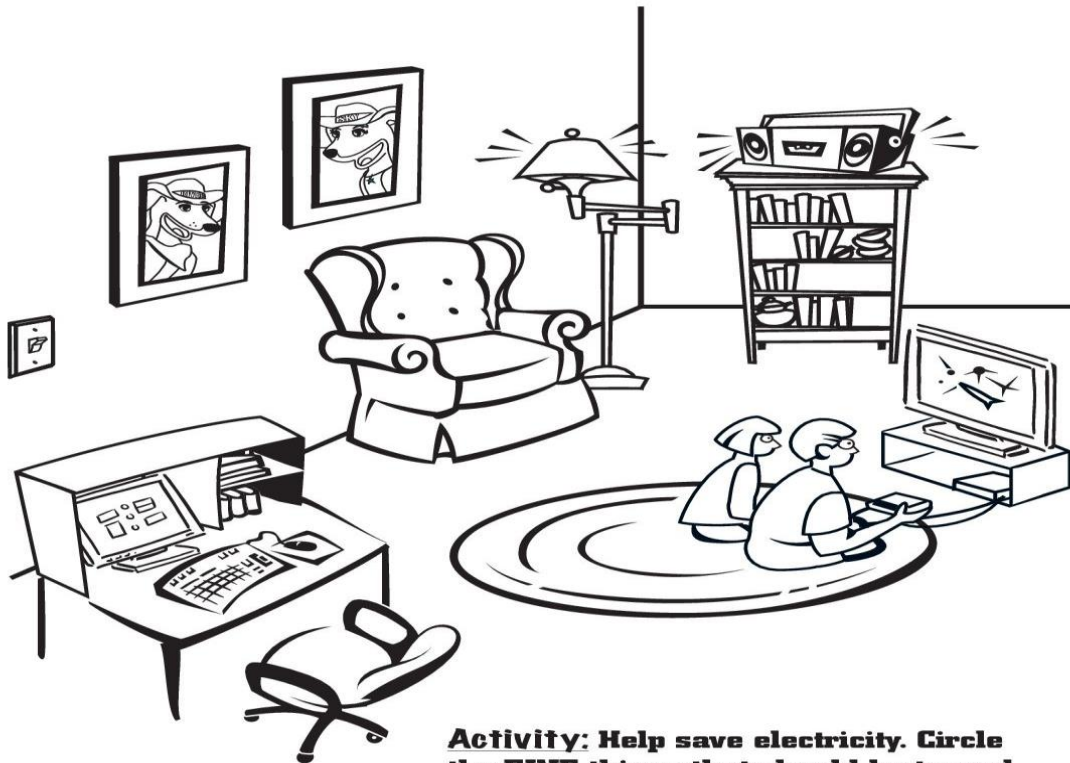
5. **Plant a tree.** Trees create shade around your house and help keep it cool.

6.3 Activities

6.3.1 Activity 1 (Individual work)

The leader of the Club should make a copy of the picture below for everyone. Ask all club members to circle five appliances that should be turned off when no one is using them.

When you leave a room, turn off any lights, radios, TVs, computers, or video games that you aren't using.



Activity: Help save electricity. Circle the **FIVE** things that should be turned off when no one is using them.

6.3.2 Activity 2: Ideas to Conserve Energy (Group work)

Divide the Club members into two or more teams (3-5 in a team). Put each team in a line. The teams will sit down facing each other. Go down the row asking each person, going back and forth from one team to the other. Thinking of conserving energy, read a statement and ask if it is a good action or bad action and why.

1. Ama leaves the television on while she goes out to play.
2. Kofi puts a sweater on instead of turning up the heat.
3. Dad leaves the computer on all night.

4. The parents take turns driving the children in the neighbourhood to school.
5. Mom replaced all the light bulbs with energy-saving bulbs.
6. Sarah left the water running while she brushed her teeth.
7. Kwame left his bedroom window open when the heat was on.
8. Kojo leaves the refrigerator open while he is thinking about what he wants to eat.
9. The family recycles paper and soda cans.
10. Akosua leaves her bedroom light on when she goes away for the day.
11. Elizabeth opens the curtains for sunlight instead of turning on the light.
12. Dad takes a shower that lasts twenty minutes.
13. Abena throws garbage in the water when he is out for a boat ride.
14. Aba used her towel more than once before washing it.
15. John hangs some of the clothes outside to dry.
16. Dad planted trees near the house to provide shade.
17. The family left lights on when they went on vacation.
18. The children rode their bikes to the neighbours instead of having mom drive them over.
19. The classroom has a recycle basket to put used paper in.
20. The family has a game night once a week and doesn't turn on the television.

6.3.3 Activity 3: Conserving Energy at Home and School (Group work)

A) How can you save energy at home

- Discuss ways to reduce energy use in your home and school?
- Think about what consumes electricity in your home. What uses a lot? what doesn't? Come up with a list of recommendations for your parents to minimize your home energy use
- What could you do personally to use less electricity in your home without compromising your daily life?

B) How can you save energy at school

Current Energy Use in the classroom

- What is using electricity in the classroom right now?
- What could you and your class do to minimize that energy use without affecting the class?
- Make a list of recommendations and present it to your Headteacher, teacher and classmates.
- Try to start a club group competition to see which group can save the most energy, documenting what you are doing each day. The winning group can be given special recognition (such as a certificate) by the club for being top energy ambassadors.

6.4 Interactive websites - Online Resources, Games and YouTube Channels.

Online Resources

- www.wonderville.org - Energy Conservation Methods & Online Game for Energy Conservation
- www.sciencewiz.com - (S.T.E.M Education Solutions)

YouTube Channels:

Channel Name	Title
ProVia	How to Save Energy- Energy STAR Education Program
Horizon Utilities	Energy Conservation for Kids
Young Energy Savers	Energy lessons for kids: Energy saving kids
Mango Juniors	Energy Saving Save Electricity Tips For Kids Animated

Module 7: Renewable and Non-Renewable Energy Sources

7.0 Introduction

This module introduces non-renewable and renewable sources of energy that learners are expected to know about at the Upper Primary School level. Non-renewable energy typically comes from fossil fuels and cannot be replaced in our life times. Renewable energy uses energy sources that are not "used up". For example, solar power from the sun is renewable as we won't "use up" all the sunlight from the sun.

7.1 Learning Outcome

Learners will

- Explain and give examples and uses of renewable and non-renewable sources of energy including the benefits or consequences of using them.

7.2 Key Concepts

There are 2 main sources of energy – the major energy sources we use today are classified into 2 main groups:

- iii. **Non-renewable** energy sources that cannot be easily replenished or is finite (can run out). **Non-renewable energy sources** include fossil fuels such as coal, petroleum, natural gas, propane as well as uranium. They are used to generate electricity, heat our homes, power electronic devices, cook our food, move our cars and to manufacture products from candy bars to cell phones. Once these energy sources are used up, they will be gone forever.
- iv. **Renewable energy** exists freely in nature is an energy source that can be easily replenished or exists infinitely (never runs out). **Renewable energy sources** include biomass, geothermal, hydropower, solar and wind. They are called renewable energy sources because their supplies are replenished in a short time.
Developing technologies that can efficiently use renewable energy sources is critical to our future.

There are benefits or consequences of using each.

Many renewable energy sources are better for the environment than burning fossil fuels which are easily accessible. Fossil fuels are leading causes of pollution and climate change. Renewable energy produces less pollution which will help protect the environment and provide us with cleaner air and water.

There are potential renewable energy sources in various places in Ghana

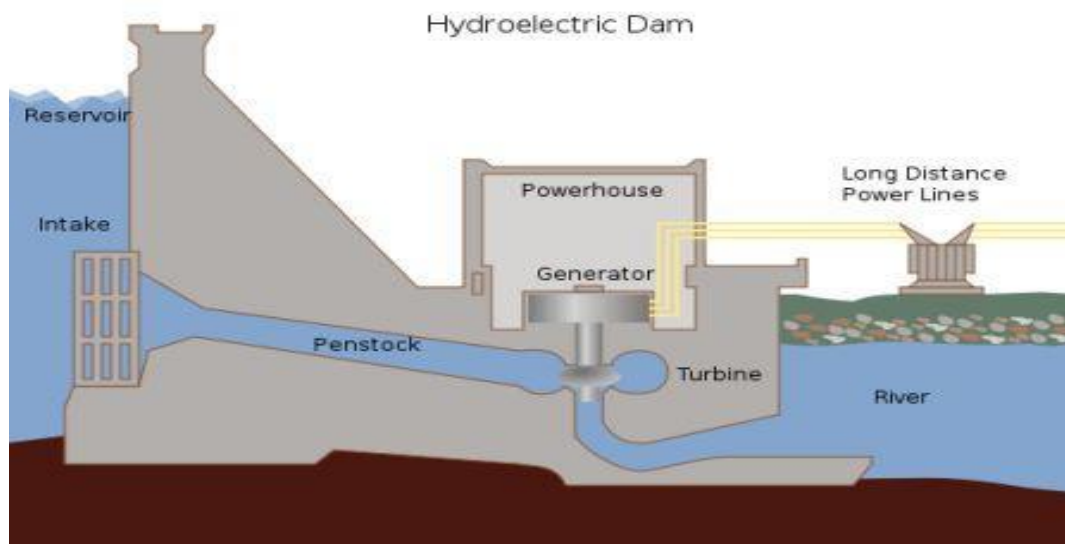
HYDROPOWER

What is hydropower?

Hydropower is a power that is generated from moving water such as rivers. It is a renewable energy source. This means that using a dam or a river to generate electricity doesn't use up any limited resources like coal or gasoline.

How do we get power from water?

Falling or flowing water from a big river has a lot of energy. We can harness this by forcing the water through a pipe called a penstock. As the water flows through the pipe it turns the blades of a turbine which spins an electric generator. As long as the water is flowing, the generator will be able to provide electricity.



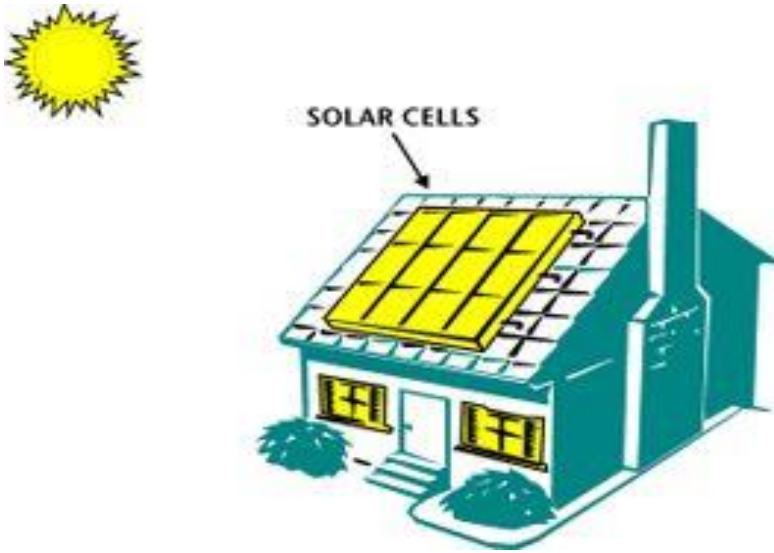
Electricity has been generated by water (from a river)

SOLAR ENERGY

What is solar power?

The primary source of all energy on planet Earth is from the sun. Solar power is power generated directly from sunlight. Solar power can be used for energy or converted into electric energy.

When we use solar power, we don't use any of the Earth's resources like coal or oil. This makes solar power a renewable energy source. Solar power is also clean power that doesn't generate a lot of pollution.



This image above shows how sunlight powers “solar cells” in order to provide electricity for a house

WIND ENERGY

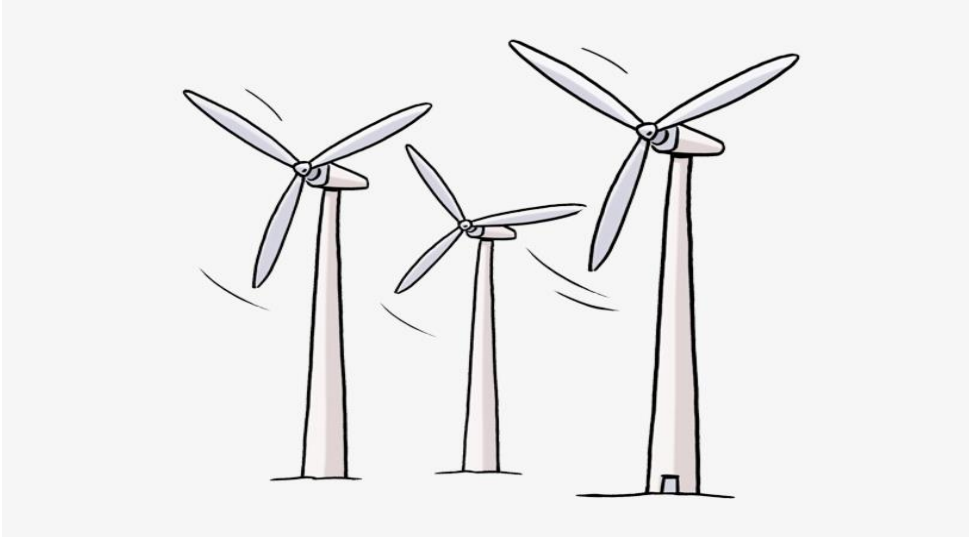
What is wind power?

Wind power is energy, such as electricity, that is generated directly from the wind. It is considered a renewable energy source because there is always wind on the Earth and we aren't "using up" the wind when we make energy from it. Wind power also does not cause pollution.

Wind Turbines and Wind Farms

To make electricity from wind, energy companies use large windmills called wind turbines. They are called this because they use turbine generators to generate electricity.

To create a lot of energy capable of powering thousands of homes, energy companies build large wind farms with lots of wind turbines. They usually build these in consistently windy places. Some companies build wind farms out in the ocean. These are called offshore wind farms.



The image above shows a windmill which generates wind energy

7.3 Activities

7.3.1 Activity 1: Pairs work

Make a copy of the questions into your jotter and answer them. Afterwards, each member should exchange their jotter and score each other. Use the word provided in the box and place it in the gaps in the sentences.

Renewable, Work, Forms, Electricity, Fossil, Uranium, Nuclear, Generate, Non-renewable

1. There are two main sources for the energy we use every day:
2. The energy obtained from natural resources that can be replaced, like wind, water and sunshine, is called (.....) energy.
3. Non-renewable energy sources are those that cannot be replaced once they are used, such as the (.....) fuel oil, natural gas and coal.
4. The Earth's natural resources are divided into two categories; -----and -----.
5. Some renewable energy resources are -----, -----, -----, -----.
6. Some of the nonrenewable energy resources are -----, -----, -----, -----.

7.3.2 Activity 2: Renewable and Nonrenewable Resources Quiz

A) Each material or item on this list is a renewable or nonrenewable natural resource or produced directly from a renewable or nonrenewable energy source. For each item mark whether it is from a “Renewable Energy (**RE**) or Non-Renewable Energy (**NRE**).

Materials	Renewable Energy or Non-Renewable Energy (RE or NRE)
Wind	
Gold Jewelry	
Plastics	
Oil	
Wood	
Ice cubes	
Water	
Paper	
Trees	
Sunlight	
Soda can	

B) Compare your answers in groups of 3 and make adjustments to your chart as needed.

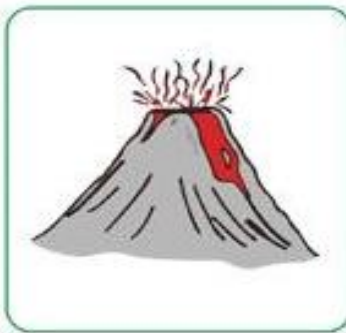
7.3.3 Activity 3: Recognizing Renewable Energy

Knowing Renewable Energy

Why must we use renewable energy?

Renewable energy sources never perish like fossil fuels. They will continue to be available at all times.

Name the renewable energy each of the diagrams below demonstrates.



7.3.4 Activity 4: What is Solar Power?

Solar energy comes from the sun. The sun is an important resource, as it helps sustain life. Without the sun, our planet would have no life. Through the use of technology, we are able to harness the energy from the sun to convert it to electricity.

SOLAR CELLS are tools that change light energy from the sun and other light sources into electricity. Many calculators use solar cells to power them.



A SOLAR PANEL is a group of solar cells connected to form a large, flat surface.

What do you think a car powered by the sun would look like? Draw a picture.

7.4 Interactive websites - Online Resources, Games and YouTube Channels.

Online Resources

- www.alliantenergykids.com - Renewable Energy- AE Kids.
- www.greenchildmagazine.com - Green Child Magazine- (8 Awesome Facts About Renewable Energy)
- www.greenkidcrafts.com - Green Kid Crafts- (Green Kid A Create, Play and Learn TEAM magazine for Kids: Green Energy.)

YouTube Channels:

Channel Name	Title
Smile and Learn	What is Energy?Energy Types fro Kids- Renewable Energy
Student Energy	Renewable Energy 101
ISAGEN	Renewable Energy for the Benefit of the Planet

Module 8: Energy Transformation

8.0 Introduction

This module introduces learners to the various changes energy goes through from one stage to the other. Energy transformation, also known as **energy conversion**, is the process of changing energy form one form to another.

8.1 Learning Outcome

- Learners will demonstrate energy changes from one form to another.

8.2 Key Concepts

- Energy does not always stay in one form. Energy can change its form.
- Energy transformation, also known as **energy conversion**, is the process of changing energy from one form to another. Energy transformation occurs everywhere, every second of the day.

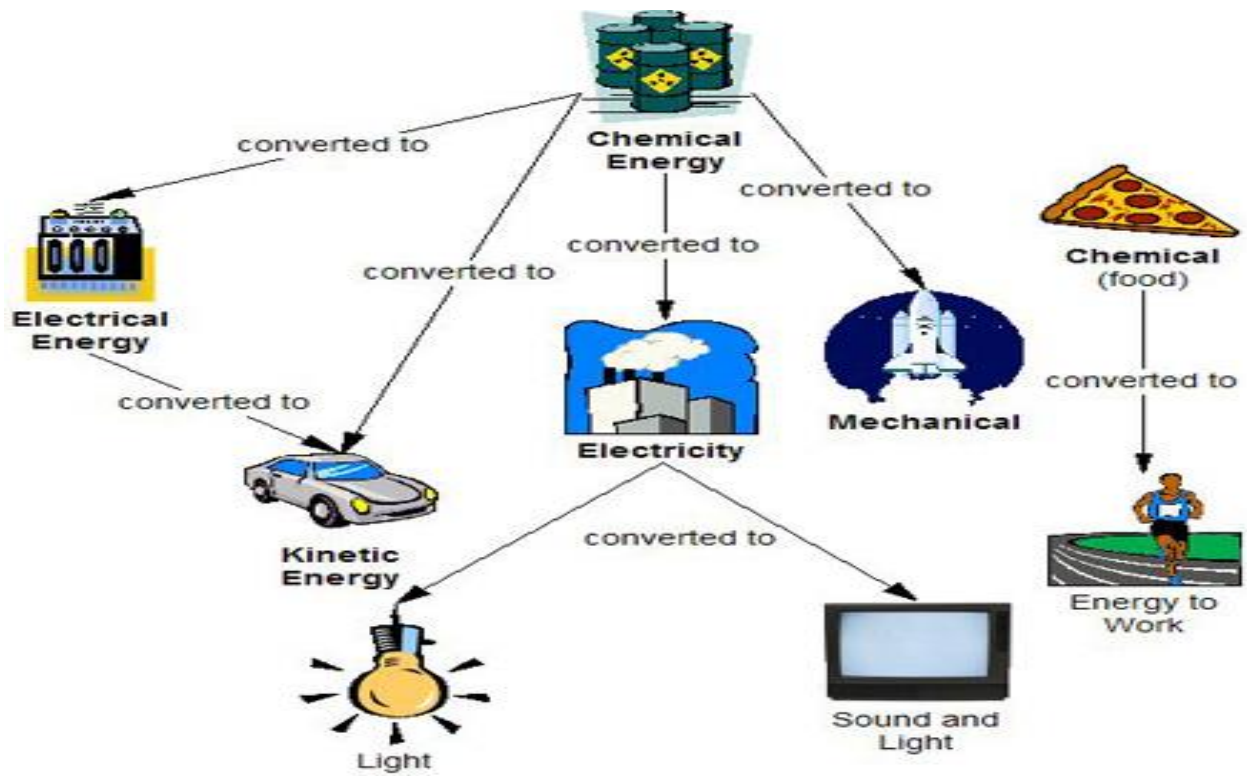
Forms of Energy Transformation

There are seven fundamental forms of energy:

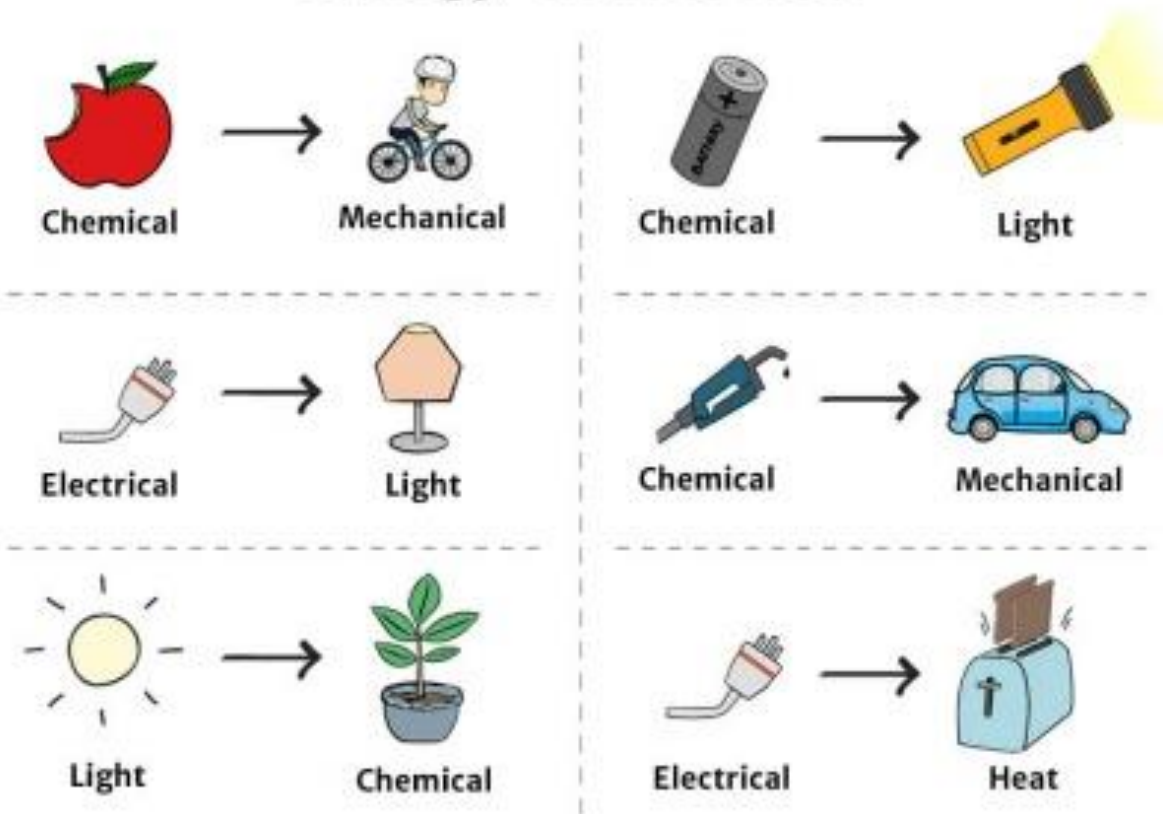
<ul style="list-style-type: none">• Electrical• Thermal / Heat• Mechanical	<ul style="list-style-type: none">• Sound• Chemical• Nuclear• Radiation
--	--

Examples of Day-to-Day Energy Transformations

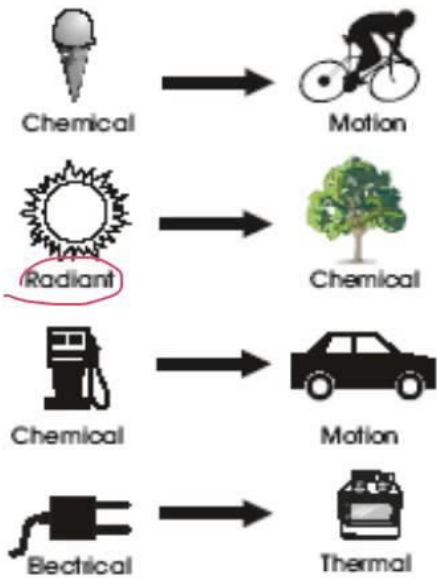
- **Chemical Energy** is converted to **Electrical Energy** (stove), **Kinetic Energy** (car), Electricity (power plant), and **Mechanical Energy** (space shuttle).
- **Electrical Energy** is converted to **Kinetic Energy**.
- Electricity is converted to light (light bulb) and sound and light (TV).
- Chemical food energy is converted to Energy to work (person working).



Energy Conversion

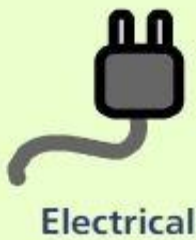


Energy Transformations



- Chemicals in food give us mechanical energy
- The sunlight provides light energy for the tree to make its own food (chemical)
- Chemical gasoline provides energy for the motion of the car
- The electrical energy in the plug creates the heat to run the stove

Energy Transformations



www.sciencewithme.com


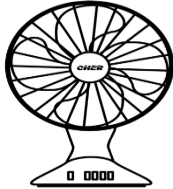

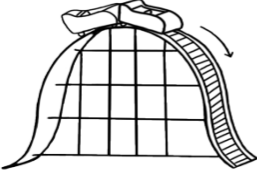


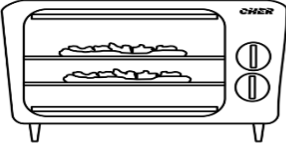
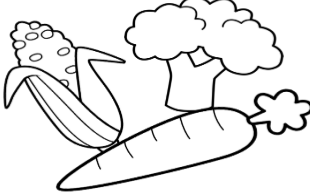
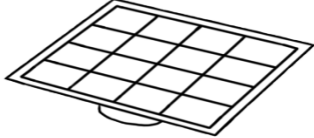
8.3 Activities

8.3.1 Activity I: Energy Transformations

NAME: _____

ENERGY TRANSFORMATIONS

NAME THE ENERGY TRANSFORMATIONS OF EACH ILLUSTRATION.

chemical sound	electrical mechanical	light thermal	potential kinetic
			
			
			

©2017 LatinFlower Store

8.3.2 Activity 2: Energy Transformation Worksheet

Note: This activity should be completed -- with learners working together in pairs.

ENERGY TRANSFORMATION WORKSHEET

Complete the energy transformations / conversions taking place below:

1.



2.



3.



4.



5.



8.4 Interactive websites - Online Resources, Games and YouTube Channels

Online Resources

- www.generationgenius.com – Energy Transfer
- www.britannica.com -Energy Transformation- Kids | Britannica Kids | Homework Help

YouTube Channels:

Channel Name	Title
Science for Fun	Energy Transformation
Najam Academy	Energy Transformation Transformation of Energy Examples of energy transfer
Deepak Sharma	Science for Kids Energy Transformation Video

Module 9: Climate Change

9.0 Introduction

This module will help learners understand climate change and its relation to energy choices.

9.1 Learning Outcomes

Learners will:

1. Identify component parts of a terrestrial carbon cycle
2. Review, draw, and act out the carbon cycle
3. Link carbon cycle dynamics to the greenhouse effect
4. Identify processes that contribute to carbon dioxide emissions
5. Graph annual carbon dioxide emissions and predict trends

9.2 Key Concepts

- Weather and climate are different, operating over different time scales.
- The climate system is a complex interaction between the land, air, and ocean systems.
- Climate change is impacted by energy choices.

What's the difference between weather and climate?

Weather: Weather is the conditions in the air above the earth such as wind, rain, or temperature, especially at a particular time over a particular area.

Weather changes in the atmosphere occur on a daily basis. The weather we experience today could be different than the weather we have tomorrow.

Figure 9.1: Picture on different weather patterns



Weather is what the forecasters on the TV news predict each day. They tell people about the temperature, cloudiness, humidity, and whether a storm is likely in the next few days. That's weather! It is the mix of events that happens each day in our atmosphere. Weather is not the same everywhere. It may be hot and sunny in one part of the world, but freezing and snowy in another.

Climate is the average weather in a place over many years. While the weather can change in just a few hours, climate can take decades, hundreds, thousands, even millions of years to change.

Climate change is the long-term changes in the weather patterns in a region. This could be a change in how much rain a place usually gets in a year. Or it could be a change in the usual temperature of an area for a month or season. Climate change is also a change in Earth's climate. This could be a change in Earth's usual temperature (NASA).

Another term interchanged with climate change is global warming. Global warming is the rise in Earth's temperature which persists for a decade or longer and is caused by climate change.

Climate change is a result of the destruction of forest areas, the usage/burning of fossil fuel (e.g. Coal) and the overheating of the earth's surfaces.

Global climate change is affecting our planet but it is difficult for people to see the effects over just a few years because the process takes a long time. But climate also varies over smaller timescales of just a few years in different regions of the globe. People can easily see the effects of these wild climate events disrupting weather patterns in large regions of the world.

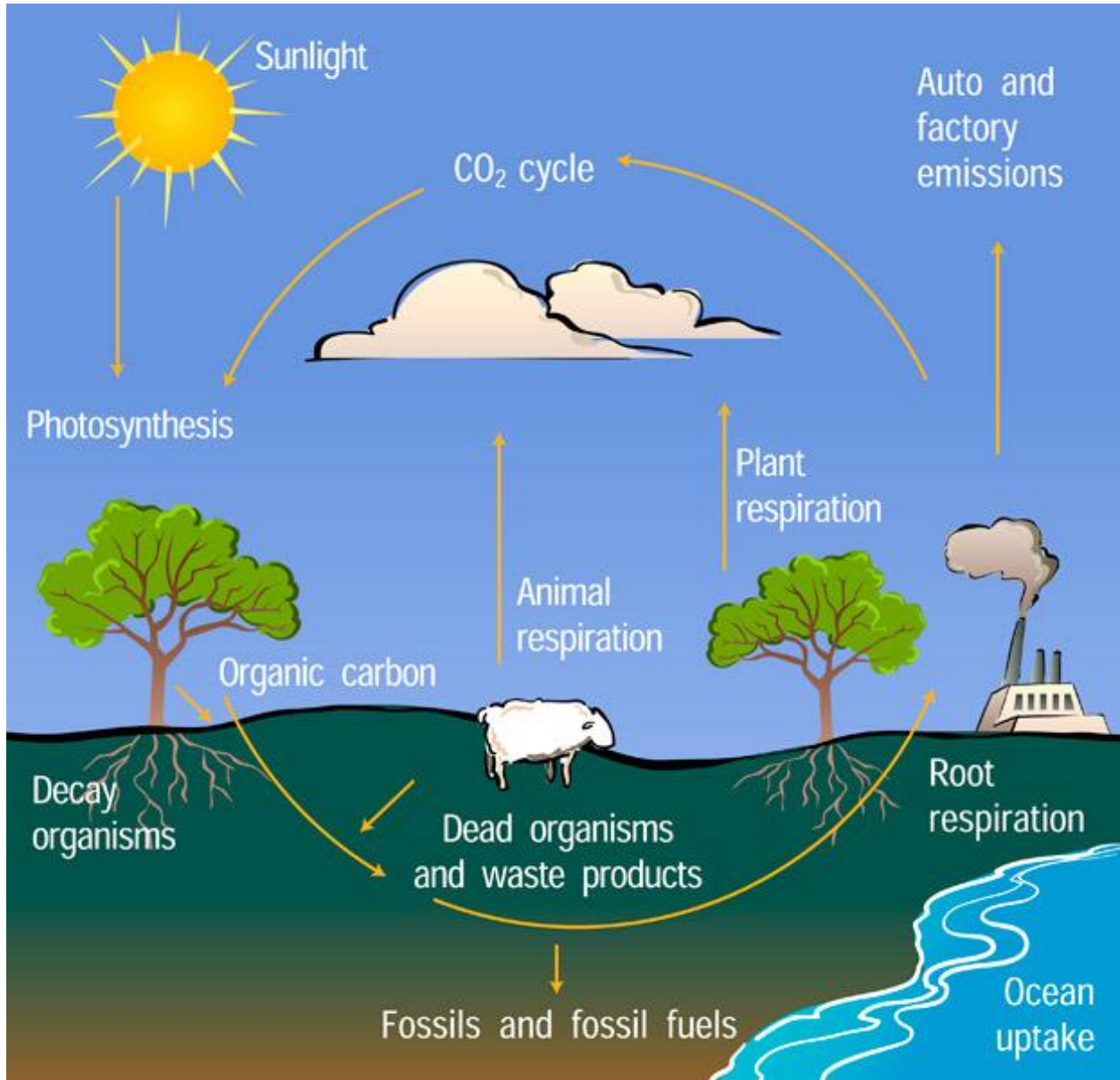
9.3 Activities

9.3.1 Activity I: Weather Versus Climate

- A. Study the definitions above and the Figure below, "What's the difference between weather and climate?"
- B. Draw pictures of the climate throughout the year in your area of Ghana. (You may want to divide your paper in 4 sections).
- C. Draw a picture of the weather yesterday, today and how it might change tomorrow.
- D. In pairs, make a list and draw pictures to show the differences between weather and climate.

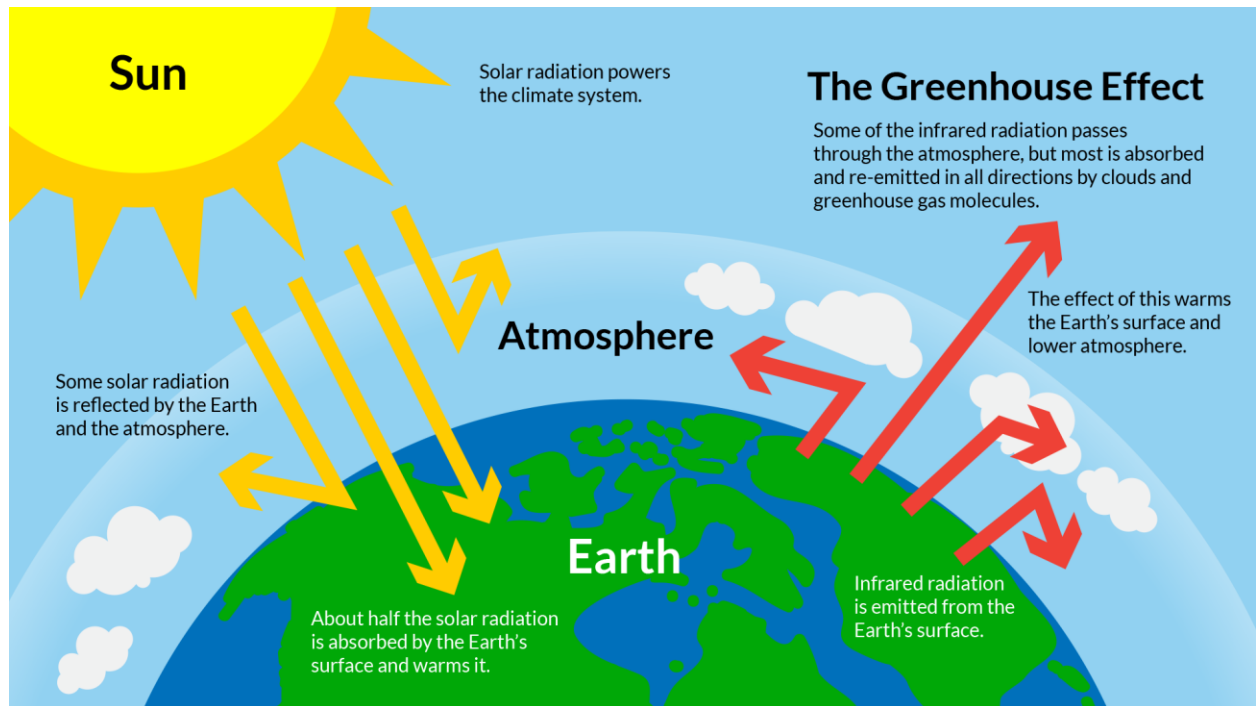
9.3.2 Activity 2: The Earth's Climate System

A. The land-based carbon cycle and role cards



UCAR Centre for Science Education

B. The greenhouse or global warming effect



Science-U.org.

9.3.3 Activity 3: Effects of Climate Change on Living Things

- Role play Activities as outlined in Section 3
- In groups, learners write their own ecosystem impact cards. They can research particular populations or communities in the ecosystem where they live,

9.3.4 Activity 4: Addressing Climate Change

- In groups, study **Figures below** and make a list of the top 5 things needed to stop climate change.
- Compare your list with other groups and as a club decide on the top 5 suggestions.
- Split into 3 groups and make posters on either:
 - what climate change is,
 - why climate change is happening, and
 - what we should do about it.
- Use your club posters to educate classes in the school.

Greenhouse effects and global warming

GREENHOUSE EFFECT AND GLOBAL WARMING

INFOGRAPHIC ELEMENTS



ECOLOGY PROBLEMS



SMOKE CAR

lorem ipsum dolor the comfort
ectetur a dipiscing fast weak it



WATER POLLUTION

lorem ipsum dolor the comfort
ectetur a dipiscing fast weak it



INDUSTRIAL FACTORY

lorem ipsum dolor the comfort
ectetur a dipiscing fast weak it



LOREM IPSUM

lorem ipsum dolor the comfort
ectetur a dipiscing fast weak it



SOLID WASTE

lorem ipsum dolor the comfort
ectetur a dipiscing fast weak it



DEFORESTATION

lorem ipsum dolor the comfort
ectetur a dipiscing fast weak it

SAVE THE WORLD



ECOLOGY

lorem ipsum dolor the comfort
ectetur a dipiscing fast weak it



SOLAR ENERGY

lorem ipsum dolor the comfort
ectetur a dipiscing fast weak it



RECYCLE

lorem ipsum dolor the comfort
ectetur a dipiscing fast weak it



WASTE SEGREGATION MANAGEMENT



PLANT A TREE

lorem ipsum dolor the comfort
ectetur a dipiscing fast weak it



BIKE

lorem ipsum dolor the comfort
ectetur a dipiscing fast weak it



DO NOT BURN

lorem ipsum dolor the comfort
ectetur a dipiscing fast weak it



DO NOT CUT TREES

lorem ipsum dolor the comfort
ectetur a dipiscing fast weak it



EcoLogic Projects Fighting **CLIMATE CHANGE**

PLANTING MORE TREES

Reforestation means more trees to soak up carbon already in the atmosphere



DECREASING ENERGY USE

Helping families build fuel-efficient stoves, which release fewer greenhouse gases



ENVIRONMENTAL EDUCATION

Ensuring that people learn the best ways to protect their resources



FINDING THE PRICES

Putting monetary values on resources so people can make better economic decisions



Read about other solutions and our project sites at EcoLogic.org/climate



Science Project: Building Electromagnet

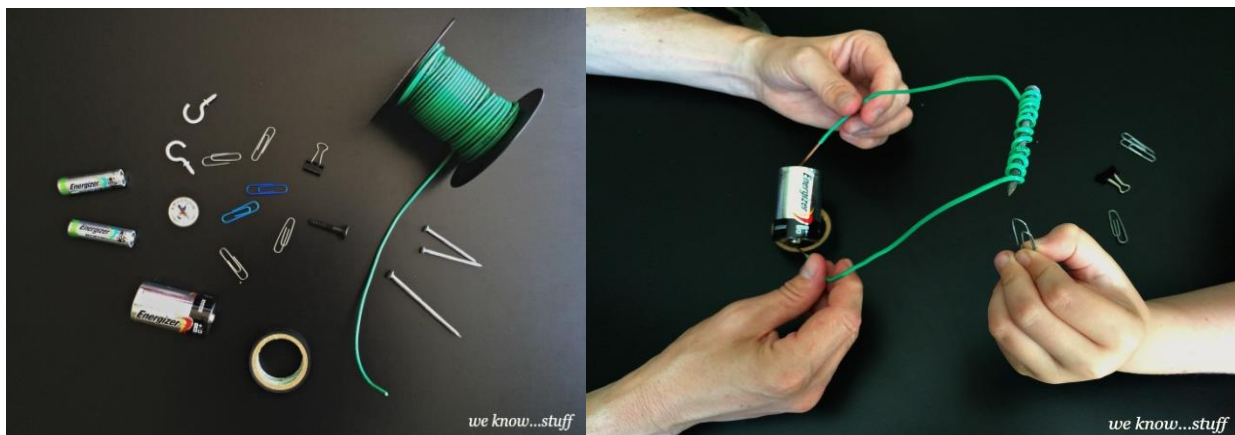
Introduction

After club members have been taken through all the modules in this club guide, they would be required to come up with science projects related to the generation of electricity using electromagnets.

Science Project I: Building an Electromagnet


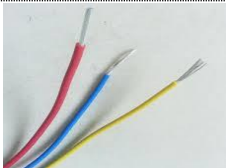
Electromagnet is a form of magnet. A magnet is however an object that attracts metals, such as a stripe pin, to its body. The difference between electromagnet and a magnet is that an electromagnet uses electricity to attract the object while a magnet attracts metals on its own. Electromagnets are used in separation of materials, loudspeakers, motors and generators.

This science project is allow you to produce electricity so that a nail can take a stripe pin.



Materials

The materials required include:

Iron nail	
Thin coated copper wire	

Dry cell battery



Electrical tape

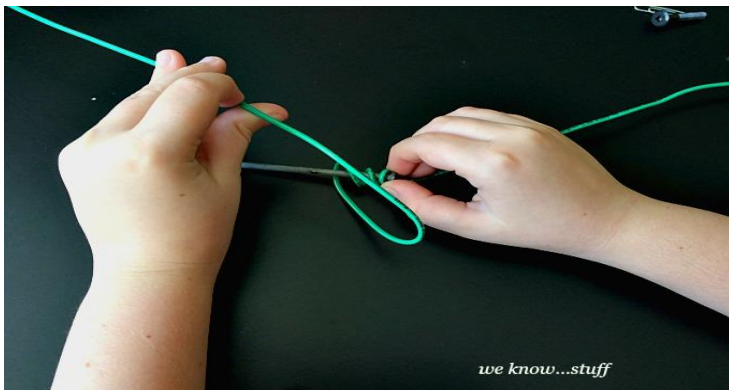


variety of small, lightweight metals eg. paper clips



Procedure:

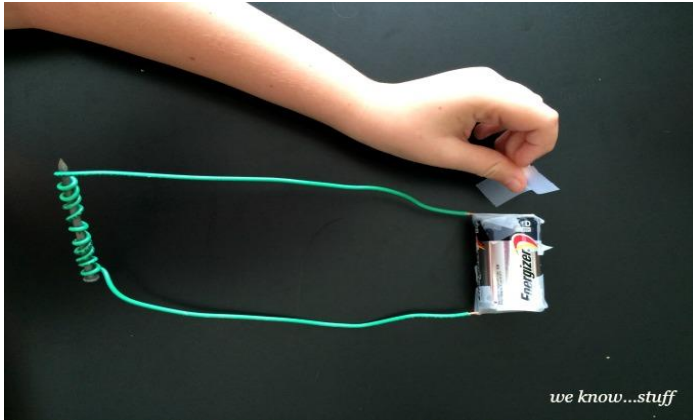
Coil the coated copper wire around nail. Leave about 25cm of the iron.



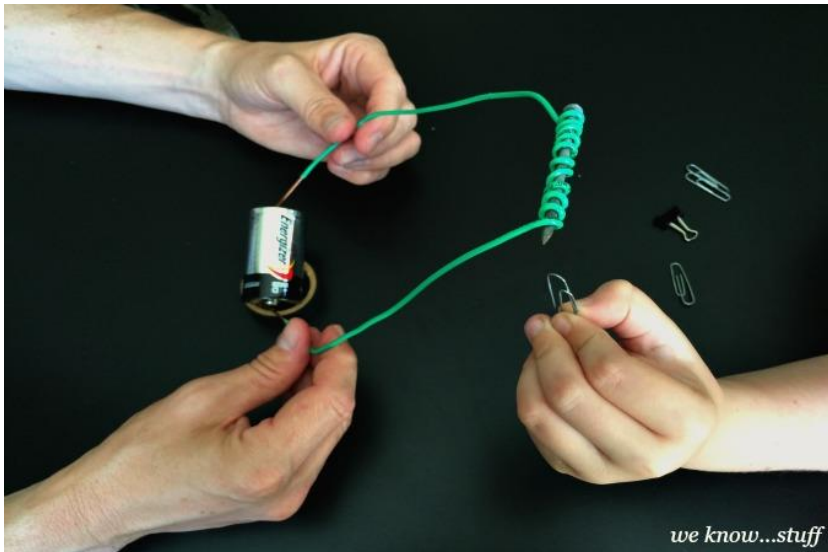
Next, peel off the two ends of the copper wire and attach it to the battery. One at the positive terminal and the other at the negative terminal.



Use the electrical tape to hold the wire attached to the battery in place.



Put a staple pin in your palm or a paper and hold it close to the nail. You will see that the paper clip will be attracted to the nail.



Explanation

The electromagnet is generated using electricity running through the wire. This makes the nail attract the metal to itself. The magnetic field is temporary as compared to an ordinary magnet.

Science Project 2: Recycled Rhinoceros

Introduction

Recycled Rhinoceros Science Project allows pupils to create a rhinoceros out of a plastic container. It will teach the pupils to reduce and use wastage which in the long run will reduce our energy consumption rate.

Materials

Medium groundnut paste jar (empty and clean)



5 small paper cups



Grey paint/ any colourful paint



Paint Brushes



Glue



2 button eyes (use buttons with a dot in the middle)

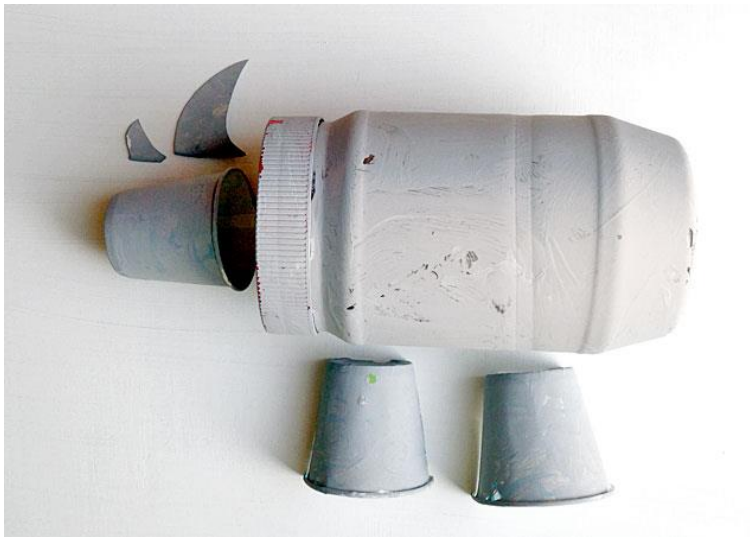


Procedure

Cut off 1/4 of the four cups (see picture), this will be the feet. From the scraps cut 2 horns; 1 large, 1 small and a tail.



Paint the jar, cups, horns, tail and jar with grey paint and colour. And leave it to dry.



Stick one piece to the jar at a time with the glue. Allowing it to dry before handling. Glue the bottoms as eyes, if you have it. If not, draw the eye on the container.



Draw a picture to accompany your Rhinoceros to show all the ways this has helped reduce energy consumption.

Science Project 3: Planting a tree at school.

Introduction: Trees help combat impacts from climate change caused by burning non-renewable fossil fuels for energy. Trees absorb carbon dioxide from the air, provide shade to help cool temperatures, and help retain soil during Harmattan Winds.

Materials:

- Tree seedlings or cuttings
- Measuring stick
- Container to measure water for watering
- Watch or clock to measure time
- Rain Guage
 - Plastic drink bottle
 - Sharp knife
 - Scissors
 - Gravel
 - Tape
 - Ruler
 - Fine-point permanent marker

Procedure:

- 1) Take cuttings from a fast growing tree such as a willow and plant where shade is needed.
- 2) Measure how tall the tree is every week/month, showing the rate of growth. Graph the results.

- 3) Water your tree daily or weekly and measure how much water it is given. Graph these amounts and compare to the tree's growth.
- 4) Record the number of hours of sunlight the tree receives.
- 5) Make a rain gauge (see below) and measure the amount of rainfall the tree receives by placing a rain gauge near the tree.
- 6) Measure the temperature in various places where there is no shade and where there is shade from a nearby tree. Predict how much your tree will lower the air temperature in its shade.
- 7) Write a story on how your tree is going to help fight climate change and conserve energy.

Procedure 5: Making a rain gauge



- a. Cut off the top of the bottle and set aside.
- b. Fill the bottom with gravel or small rocks so it is stable.
- c. Mark the top of the rocks with a line marked "0".
- d. Measure and mark each half centimeter from "0" upwards to create a ruler on the bottle.
- e. Put the top of the bottle back, **but upside down**. Tape in place.
- f. Fill the bottle with water up to the "0" mark.
- g. When it rains, record how much rain has fallen in the bottle.

Science Project 4: Renewable Energy – Power from Water

<https://www.education.com/science-fair/article/water-produce-energy/>

- This is to assist the club learn about generating electricity from water.

Science Project 5: Clean Water from the Sun

https://www.education.com/activity/article/Cleaning_Water_middle/

Building a Solar Oven

<https://www.homesciencetools.com/article/how-to-build-a-solar-oven-project/>

- This is a project which helps your club learn to build a solar oven.

Science Project 6: Building a Wind Turbine

<https://www.bikersrights.com/wind-turbine-for-a-school-project/>

- This is a project which helps your club learn to build a wind turbine to generate power.

References

1. www.amazon.com
2. www.homedepot.com
3. www.indiamart.com
4. www.teacherspayteachers.com
5. www.wirescable.com
6. www.za.chinahomelife.com
7. www.http://4.bp.blogspot.com
8. www.bigstock.com
9. www.cleverlearner.com
10. www.docplayer.net
11. www.dreamstime.com
12. www.en.wikipedia.org
13. www.eslprintables.com
14. www.i.pinimg.com
15. www.indiamart.com
16. www.mathworksheets4kids.com
17. www.michaels.com
18. www.nreca.coop
19. www.pinterest.com
20. www.screwfix.ie
21. www.shop.crayola.com
22. www.teacherspayteachers.com
23. www.worksheetplace.com
24. <http://resources4rethinking.ca/media/Electricity%20Conservation%20&%20YOU-EN-June%202016%20Final%20Version.pdf>

List of Contributors

NAME OF CONTRIBUTORS	INSTITUTION	DESIGNATION
NaCCA Team of Experts		
Dr. Prince H. Armah	MoE- NaCCA	Executive Secretary
Mr. John Annang	NaCCA	Training Officer
Alhaji Seidu Mahama	NaCCA	NaCCA
Mercy Nyamekye	NaCCA	Curriculum & Research Officer
Joana Vanderpuje	NaCCA	Curriculum & Assessment Expert
Abigail Owusu Oduro	NaCCA	Curriculum Officer
Saddik A. Mohammed	Ga South Municipal Education Office	Science Coordinator
Joachim Seyram Honu	NaCCA	Assessment Officer
Wilma S. Thus-Glover	NaCCA	PPO - Inclusivity
Internal Compact Team		
Dr. Prince H. Armah	MoE- NaCCA	Executive Secretary
Divine Ayidozoe	MoE- SRIM	Director
Mercy Nyamekye	MoE- NaCCA	Curriculum and Research Officer- Technical Assistant to the Consultant
Priscilla Adjei- Darko	MiDA	Gender Project Technical Assistant
Sylvester Ayayee	MiDA	Project Manager
Jeremiah O. Ansah	GES	F/A Technical Assistant to the Consultant
Philip Kwesi Incoom	GES/TVET	Metro Director, GES Cape-Coast
Augustus Agyemfra	GES	Secondary Education
Issah Baffoe	GES	Basic Education
Jeremiah Badu S.	GES	Special Education Division
Representative from GES Council	GES	Director, GES Council
AFC Consulting Team		
Dr. Leslie Casely-Hayford	AFC	Director and Lead Consultant
Mr. Jones A. Frimpong	AFC	Project Manager
Dr. Liza Ireland	Canada	Curriculum & Environment Expert
Dr. Kingsley Arkorful	AFC	Curriculum Expert
Jennifer Quaicoe	AFC	Administrator
Ayeley Foli	AFC	Research Assistant
Louisa Owusu-Adjei	AFC	Research Assistant
Eunice Bodza	AFC	Service Personnel
International Reviewers		

List of Contributors

NAME OF CONTRIBUTORS	INSTITUTION	DESIGNATION
Dr. Liza Ireland	Canada	Curriculum & Environment Expert
Dr. P. Dharmalingam	DESL, India	STTA-Energy Efficiency and Conservation Specialist
M.S. Sheela	DESL, India	STTA-Energy Efficiency and Conservation Specialist
Meredith	USA	Curriculum Expert
Selected Teachers (Reviewers)		
Osman Bin Umar	G.E. S	Teaching
Bassey Nkanu Dadzie	G.E. S	Teaching
Victor Nartey Kpabitey	G.E. S	Teaching
Ivy Kissi Adonteng	G.E.S-Weija, Gbawe	Language coordinator (English Language)
Amedegbor Bismark Valerian	G.E.S (Huapa D/A Basic School)	Class 5
Anang Doris	Bethel High Academy	Class 2- JHS 3
Sylvester Kudjo Ewordu	OLAM SHS, Tema	SHS 3
Samilia Sueley Sowah	Agbekotsekpo D/A Basic School	Subject Teacher (English language)