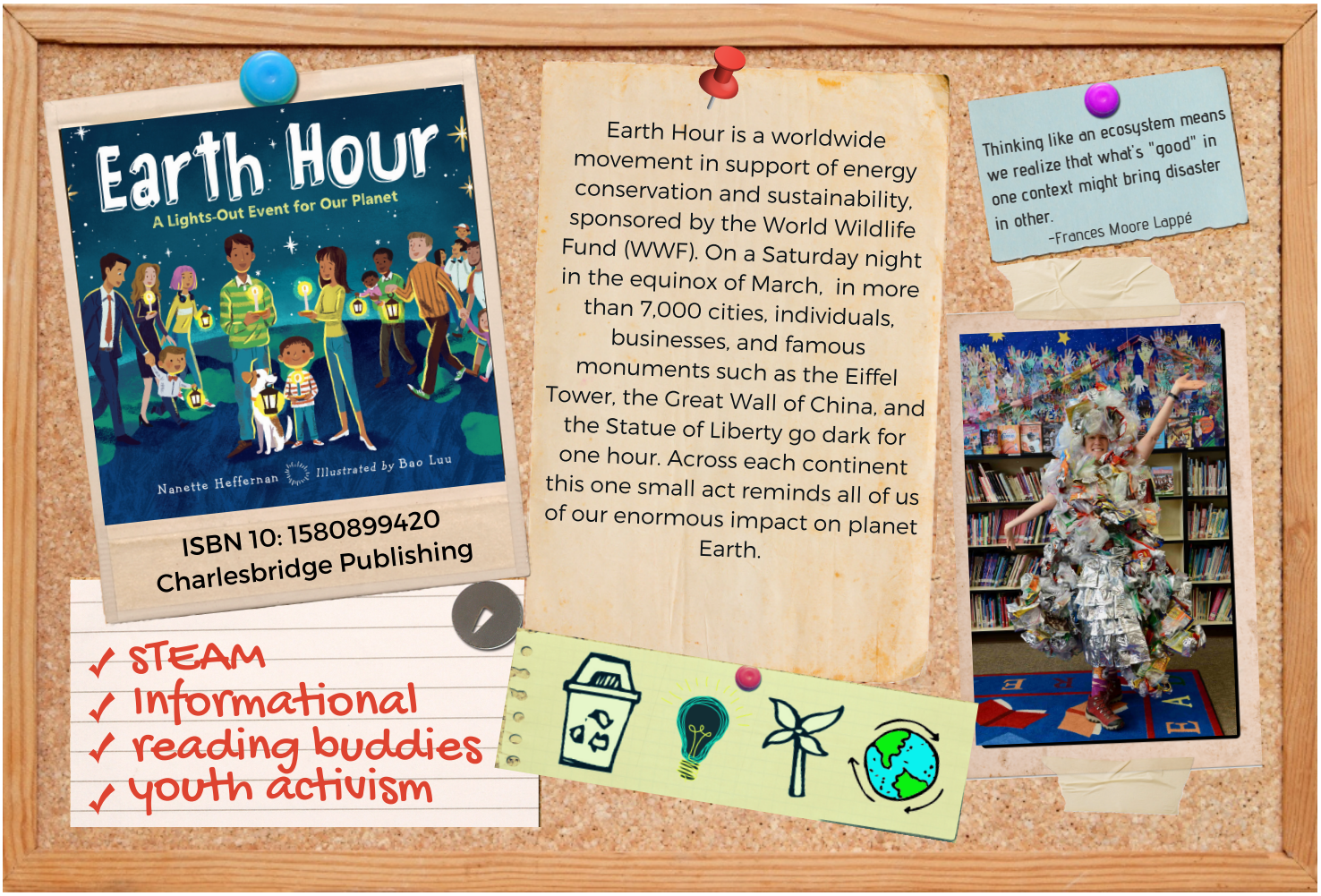
EDUCATOR'S GUIDE

EARTH HOUR

K-6 ENVIRONMENTAL LITERACY

(Energy and Climate Change)



GUIDE CO-AUTHORED BY

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ABOUT THIS GUIDE

Understanding and appreciating the natural world, and our place in it, is an important goal of K-12 education. While we cannot predict all the issues the next generation will confront, we can be certain that among them will be issues related to the environment. (www.enviroliteracy.org) The National Science Board's Environmental Science and Engineering for the 21st Century report states, "The environment is a critical element of the knowledge base we need to live in a safe and prosperous world," and calls for increased efforts to improve public understanding of environmental issues.

EARTH HOUR, by Nanette Heffernan, offers a range of layered concepts—from basic to more complex—supporting environmental literacy in grades K-6, and Reading Buddies programs popular in many schools. This guide was co-developed by Nanette Heffernan and Sharon Angal. It draws on CCSS - NGSS standards, Nanette's 15 years experience of working with children and schools on environmental issues, and Sharon's expertise in teaching science. The activities will encourage students to think critically about the many ways our daily choices impact Earth and its ecosystems and how children can be part of the solution to reverse climate change.

Nanette Heffernan is a children's author and sustainability consultant. Her lifelong goal is to make Earth a better home for children whether by making them laugh or addressing environmental issues that will affect their generation. Although she loves her leadership roles in the community, she is most fulfilled while dressed in school lunch trash and visiting schools and festivals to talk to thousands of kids about the importance of protecting our environment. She is pleased to share her efforts have earned her three Environmental Awards of Excellence. She lives near San Francisco, CA with her family, Koda the dog, George the cat, and eight chickens, all named Companion.

Sharon Angal has been a teacher for twenty-eight years in Oregon, USA. She has spent most of her time in second grade, with some excursions into first and third grade. Sharon enjoys getting students excited about learning especially in the areas of math and science. She was the 2016 recipient of the Presidential Award for Excellence in Math and Science Teaching. Sharon loves living in the Pacific Northwest and when she's not teaching you'll find her reading, playing with her labradoodle Winston, hiking, or kayaking.

THEMES

- Energy Production (fossil fuels & renewable energy)
- Energy Consumption
- Energy Conservation
- How does generating energy make air pollution
- Climate Change (how are energy and air pollution connected to climate change)
- Environment (we are all connected)
- Global Citizenship (Social Studies)
- Community
- Leadership (be the change)

CROSS CUTTING CONCEPTS

- Cause and Effect
- Energy and Matter
- Influence of Engineering, Technology, and Science on Society and the Natural World
- Stability and Change
- Scientific Practices
- Asking Questions and Defining Problems
- Planning and Carrying Out Investigations
- Constructing Explanations and Designing Solutions
- Obtaining, Evaluating, and Communicating Information

CCSS STANDARDS

Reading

- Key Ideas and Details
- Reading Informational Text
- Craft and Structure
- Integration of Knowledge and Ideas

Writing

- Text Type and Purpose
- Research to Build and Represent Knowledge
- Product and Distribution of Writing

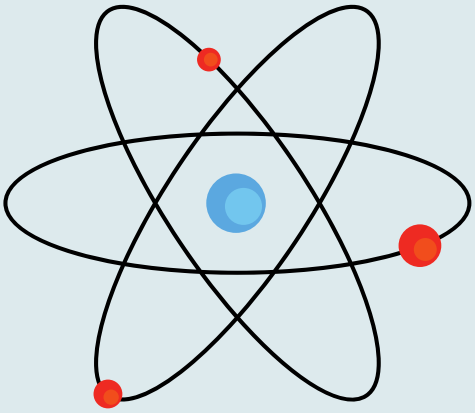
Social Studies

Math

- Numbers and Operations - Fractions
- Operations & Algebraic Thinking
- Time and Date
- Represent and Interpret Data
- Time Zones
- Statistics and Probability

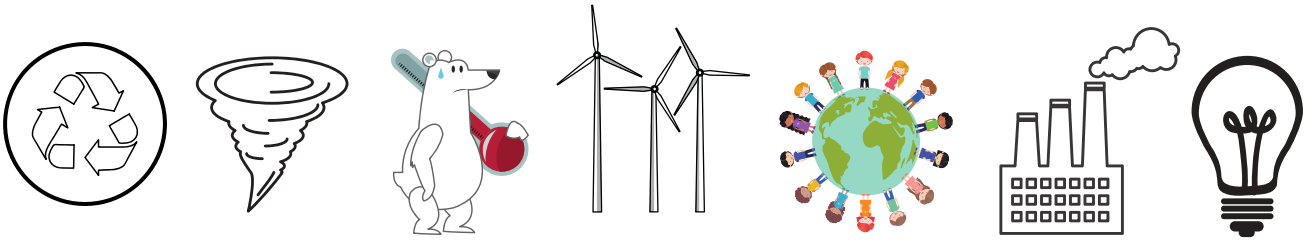
NGSS STANDARDS

- Earth and Human Activity
- Energy
- Earth Systems
- Earth's Place in the Universe
- Engineering Design



BEFORE YOU READ: K-2

- **Author-Illustrator-Theme** - After sharing the cover and title of the book, ask students what they think EARTH HOUR is about. What is the subtitle? Who is the author and what does she do? Who is the illustrator and what does he do? Make a list of unknown vocabulary words in the narrative and back matter. **ELA Reading Informational Text RI.K.4-6. RI.1.4-6, RI.2.4-6**
- **Themes** - Can students think of any other books or events with a similar theme? (Climate Change, Earth Day) Capture their ideas on chart paper. ***NGSS - Earth and Human Activity***
- **What is Energy**? Put the word energy on the board. Have students talk in partners about what energy means to them. Have partners share out their ideas and record them on a large piece of paper. Have them explain how their ideas relate to energy. *(Energy helps us do things. It gives us light. It warms our bodies and homes. It bakes cakes and keeps milk cold. It runs our TVs and our cars. It makes us grow and move and think. Energy is the power to change things. It is the ability to do work. - www.need.org)* **NGSS - Energy**
- **What takes energy and what does not?** Have students get into groups of 3-4 and hand out energy card pictures and sorting paper (see *Energy Cards A* resource at the end of the guide. *Energy Cards B* is a more advanced set, which can be used with older or advanced students). Ask students to place the cards in the two columns on the sorting paper. One side should be items that use energy and the other side should be items that do not use energy. Glue pieces into place when students are finished. Save the papers for later when students will revisit their first ideas to see if their ideas have changed. **NGSS - Energy**



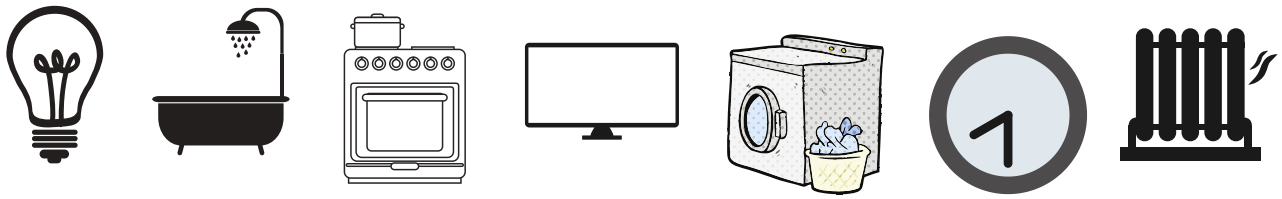
BEFORE YOU READ: 3-6

- **Vocabulary -** Review the backmatter for any unknown vocabulary words. Use the NEED Elementary Energy guide for additional vocabulary (*see Additional Resources*). **ELA Reading Informational Text RI.3.4. RI.1.4, RI.5.4, RI.6.4**
- **What's the theme?** Share the cover of the book with students and ask them what they think EARTH HOUR is about. Push older students to consider why you are sharing this book. Encourage them to think about other books or events that focus on similar themes (climate change, environmentalism, conservation). **ELA Reading, NGSS - Earth and Human Activity**
- **What is energy?** Ask students to discuss with a partner, what they think of when they hear the word energy. After a few minutes, ask students to share their ideas of energy. How do they know their idea is a form of energy? How is energy used? How is it consumed? What is their rationale behind their ideas? *(Energy helps us do things. It gives us light. It warms our bodies and homes. It bakes cakes and keeps milk cold. It runs our TVs and our cars. It makes us grow and move and think. Energy is the power to change things. It is the ability to do work. - www.need.org)* As a class, write down student ideas about energy to keep up in the classroom to refer to during the unit. **NGSS - Energy**
- **How many forms of energy can you think of?** (see link to *10 Sources of Energy* in Resources) Give students time to work on a concept map around energy. How many forms of energy can they come up with? How do humans extract/capture that energy? What is the byproduct (waste) of each energy source? At the end of the unit, have students revisit their original map and see what changes they would make. **NGSS - Energy**

WHILE YOU READ: K-2

- **How many different energy uses can you find?** Ask students what the difference is between energy to help our bodies grow and electrical energy. *(Energy for our bodies comes from the sun => plants => animals. Electrical energy mostly comes from fossil fuels like coal, oil, and gas, but we can also get electrical energy from the sun (solar), wind, water (hydro), and plants (bio).)* How many different uses of energy in the book can students identify. Did any uses surprise them? Many students know lights use energy but did they know heating water for their bath takes energy also? **NGSS - Energy, Earth & Human Activity ESS3.C**

- **Time and date -** Can students tell you when Earth Hour occurs every year? What month? What season is March in? What time of the day does it occur? Why is it 8:30 p.m. and not 8:30 a.m. *(The date of Earth Hour is choosen by the World Wildlife Fund and Earth Hour.org each year. Sometimes it falls before the official start of spring and sometimes after, therefore, it's safest to say it occurs in winter since it is always in March. It is celebrated at night because Earth Hour is a symbolic lights-out event that wouldn't have the same impact during daylight.)* **CCSS Math 1.MD.C3, 2.MD.D.7**



WHILE YOU READ: 3-6

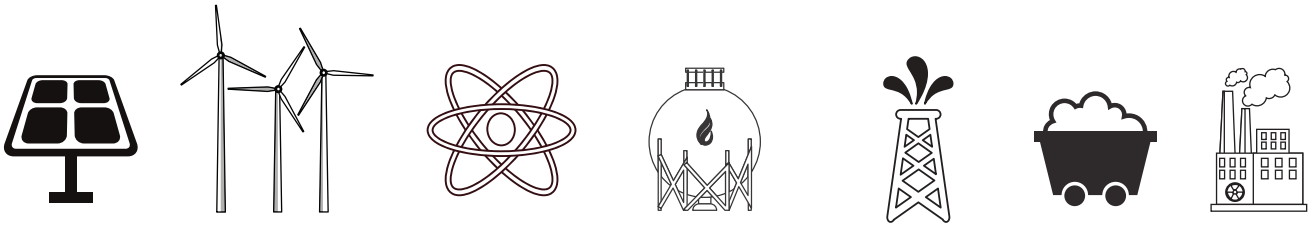
- **What is the difference between energy to help our bodies grow and electrical energy?** *(Energy for our bodies comes from the sun => plants => animals. Electrical energy mostly comes from fossil fuels like coal, oil, and gas, but we can also get electrical energy from the sun (solar), wind, water (hydro), and plants (bio).)* ***NGSS - Energy, Earth & Human Activity ESS3.C, ESS3.A, 4-ESS3-1***
- **How many different uses of energy in the book can students identify**. **NGSS - Energy, Earth & Human Activity 4-ESS3, 4-ESS3-1**
  - Where do they think the electricity comes from for lights, cooking, etc *(fossil fuels, gas, solar, ect.)*
  - Did anyone recognize the dinner as energy for our bodies?
  - Did any enrgy uses surprise them? Many students know lights use energy but did they know heating water for their bath takes energy also?
- Can students **explain the waste product of the energy** sources they identified and how that affects Earth and different populations? *(burning fossil fuels creates air pollution/CO2).* **NGSS-Earth & Human Activity ESS3.C, ESS3.D, MS-ESS3-4, MS-ESS3-5**
- Can students tell you **when Earth Hour occurs every year?**
  - Why is Earth Hour in the Equinox of March? *(The equinox in March is the time in the northern and southern hemispheres which allows for near coincidental sunset times in both hemispheres, thereby ensuring the greatest visual impact for a global 'lights out' event.)* **CCSS Math, 5-ESS1-1, MS-ESS1-1**
  - What time of the day does Earth Hour occur? Why is it 8:30 p.m. and not 8:30 a.m. What does 8:30 local time mean? ***(time zones)***

AFTER YOU READ

SCIENCE K-2

- Review where electrical energy comes from *(fossil fuels like coal, oil and gas, and renewable sources such as sun, wind, water).*
- In what ways is energy helpful?
- In what ways is producing energy harmful? *(pollution)* **ESS3.C**
- What does "clean energy" mean? *(sources of renewable energy that do not pollute the earth in order to produce them such as solar, wind, and hydro power).* **ESS3.D**
- **Can students share any ideas for saving energy?** *(Many students will think of turning off the lights, but challenge them to think of all the electrical energy uses in their daily life and how they can reduce them. Carpooling, closing the doors or putting on a sweater when it's cold, opening windows when it's hot, reading a book or playing a board game instead of video games.)*
- How does using less energy help Earth? Young children can usually evaluate other's actions while not understanding the impact of their own behavior. Help them create that understanding in order to have a thoughtful conversation. For example, when they leave the lights on after they leave a room they might be hariming the environment without realizing it.

NGSS - Energy, Earth & Human Activity K-ESS3-3, ESS3.C, ESS3.D



SCIENCE 3-6

Electrical Energy & Its (Elementary Energy Info Book www.need.org)

- Discuss the idea that **energy on Earth is finite**; it never disappears, it only changes form. *(There is the same amount of energy today as there was when the world began. When we use energy, we don't use it up completely; we change it into other forms of energy. When we burn wood, we change its energy into heat and light. When we drive a car, we change the energy in the gasoline into heat and motion. There will always be the same amount of energy in the world, but more and more of it will be changed into heat. Most of that heat will go into the air. It will still be there, but it will be hard to use. www.need.org)*
- Discuss how electrical energy is produced.
- In what ways is energy helpful?
- In what ways is producing electrical energy harmful?
- What does "clean energy" mean? *(energy from renewable sources)*
- Can students share any ideas for saving energy? *(Many students will think of turning off the lights but challenge them to think of all the electrical energy uses in their daily life and how they can reduce them. Carpooling, closing the doors when it's cold, opening windows when it hot, putting on a sweater at home, reading a book or playing a board game instead of video games. Enforce that a good way of reducing energy is to not waste things (waste-free lunch), reuse or repair things (use both sides of every paper), recycle and compost).*

NGSS Energy PS3.B, Earth & Human Activity ESS3.A, ESS3.C, ESS3.D

CLASSROOM ACTIVITIES

SCIENCE K-2

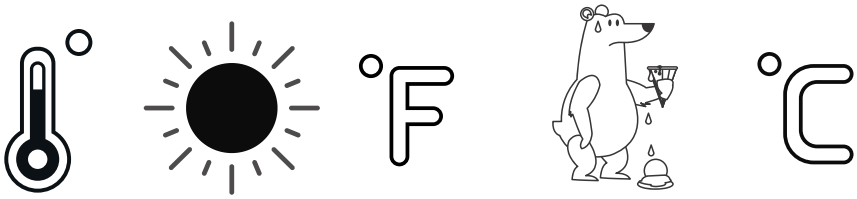
PICTURE TALK

Preparation:

- Before doing this activity, hang up copies of energy pictures on chart paper around the room.
- Different colored markers- enough for each group you create.

Lesson:

- Divide the students into as many groups as you have pictures. Send each group to a different picture and ask them to write down on the paper how the item in the picture is using energy, or anything that the picture might make them think about energy when they look at it.
- Let students spend about 3-4 minutes at a picture. Then have them rotate to the next picture and write down their ideas. Keep doing this in 3-4 minute increments until you decide that they have done enough, or you notice they are not able to come up with new ideas.
- Bring the students together and talk about what they noticed about the pictures and comments that they made.



(Activity to help understand energy)

Preparation:

- One bag of mini chocolate chips
- Give each student 5 mini chocolate chips on a paper towel (you can put them in plastic snack bags if you prefer but it's better for the environment if you don't)

Lesson:

- Talk with students about how the sun gives off heat and keeps Earth warm. Energy from the sun keeps all of us, animals and plants alive. Without the sun, nothing on Earth would be alive. Ask students what they notice happens to things when the sun is out. You want to get across the idea that things get warm (car seats, pavement, your skin can burn) and things can sometimes change (ice, candle wax, and ice cream all melt) ect. **NGSS Energy PS3.B, K-PS3-1**
- To help get across the point that **energy from the sun is heat energy,** have students conduct an experiment.
  - Predict: Ask students, "What would happen if you pour all of the mini chocolate chips in your hand?"
  - Write down all answers on the board.
  - Have students put the chocolate chips on their hand, then put their hands together for one minute (you can use gloves but it's better for the environment if you don't).
  - At the end of one minute, ask students to open their hands and see what happened. Discuss why the chocolate has melted.
  - It is due to heat energy from your hands. Your body has energy and some of that energy is given off as heat. It is what keeps us warm. This is how the chocolate melted in your hand.
- This is **similar to how the sun heats our planet.** Except, when there is too much pollution in the air (atmosphere) it can trap the sun's heat and warm the planet up too much. This is called **global warming.**

AFTER YOU READ

SOCIAL STUDIES 2-6

- **Leadership & Social Justice**
  - Do your students have an opinion on where their energy comes from? Make a stand. Research and write about it, then debate it with others in the class. Ask the school board if they can present their debate to them about the importance of using less energy as a district.
  - Can your school add a VP of Sustainability to its student council? This student/student council could be in charge of energy conservation (and other green practices) at your school.
  - **Go further!** Concentrate on local government, like the principal or mayor and make suggestions for change either for energy savings or energy sources. Maybe expand the reach and write a letter to a Congressman, Senator, Head of the EPA, or even the President of the United States.
  - Investigate local businesses and talk about their energy use. Maybe take a tour or have someone come in from that business to talk about how they are saving energy.
  - If your school or city has solar panels anywhere, perhaps a company that makes and sells them could visit classes and talk about how it helps the environment.
  - Fifth graders could research the primary energy source for each of the 50 states. Does a state use more sustainable energy sources or rely heavily on fossil fuels like coal?

- **Think Global, Act Local**
  - Gather data off the internet about energy consumption by country and per capita. Create a graph, or chart, something that shares out the data, then share it with each other. Students can all take a country to add to the chart. Does their country use the most? The least?
  - Do some analysis around the data and see what conservation ideas might be generated. Students that age are more capable of thinking about what can be done to help the environment, and that activity might spur some writing to Congress, the EPA, or the White House.
  - Is it possible to get energy use data from your school district office for the amount of energy used at each elementary school per student (total energy use / student population). That would be an interesting comparison, especially to see where their school falls in the line of use. It might create a conversation around how, as an entire school, they can reduce that energy consumption.
  - Have students consider their own energy consumption. How does their energy consumption impact others in their community, locally and globally?

MATH K-2

How Many Light-Hours Do We Use?

- Have students do an at home light-hours survey by the hour (5-6 pm, 6-7 pm, 7-8 pm ect.) either for one night or several. Every hour, on the hour, they can count the number of lights on in their house. Each light on counts as one hour. For example, if one light was on in the house from 5-6 p.m. that is one light hour. But if we turned two more lights on from 6-7 p.m. that is 3 light hours for a total of four light hours. What was the light being used for? Cooking dinner, homework, working on the computer, reading stories? Was that light helpful or redundant at that time?
- Have students share how many light hours they surveyed at home.
- Consolidate the data. As a class, how many light-hours did they use each hour, each night?
- Plot and summarize the data at a grade appropriate level.
- Brainstorm ideas for how every house could use 10% fewer light-hours.

Operations & Algebraic Thinking, Numbers & Operations, Represent & Interpret Data

CLASSROOM ACTIVITIES

SCIENCE K-6

What uses electricity – Scavenger Hunt

- Helping students understand energy use starts right where they spend many hours of their day, at school. After reading EARTH HOUR, take your students on a scavenger hunt around school, inside and out, and ask them to find as many items as possible that use electrical energy. It can be items mentioned in the book [light switch, heater/temperature gauge (to represent HVAC)] to stoves (if your school has a kitchen), hot water from sinks, street lights, lights around the building, bells, loud speaker, clocks, etc.
- Choose which scavenger hunt sheet works best for your grade level. Sheet A is for students who are not writing, and they can draw and label a picture of the item. Sheet B is for students who are able to write out the word of the item. You can also decide if you want students to work in teams or individually. If you have a parent who can help, you can divide your students into two groups, or smaller groups, and let them search on their own.
- Once you are finished, gather your students to discuss what they found. They can star words or pictures that are the same, or highlight them. As students share what they found, write it down on chart paper, writing down all items, even if they are incorrect. You can go back later and talk through incorrect items, or hopefully, students will discover the error as they do more activities.
- Talk with students about coming back to the chart later to see if they find anything else to add or take off the chart. Note: You may end up having students start to discuss inaccuracies before you are even done with the lesson. Go ahead and acknowledge and address these as you go along. It is a good discussion for students to have with each other.
- This same activity can be used to send home and have students look around their house with a parent for ways electricity is used. Students bring back their Scavenger Hunt sheets and graph data. If you have graphed data from the school scavenger hunt, then it would be a great way to set up a Venn diagram and do some comparing between school and home energy use.
- Can students think of any ways to reduce energy use in any of these places?

- **WRITING**
  Students can draw/write about what they found on their scavenger hunt. Write a letter to the principal about what they noticed and see if it is possible for have a school-wide day of saving energy. Like Waste-Less-Wednesday, where everyone in the building tries to use less light. **ELA Literacy Text Types and Purpose K-6**

- **MATH**
  As a class have students graph the number of each item they found on their scavenger hunt. Once the graph is made, ask students to take a moment to look at it. Then have them turn and talk to their neighbor about what they noticed. Have students share out their findings. Ask students to talk about why they think there is more than one item found than another? What does that mean for energy use? Do you think there is something that can be done about changing it? Can we use less? (For example, if students found more light switches or lights, ask if we can turn them off instead of having them on all the time?) Schools will vary from place to place, so data will be determined by your own building. The examples in the book were chosen based on the highest collective usage. **Older students can go further** by using data found when researching to make charts that record data. Find out energy use from other states or countries and make a data usage chart. Compare and contrast the amount of energy used between countries/states and see where their state/country falls in the line of use. Why? Is it due to population? Resources available? Political power? A lot of different things can be looked at and from different points of view. **Social Studies**

CLASSROOM ACTIVITIES

SCIENCE K-6

- **I Spy!**
  - Send students on a **scavenger hunt** for ways people, communities, and scientists are coming together **to combat climate change.** Ask students to identify how the examples they find are reducing climate change.
    - Solar - Can they find any examples of solar power installations in their community? Do these solar panels serve a dual purpose and shade a parking lot?
    - Wind - Are there any windmills in the area? What is the power they generate used for? Are there any concerns with the windmills? *(birds)*
    - Does your city have any certified LEED (Leadership in Energy and Environmental Design) buildings? Have students check with the Chamber of Commerce or the Building Department. What are some specific features of the building that help the environment? *(Lots of natural light? Renewable building supplies? ect.)*
    - Does your community get any of its power from hydro or bio? Have them ask their local utility company. Can they drive by the source to see it?
    - Can students find any "purple pipes" in your area? Purple piping refers to lines designated for recycled water, which is treated to a level suitable for irrigation and industrial use, but not for drinking. Fresh water is one of Earth's most valuable resources and purifying water is hugely energy intensive. Filtering water to make it fit for irrigation not only saves fresh water but saves energy too!
    - Can students find any examples of native landscaping? Native plants almost always promote local ecology and biodiversity, save water, and reduce the need for pesticides.
    - Does your school or community library have water bottle filling stations?
    - Does your community promote bycicling or public transportation? How? How is public transportation powered in your community?
    - Does your community support any laws or ordanences about togo items in restaurants? Is styrofoam allowed? Straws? Plastic bags? Or do they have alternatives?
    - Are there recycling cans in your downtown area? Shopping centers?
    - Have students interview other teachers, the librarian, principal, or parents for ways to they could make their school a LEED certified building. *(more windows for natural light, solar, purple pipes, more trees, water bottle filling stations, ect.).* Have students draw diagrams of the school with these features included. What is the benefit of each feature? Let them share their ideas with each other to see if they can come up with anything new.
    - Can students find any other ways their community is combating climate change?

NGSS Energy ESS3-C, Earth and Human Activity ESS3.A, ESS3.C, ESS3.D, MS-ESS3-3 and 4, Engineering Design ESTA.A, ESTA1.B, ESTA1.C, 2-ETS1

- **The Air We Breathe**
  - Smear the bottom of a petri dish(es) with a very thin layer of Vaseline. Set the dish wherever you want to monitor the air (classroom counter, playground, home). Leave for 24 hours then see what you can observe.
  - **Older students can go further** by viewing results under a microscope. Compare your results with the current air quality reports for your area. All the particles students see through the microscope are called particulates. Meteorologists analyze particulate matter as one of many variables used to evaluate air quality. More particulates means poorer air quality. Many particulates come from burning fossil fuels. **ESS3.D**
- **Earth Hour Every Day**
  - Observe when natural light is best in your classroom and make a plan to turn off some or all of the lights for some or part of each day. Does this vary by season? Can you have Earth Hour every day in your own classroom or only certain days of the week/month? Why? **ESS1-1, ESS1-2**
  - **Older students can go further** by figuring out how much electricity it takes to keep all the lights on in their classroom each day and therefore how much they are saving by turning some/all of them off. How many metric tons of CO_2 does that represent a year?
- **Where Does My Energy Come From**
  - Contact your local utility company and find out the source of your electricity: renewable versus fossil fuels?
  - Is this the best source for your school/home? Do you have a choice of sources?

CLASSROOM ACTIVITIES

SCIENCE 3-6

ENERGY, CLIMATE CHANGE, GLOBAL WARMING

Preparation:

- One bag of mini chocolate chips
- Give each student 5 mini chocolate chips on a paper towel (you can put them in plastic snack bags if you prefer but it's better for the environment if you don't)

Lesson:

- Discuss the idea that **energy on Earth is finite**; it never disappears, it only changes form. *(There is the same amount of energy today as there was when the world began. When we use energy, we don't use it up completely; we change it into other forms of energy. When we burn wood, we change its energy into heat and light. When we drive a car, we change the energy in the gasoline into heat and motion. There will always be the same amount of energy in the world, but more and more of it will be changed into heat. Most of that heat will go into the air. It will still be there, but it will be hard to use. www.need.org).*
- Talk with students about how the **sun gives off heat** and keeps Earth warm. Energy from the sun keeps all of us, animals and plants alive. Without the sun, nothing on Earth would be alive.
- Discuss how **energy can be transferred.** (The sun => plants => animals & humans) For example, our bodies require energy (food) and give off energy (heat). To help get across the point that energy can be transferred, have students conduct an experiment.
  - Predict: Ask students, "What would happen if you pour all of the mini chocolate chips in your hand?"
  - Have students put the chocolate chips on their hand, then put their hands together for one minute (you can use gloves but it's better for the environment if you don't).
  - At the end of one minute, ask students to open their hands and see what happened. Discuss why the chocolate has melted.
  - It is due to heat energy from your hands. Your body has energy and some of that energy is given off as heat. It is what keeps us warm. This is how the chocolate melted in your hand.
  - What are some of the ways we trap the heat energy from our bodies? (hats, coats, gloves, shoes). If we have too much heat energy trapped inside our jacket we will get hot. This is similar to global warming.
- Discuss how **global warming leads to climate change -** Producing energy from fossil fuels creates air pollution. The pollution generated from all these energy sources is primarily greenhouse gases. Heat gets trapped close to Earth's surface by these greenhouse gases, similar to the way a car parked in the sun, with its windows closed, traps heat inside of it or how a jacket traps the heat form our bodies. Record temperatures and an increase in these gases have led scientists on every continent to agree that our planet is heating up. This is called global warming and it is causing climate change. Some **examples of how global warming is causing climate change** are: melting glaciers cause flooding and extreme weather events such as hurricanes and longer and more frequent droughts. A few effects of these changes are difficulties growing food and loss of habitat, forcing people and animals to relocate to new areas. Air pollution also causes medical issues such as asthma, heart disease, and lung cancer.
- Although the increase in climate change is caused by humans, we are also the ones who can control it. Discuss ways government, scientists (engineers), and people are tackling climate change.

NGSS Earth and Human Activity ESS3.A, ESS3.B, ESS3.C, ESS3.D, MS-ESS3-4, MS-ESS3-5

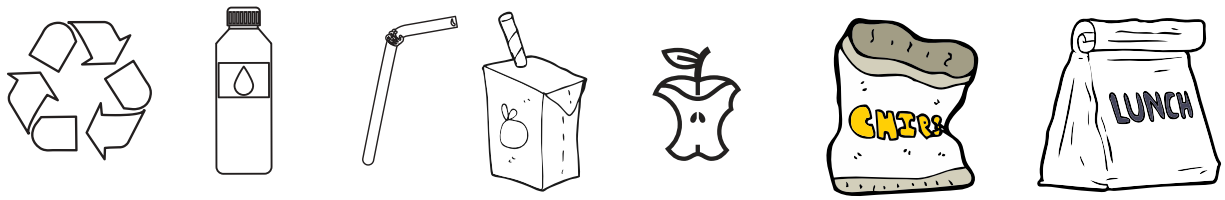
CLASSROOM ACTIVITIES

MATH 3-6

How Many Light-Hours Do We Use?

- Have students do an **at home light-hours survey** by the hour (5-6 pm, 6-7 pm, 7-8 pm ect.) either for one night or several. Every hour, on the hour, they can count the number of lights on in their house. Each light on counts as one hour. For example, if one light was on in the house from 5-6 p.m. that is one light hour. But if we turned two more lights on from 6-7 p.m. that is 3 light hours for a total of four light hours. What was the light being used for? Cooking dinner, homework, working on the computer, reading stories? Was that light helpful at that time?
- **Consolidate the data.** As a class, how many light-hours did they use each hour, each night? What was the total per house. What was the average per house? Was their house higher or lower than average? What fraction of students used less than average? What fraction used average?
- **Plot and summarize** the data at a grade appropriate level.
- **Brainstorm** ideas for how every house could use 10% fewer light-hours.

Measurement And Data 3.MD.B.3, 4.MD.A.2, 5.MD.B.2 Understanding Fractions 3.NF.1, Statistics and Probability 6.SP.B.4, 6.SP.B.5.A-D



MOVEMENT & GAMES K-6

Recycle challenge

- One of the **best ways to conserve resources is to recycle.** For many materials (paper, aluminum, glass) it takes far less energy to make new items out of recycled material than it does out of virign material. Therefore, it is an important lesson in Environmental Literacy to know what is recyclable and what isn't. Not only does this help us conserve energy but it also helps us make better purchasing decisions.
- **Gather a collection of items** (recyclable, compostable (plastic fruit as an example), landfill). Encourage students to bring items from home. The vast majority of waste at school comes from lunch so be sure to include lots of lunch items (milk cartons, water bottles, straws, napkins, plastic spoons, plastic single use food trays, juice boxes, plastic baggies, tin foil, chip bags, paper bags, orange peels, ect.).
- Line up three cans color coordinated to your school trash can (e.g. black for trash, blue for recycle, green/brown for compost). Hold the items up one-by-one and have students tell you **where it should go**. Recycle challenge is based on what's recyclable in your area. Are more or fewer items recyclable? Once students have mastered the activity as a class you can **take it outside** as a relay challenge and add more difficult items like juice boxes and Styrofoam.
- **Conduct A Lunch Trash Audit -** Spread a tarp on the ground. Dump a trash can full of lunch trash on the tarp. Have students identify recyclable items that ended up in the trash. What percentage of the volume do they think could have gone into recycle instead. Share your findings with other classes. Have students play the recycle challenge with other classes. Then repeat the trash audit one week later. Did your school improve?
- **Older students can go further** by having them **research what's recyclable in your city** and what's not. Most of our trash is recyclable. Yet, not all waste management companies take all recyclable items. Why? *(Recycling and waste management companies are for-profit businesses. It depends if there is a market for them to resell what they collect).*

NGSS Earth and Human Activity ESS3.A, ESS3.C, ESS3.D, MS-ESS3-4

CLASSROOM ACTIVITIES

MOVEMENT & GAMES K-6

- **How Much Pollution Is Generated When I...?** We don't often think about how much air pollution we generate with our daily activities. Here is a fun game to help students visualize their activities in terms of CO2. Please note, this is not "exact" and is only intended to give students a thought inspiring visual. Since different electronics use different watts, and different sources of energy produce different amounts of CO2, there is no way to know for certain the exact amount of CO2 produced by each activity.

    - Preparation - Have students bring in 5-6 cardboard cereal boxes from home. An average cereal box is .11 cubic feet. Don't worry if the boxes are slightly larger or smaller. Remember this is only an estimate activity. Deconstruct the boxes, lay them flat, and have students decorate the inside (plain side) with pictures and facts they've learned from this unit: energy if finite, burning fossil fuels creates CO2 pollution, ways to conserve energy, sources of clean energy are..., ect. Reconstruct the boxes with glue, tape, or staples.

    - Energy usage for electronics is measured in watts/kilowatt hours. For example, an average 32" plasma flat screen TV uses 160 watts or 0.16 kWh. Write the activity list from the table below on the board in random order. Have students rank the list from highest to lowest per hour of energy usage (Note: the list is currently in high to low order.)

Activity	Kilowatt Hrs (kWh)	Pounds-CO2/hr	Kilograms-CO2/hr	# Ceareal Boxes
Drive to School	.15 gallons of gas	2.7 lbs.	1.233 kg	212
Bubble Bath 30 gal.	.000293 / f. degree	.34754 lbs.	.1833	27
32" TV / hr	.16 kWh	.1808 lbs.	.0954 kg	14
Xbox One / hr	.09 kWh	.1017 lbs.	.0536kg	8
Read w/ LED light/hr	.006 kWh	.00678 lbs.	.00357 kg	1
Play Outside	0	0	0	0

- The decorated boxes represent the volume of CO2 generated by burning fossil fuels. Have students stack the number of boxes they think corresponds with each activity then check their answers. E.g. watching TV for one hour generates the equivalent volume of 14 boxes of CO2 but playing XBox for 1 hour is 22 boxes because you need a TV to play Xbox.

- **Older students can go further** by inviting younger grades to **Buddy Read** EARTH HOUR then participate in your project. Consider conducting the activity near the time of your school science fair so you can save the boxes to use in the fair and all students can participate.

NGSS Earth and Human Activity ESS3.A, ESS3.B, ESS3.C, ESS3.D, MS-ESS3-4, MS-ESS3-5

CLASSROOM ACTIVITIES

ART

Earth Hour Pledge Globe

One of the benefits of Earth Hour is that children can contribute to conservation and participate on their own. Making mindful choices is a big part of this participation and a huge step toward environmental stewardship. Earth Hour pledge globes help them along this path.

Materials:

- One copy of the Earth Hour Pledge Globe sheet (located at the end of this guide)
- Markers or crayons
- Brass fasteners ("brass brad")
- Hole punch

- Have students brainstorm different ways they can help reduce climate change such as turning off the lights when they leave the room, packing a waste-free lunch or snack for school, remembering to bring a reusable water bottle to school and sports, or refusing plastic straws. Encourage them to remember ideas you discussed in the lesson(s) even if they are not within their control, such as chosing renewable energy sources, installing solar panels, or planting a native garden.
- Give each student a copy of the Earth Hour Pledge globe to fill in per your directions. Younger students can color the land and water while older students can identify the continents.
- When they are finished filling in the picture have them trim the outside using the cutlines provided. Then have them cut the globe in equal width strips using the lines as a guide. IMPORTANT. To make sure the strips don't get out of order have students cut one strip at a time and number them as they go. For example, after they cut the first strip write a tiny #1 on the end. Now they can cut a second strip and write a small #2 on the end. Repeat until all the strips are cut and numbered.
- On the back of one or all of the strips (as close to the center as possible) students can write their Earth Hour pledges or different ideas they came up with to help the environment.
- Punch a hole in each end of all the paper strips. Stack them all one on top of the other (colored/picture side down) starting with strip #1, followed by #2 and so on. Put a brass brad through all of the holes on one end then put another brass brad through all of the holes on the other end.
- Carefully Make a "U" shape with all of the paper strips and fan them out to make a globe.
- The strips won't fit together to form a solid exterior so students will now be able to see their pledges on the inside.
- The globes make wonderful classroom decorations if you tie a piece of ribbon or fishing line to the brass fastener and hang them up.

ADDITIONAL RESOURCES

READING

K-2

- Global Warming by Seymour Simon, 2013
- Heros Of The Environment by Harriet Rohmer, 2009
- Loony Little, An Environmental Tale by Dianna Aston, 2007, 2020
- Manfish: A Story Of Jacques Cousteau by Jennifer Berne and Eric Puybaret, 2015
- The Boy Who Harnessed The Wind: Picture Book Edition by William Kamkwamba and Bryan Mealer, 2012
- The Magic School Bus and Climate Change by Joanna Cole and Bruce Degen, 2012
- The Tree Lady by H. Joseph Hopkins and Jill Mc Elmurry, 2013
- What A Waste by Jess French, 2019
- What If Polar Bears Disappeared? Lily Williams, 2018
- What If There Were No Bees? by Suzanne Buckingham Slade and Carol Schwartz, 2010
- What Is Climate Change by Gail Herman, 2018

3-6

- A Bird On Water Street by Elizabeth O. Dulemba, 2014
- Fuzzy Mud by Louis Sachar, 2015
- Global Warming by Shelly Buchanan, 2015
- Hoot by Carl Hiaasen, 2005
- The Last Wild by Piers Torday, 2015
- The Boy Who Harnessed The Wind Young Readers Edition by William Kamkwamba, 2016
- Willa Of The Wood by Robert Beatty, 2019
- Who Was Jacques Cousteau? by Nico Medina, 2015
- Who Was Rachel Carson? by Sarah Fabiny, 2014

ONLINE RESOURCES

NATIONAL ENERGY EDUCATION DEVELOPMENT PROJECT (www.need.org)

- **The 10 Energy Sources Poster** (https://the-need-project.myshopify.com/collections/energy-sources/products/energy-sidekicks-renewable-nonrenewable-chart)
- **Energy Info Book** (link to all grades: https://the-need-project.myshopify.com/products/energy-infobooks)
- **Energy Bingo** (https://www.need.org/resources/energy-bingo-games/?portfolioCats=34)
- **Energy Coloring Sheets** (https://www.need.org/educators/awesome-extras/coloring-sheets/)

CLIMATE LITERACY AND ENERGY AWARENESS NETWORK (https://cleanet.org/index.html)
The CLEAN Collection of Climate and Energy Educational Resources is a collection of 700+ free, ready-to-use learning resources rigorously reviewed by educators and scientists suitable for secondary through higher education classrooms.

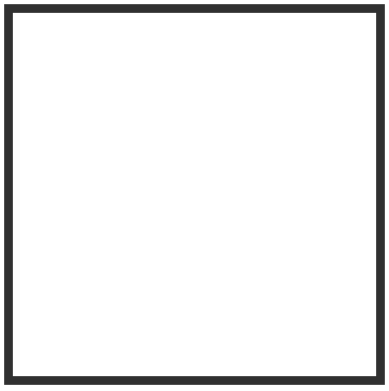
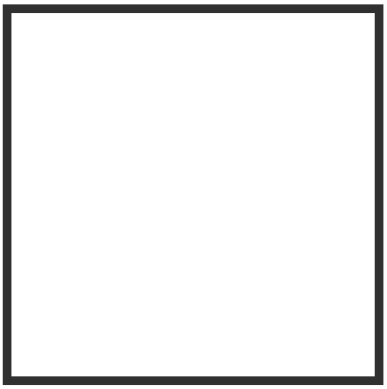
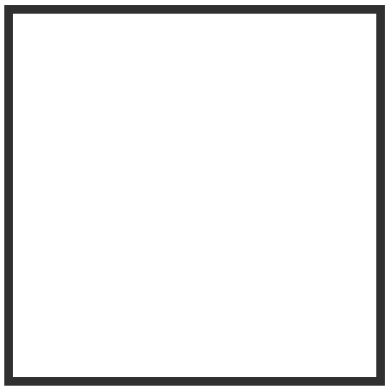
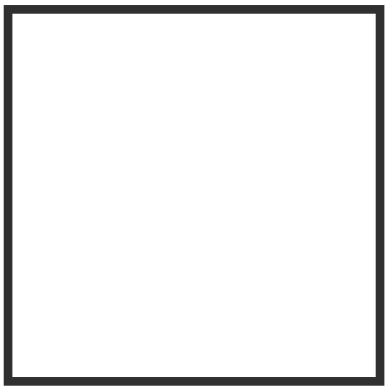
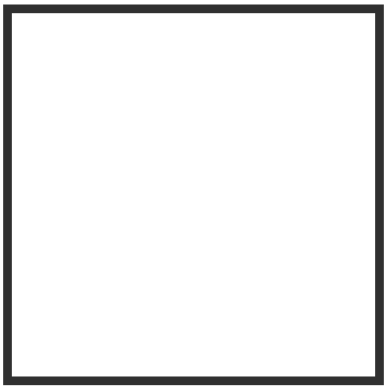
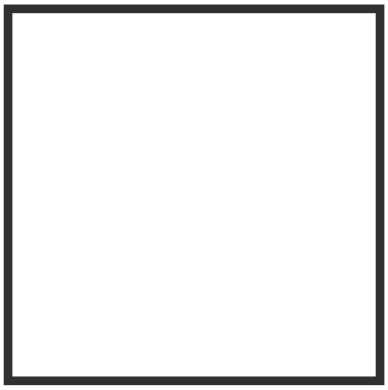
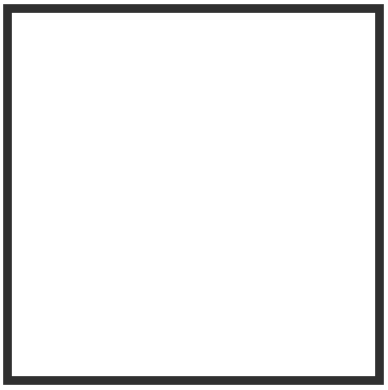
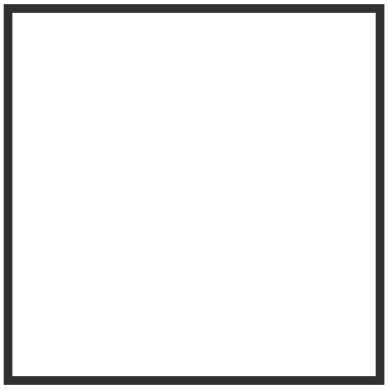
YOUTUBE LINKS

- **Renewable Energy 101** - National Geographic (https://www.youtube.com/watch?v=1kUE0BZtTRc)
- **Global Warming 101** - National Geographic (https://www.youtube.com/watch?v=oJAbATJCugs)
- **Cause And Effects of Climate Change** - National Geographic (https://www.youtube.com/watch?v=G4H1N_yXBiA)
- **Greta Thunberg At The U.N. On Climate Change** (https://www.youtube.com/watch?v=bW3IQ-ke43w)

GREEN RIBBON SCHOOLS

- 2019 Green Ribbon Award Recipients (https://www2.ed.gov/programs/green-ribbon-schools/highlights-2019.pdf)

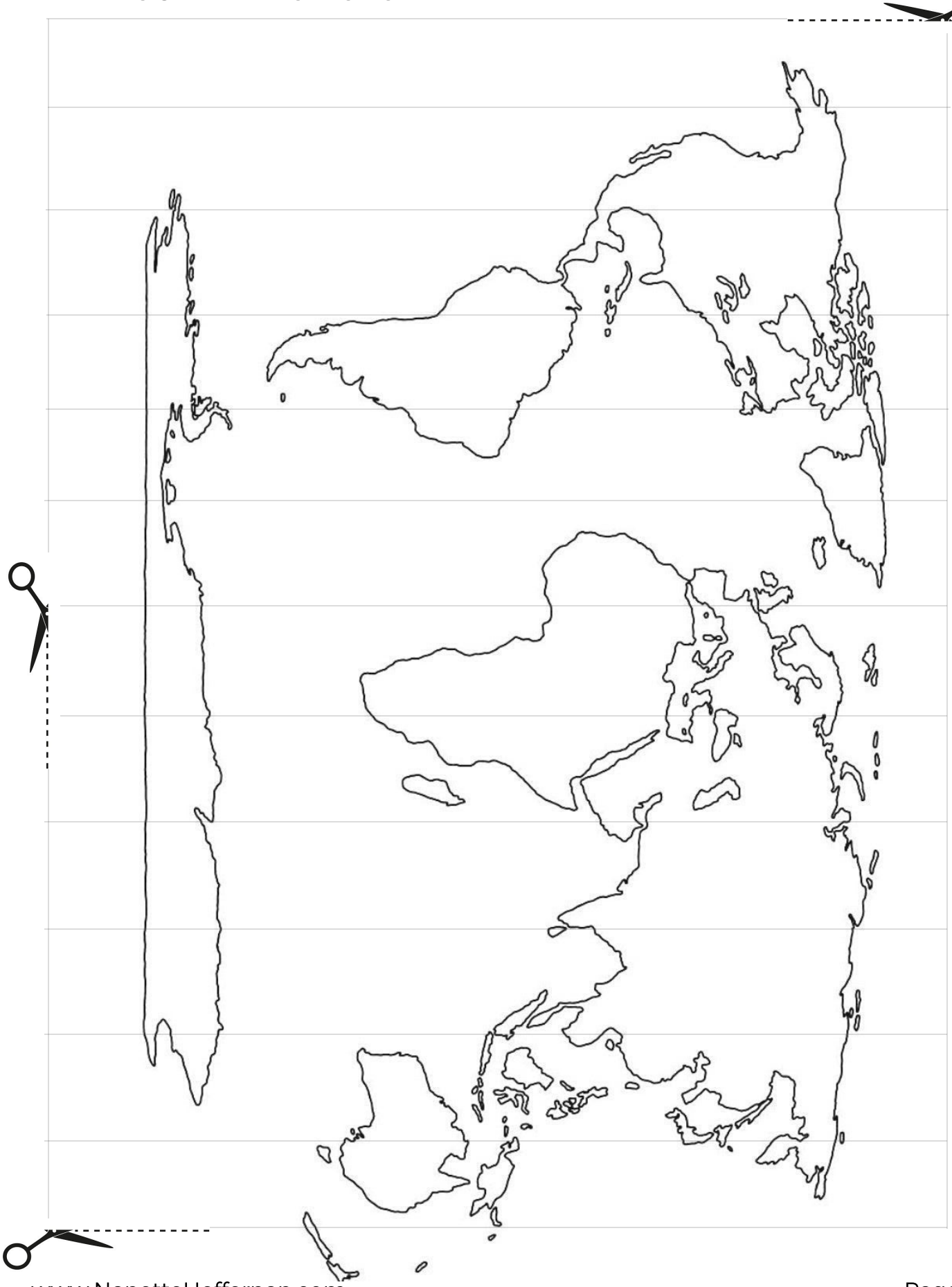
EARTH HOUR SCAVENGER HUNT (A)

ITEM	QUANTITY	ITEM	QUANTITY
			
			
			
			

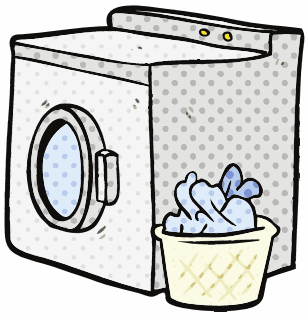
EARTH HOUR SCAVENGER HUNT (B)

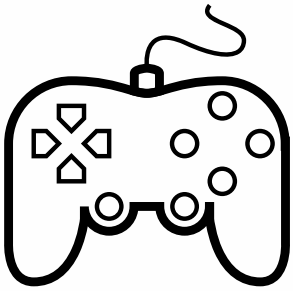
ITEM	QUANTITY

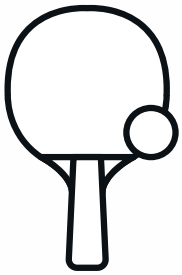
EARTH HOUR PLEDGE GLOBE

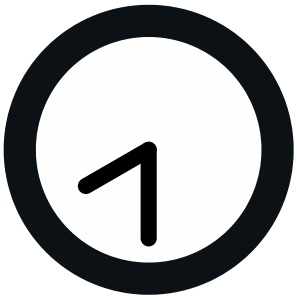


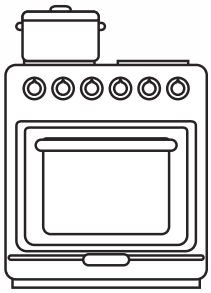
ENERGY CARDS (A) Cut and sort. Which items use energy (electricity/fuel/stored energy) and which don't?

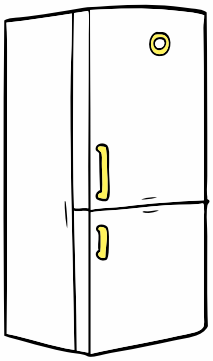


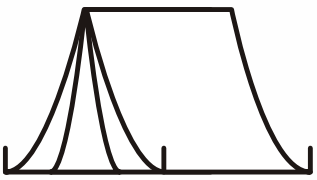


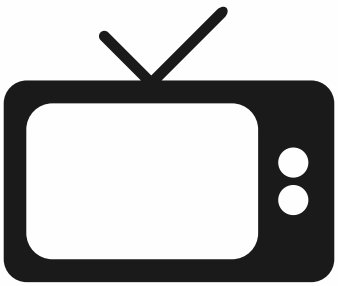


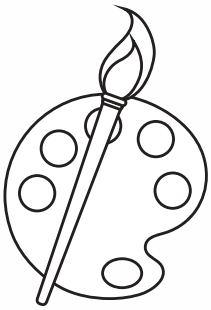




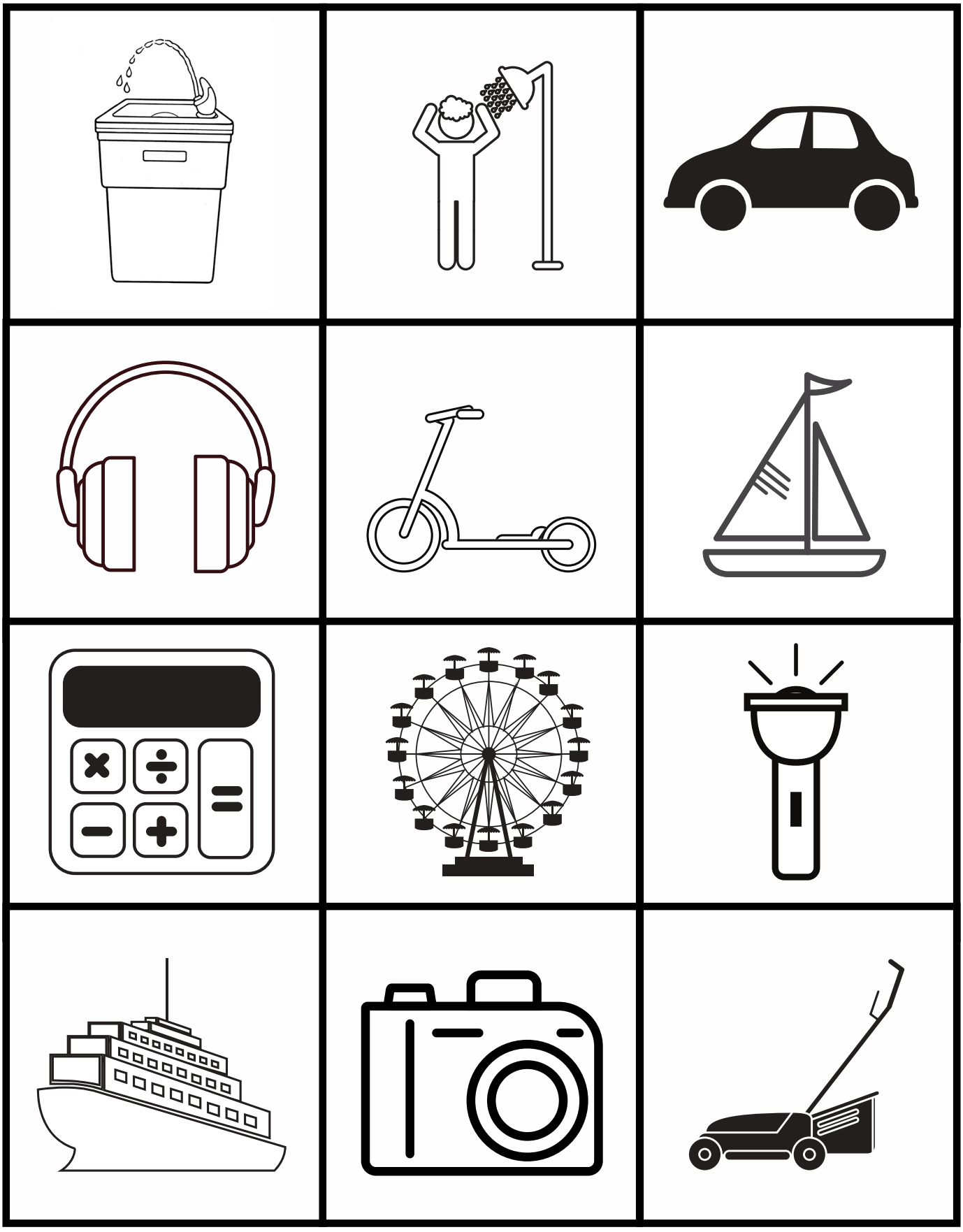








ENERGY CARDS (B) Cut and sort. Which items use energy (electricity/fuel/stored energy) and which don't?



ENERGY CARDS KEY

ENERGY CARDS A

(left to right)

- Y - Washing machine/laundry
- Y - Lightbulb
- N- Whisk (only human energy which is stored energy)
- Y - Video Games
- N - Ping Pong
- Y - Clock (electric or stored energy in a battery)
- Y - Stove/cooking
- Y - Refrigerator
- N - Camping
- N - Reading
- Y - TV
- N - Art

ENERGY CARDS B

(left to right)

- N - Drinking fountain (water bottle filling stations are electric)
- Y - Hot shower (water heaters are either gas or electric)
- Y - Car (gasoline)
- Y - Headphones (power cord or rechargeable battery)
- N - Scooter
- N - Sail boat (primarily wind)
- Y - Calculator (stored energy from a battery)
- Y - Ferris Wheel
- Y - Flashlight (stored energy from a battery)
- Y - Ship (usually diesel)
- Y - Camera (stored energy from a battery)
- Y - Lawnmower (gasoline)

CONTACT INFO

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