

ADVANCED LEARNING LABS

Collaboration between NC Department of Public Instruction and AIG Teachers across the state

TO ENGAGE, ACTIVATE, AND GROW OUR STUDENTS

GRADES

K-1

Energy



ENGLISH LANGUAGE ARTS

The Sun and wind are both sources of energy.

Listen to this version of Aesop's fable "The North Wind and The Sun at this link:" <https://www.youtube.com/watch?v=TrFUYAJXWLU>

Create paper puppets of the Sun, the North Wind, and the man. Retell the story to a family member using the puppets.

Discuss the following questions with your family:

- Which is stronger in this fable, the sun or the wind? Use details from the story to support your opinion.
- Which source do you think gives more energy in real life? Give reasons for your opinion.
- What is the moral (lesson) that is told at the end of the story? How does the story teach this lesson?



SOCIAL STUDIES

How do people change the environment?

Watch this video to see how humans changed the island of Manhattan: <https://thekidshouldseethis.com/post/how-do-living-things-change-their-environments>

Consider your community. Draw a picture or make a list comparing your community today to what you imagine it may have been like 400 years ago.

- What plants and animals live there?
- What natural resources do people in your community use? Consider water, wind, sunlight, plants, wildlife, etc.
- How have people changed the environment where you live? Consider planting, building, roads, water use.
- Which resources are used or changed to fulfill our need for energy?



SCIENCE

Plants need energy to live. Watch the video at this link to learn how plants use photosynthesis to make their own food: <https://www.youtube.com/watch?v=lln136eMI4g>

Summarize what plants need for energy and growth.

Humans get some of our energy from eating plants. Plants are also food for other animals.

Make a list of plants that you eat.

- Is there a plant you would like to try?
- Is there a plant that is your favorite? Why?



MINDFULNESS

Do you ever have trouble feeling energetic in the morning? You can connect your breathing with movement to help you wake up and gain energy.

Practice the strategy in this video: <https://www.youtube.com/watch?v=O29e4rRMv4>

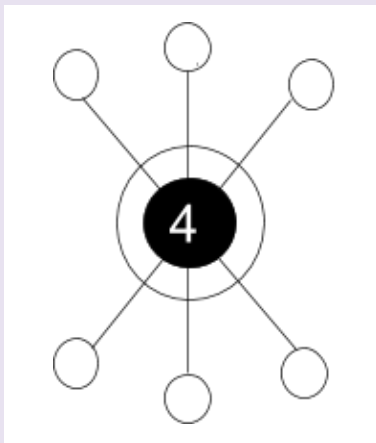
- How did you feel before practicing the strategy?
- How did you feel after practicing the strategy?
- How might this be a good way to help yourself wake up in the morning?
- How could you use this strategy at other times in your day?

Energy



LOGIC PUZZLE

Fill in the circles at the end of the sun's rays using 1, 2, 3, 5, 6, 7 so that all three numbers in a line must equal 12. Use each number only one time.



FIELD STUDIES

Did you know some living things can create their own light? This is called bioluminescence.

Watch this video to learn more: <https://www.youtube.com/watch?v=oKjFVBVGad0>

- What are some potential uses for bioluminescence?
- If you could create your own light, from where on your body would you want it to be emitted?
- In what situation would you use the ability to create your own light, and why?

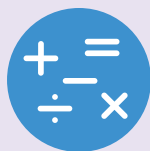
Draw a picture of yourself as if you had bioluminescence and share it with a family member or friend.



RESEARCH EXPLORATIONS

Kinetic energy is the energy of motion. Let's explore it by creating a chain reaction that will demonstrate kinetic energy.

1. Gather some dominos or similar objects.
2. Create a path where each domino stands on its end close enough to the next domino so that it will hit it if it falls.
3. Look at the dominos after they are set up. They are not yet moving, so they have potential energy.
4. Tap the lead domino and watch the chain reaction. Motion is kinetic energy!
5. Create more complex chain reaction paths.
 - What does your research through repeated trials teach you about kinetic energy?
 - List other times that you observe kinetic energy.



MATH

Daily habits contribute to your energy level. Collect and analyze data to determine which habits make you feel healthy and energetic.

Track your habits for one week. Include what you eat, how many times you exercise, and how much rest you get.

Create a chart to display the data you collected. Analyze the data through the following questions:

- How does your data differ from day to day?
- What day did you get the most rest? The least exercise?
- Which day did you feel the best? What does your data tell you about this day?
- What questions can you create about your data? Ask a family member to answer them.

What does your data tell you about which habits make you feel healthy and energetic?



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GRADES

2–3

Energy



ENGLISH LANGUAGE ARTS

Words are powerful and have the ability to impart energy, causing people to think, to feel and to act.

What is a topic that you feel strongly about? What would you like to see people start doing or stop doing for the betterment of a cause, person, or place?

Once you have chosen a topic, plan and write an opinion piece that takes a position on the topic, supporting your opinion with reasons that ultimately energizes the readers and encourages them to act.

Your opinion piece could be in the form of a letter to the editor of a newspaper, a magazine article or blog.

The topic and format you choose are completely up to you and depend on your own interests and energy.



SOCIAL STUDIES

Energy is a combination of a person's physical and mental powers, typically as applied to a particular task or activity. How can citizens' energy contribute to the well-being of a community's natural environment?

Brainstorm ways citizens in your community can use both their physical and mental energy to benefit the local natural environment. Create an "environmental energizer workout plan" for yourself, choosing items from the list that utilize both your mental and physical energy.

Photograph before and after pictures of the physical environment you're cleaning and then advertise your "environmental energizer workout plans" to others to encourage them to contribute to the well-being of your community's natural environment.



SCIENCE

Static electricity is the buildup of electrical energy created when rubbing two objects together. How do you measure this type of energy? An electroscope is one instrument used to measure energy in the form of electricity.

Use the guide at this link to create your own electroscope: <https://www.scientificamerican.com/article/static-science-how-well-do-different-materials-make-static-electricity/>



MINDFULNESS

Through the mindful practice of grounding your energy, you can calm your body when you are too positively or negatively charged, returning you to a neutral state.

One way to ground your energy is to take time to notice things around you and be mindful of your surroundings.

Find a quiet place that will help you focus on your surroundings and ground your energy using your five senses. In your mind or on paper, list 5 things you can see, 4 things you can touch, 3 things you can hear, 2 things you can smell, and 1 thing you can taste.

After creating your list, use it to be mindful of your energy and to determine how you feel afterwards.

Energy



LOGIC PUZZLE

WindToys Logic Puzzle

Figure out each student's favorite toy using the following clues:

- Roberto does not like bubbles.
- Meng-Wei likes the sky.
- Mariam does not like to throw.
- Jeremy does not like spinning things.
- Roberto likes to throw and catch.

NAME	KITE	BUBBLES	PINWHEEL	FRISBEE
Roberto				
Mariam				
Meng-Wei				
Jeremy				



FIELD STUDIES

Music has a direct impact on the energy level and mood of many people. Upbeat, fast-paced music gets them pumped up and energized, while quiet music helps them feel calm and relaxed. How does music impact your energy level and mood?

Create two playlists: one with fast-paced songs and one with slower-paced songs. Establish a route (a circular route works best) and ask family members or friends to participate in your field study.

- Week one: run the route with no music, record everyone's times, distance, etc.
- Week two: run with fast-paced music and record the data.
- Week three: run the route with slower-paced music and record the data.

Did the faster-paced music energize people? Make them run longer? Did one type of music energize you?

Design an experiment to test the type of music that lowers your energy and calms you most.



RESEARCH EXPLORATIONS

Static electricity was first discovered around 600 BC by the Greek philosopher Thales of Miletus. He noticed that if amber was rubbed hard enough, particles of dust would start to stick to it. Some 2,000 years later, the word "electricity" was first used, based on the Latin word "electricus" meaning "like amber."

These days, static electricity is used in copy machines, in air fresheners, to paint cars, and to control pollution of smokestacks. You can learn more about it here:

<https://www.loc.gov/everyday-mysteries/item/how-does-static-electricity-work/>

Though static electricity is energy and not magic, watch this video for ideas on how to create your own magic show using static electricity: <https://www.youtube.com/watch?v=ViZNguYt-Y>



MATH

Energy comes in many forms, but how do you access it? One way we "get" energy is from the food we eat. Here's a recipe for "Peanut Butter Energy Bites:" <https://tasty.co/recipe/peanut-butter-energy-bites>

Research the total costs to purchase each of the ingredients. Keep in mind that even though you will not need a whole bag of chocolate chips, you will have to buy a whole bag.

Once you have the total cost of all ingredients, which can be rounded, divide by the serving size (16) to calculate the cost to make one serving. Note: the actual cost will be a little less, because for most ingredients you'll have some left over.

Decide how to price each energy bite to make a profit, which is the difference between the amount earned and amount spent.

Create a unique name for your energy bites and design a poster advertising them for sale.



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GRADES

4–5

Energy



ENGLISH LANGUAGE ARTS

Good writing has the ability to energize people and call them to action. What is a topic that you feel strongly about? It often helps to think about something you want people to start doing or that you want them to stop doing.

Once you have chosen a topic, craft an opinion piece that takes a position on the topic, supporting your opinion with reasons and information that ultimately energizes the readers and encourages them to act.

Your opinion piece could be in the form of a recorded video commentary on a local news channel, vlog, motivational speech, or TED Talk. The topic and format you choose are completely up to you and depend on your own interests and energy.

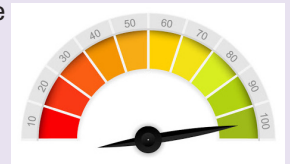


SOCIAL STUDIES

Civic participation is the energy we invest in for the health of our community. Research ways citizens can participate in their community as well as signs of a healthy community. Create a civic participation energy scale and corresponding community health scale to show this relationship.

Provide examples of minor ways, or those that take low energy for citizens to participate in their community, which would be rated a 10 in the red on the meter below. One example of a minor way could be picking up litter. Provide examples of major ways, or those that take high energy for citizens to participate in their community, which would be rated near the 100 in the green on the meter below. Chart each example with the corresponding energy impact on the health of the community.

Why is energizing levels of civic participation in the U.S. so important?



SCIENCE

Using wind as a source of energy dates back to 5000BC when early Egyptians used wind to sail boats on the Nile River. The National Energy Education Development (NEED) Project began as a way to educate people about energy efficiency and using renewable resources.

Read more about types of wind, uses of wind, and ways to measure wind in the "Energy from the Wind" student guide developed through NEED at this website: <https://www.need.org/wp-content/uploads/2019/11/Energy-From-The-Wind-Student-Guide.pdf>

On page 17, follow the instructions to learn how to make an anemometer to measure wind speed and gather your own wind data!



MINDFULNESS

Through the mindful practice of grounding your energy, you can calm your body and return to a neutral state. When you connect with others, whether negatively or positively, you're engaging in some form of energy exchange, and eventually that can zap your energy. One way to ground your energy is to shield it by taking quiet time for yourself to think, reflect and be calm.

Find a quiet space and design an "energy shield" for yourself; think of things that replenish your energy and help you to feel calm, safe, secure, and supported. Use these things to design your shield. Hang it in your room.

Take five minutes each day this week to sit and think, focus on your shield, and ground your energy. Reflect on your energy levels at the end of that week.

Energy



LOGIC PUZZLE

Harry Spotter Windy Myths Logic Puzzle

Professor Huggdatreaz asked Nevi to take the researchers' reports to Professor Dieseldore. Unfortunately, a gust of wind came up and blew the reports out of Nevi's hands into the lake.

Help match the researcher to their data in this puzzle:
https://docs.google.com/document/d/1E5j_ZqgT32-61LAiz_UtTGAKfuJkCGRM3tSzZIZQX-o/copy



FIELD STUDIES

Music has a direct impact on the energy level and mood of many people. Upbeat, fast-paced music gets them pumped up and keeps them energized, and quiet music helps them to calm down and relax.

Read this article: "4 Remarkable Ways Music Can Enhance Athletic Performance" on the website below:
<https://thehealthsciencesacademy.org/health-tips/music-can-enhance-athletic-performance/>

As you read, look for evidence of the relationship between music and energy through mental and/or physical performance.

Create three separate playlists based on information in the article: one to increase an athlete's speed, one to help focus on a task or skill, and one to help calm any pre-competition anxiety. Choose your favorite song in each of these categories: energize, focus and calm.



RESEARCH EXPLORATIONS

Renewable energy comes from natural sources and is constantly replenished by nature. Besides wind, water, and solar energy, Duke University is helping hog farms in NC use hog waste to generate electricity. Read an NPR article about it here: <https://n.pr/3eOd3yV>

View this video for another example of using waste to create electricity: <https://youtu.be/ziS7yYFT6jc>

How much energy do we use? How Much Do You Consume? <https://www.energy.gov/eere/how-much-do-you-consume>

Share your research findings with your family. Brainstorm ways your family could start using less energy or using renewable resources to create an energy conservation plan for your family.



MATH

Using energy costs money. The more you use, the more you pay. Use the energy calculator and make a list of the top 10 ways your family uses electricity. Here is a link to the energy calculator: <https://www.energy.gov/energysaver/maps/appliance-energy-calculator>

Add the totals to get your average yearly cost for all ten ways. Divide the totals to see how much the cost is per month, then per week, and finally per day.

Discuss with your family how you can begin to reduce your use of electric energy each day.

Then calculate the costs again, using the amount your family agreed on. How much did you save per year, month, week, and day?



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GRADES

6–7

Energy



ENGLISH LANGUAGE ARTS

Many of today's modern movie and comic book heroes have superpowers that have originated from sources such as radiation, mutations, or even exposure to aliens.

Create an original superhero whose power is derived from a source of energy such as wind, solar, or water.

Write a narrative of the superhero's experiences that led to superherodom. Be sure to include narrative techniques such as dialogue, pacing, and description to develop experiences, events, and characters.



SOCIAL STUDIES

Between 1960 and 1970, Egypt undertook a mammoth engineering project that would lead to flood control, an irrigation system, and hydroelectric energy; it was the building of the Aswan High Dam. The dam, however, would flood several monuments built in Ancient Egypt, including the Temple of Abu Simbel and the Temple of Isis. There was an outcry worldwide that led to the preservation of these monuments.

Watch this video to learn more about the building of the dam and the preservation of the historical sites:

<https://whc.unesco.org/en/list/88/vid>

Using the information from the video, create a podcast that conveys how communities should weigh the benefits of hydroelectric power against the importance of cultural heritage.



SCIENCE

Energy is defined as the capacity to do work. Follow this first link from NASA to watch Astronaut Joe Acaba demonstrate potential and kinetic energy aboard the International Space Station: <https://www.nasa.gov/stemonstrations-energy.html>

As you watch, observe the differences in the two types of energy. How can the same object have different potential energies?

Design an experiment to determine which of several household objects have the most kinetic energy when held at the same height. How can you increase an object's potential energy?

Record this in your science notebook.

View this video for a more complex understanding of the concepts: <https://www.youtube.com/watch?v=g7u6plfUVy4>



MINDFULNESS

Approaching situations or people with enthusiasm at times can deplete our energy levels. This happens when the energy we bring to the situation is blocked or rejected. Like liquid in a paper cup with small holes in it, our energy drains. Consider the relationships you have with others.

- Do these relationships cultivate or drain your energy?
- What do you do to foster energy in those around you?

Devise a plan of action to use when you are around someone who drains your energy.

Need some ideas? Try some of the tips from PsychologyToday to help you overcome negative energy by reading the article at this link: <https://www.psychologytoday.com/us/blog/the-ecstasy-surrender/201412/tips-sensitive-people-protect-their-energy>

Energy



LOGIC PUZZLE

This “burning rope” problem is a classic logic puzzle. You have two ropes that each take an hour to burn, but they burn at inconsistent rates. How can you measure 45 minutes?



FIELD STUDIES

Ocean waves are powerful. Whether you have felt them at the beach, seen them in a movie, or read about them in a book, you are most likely familiar with the image of someone getting knocked over in the ocean. There are scientists who are studying how to harness the energy of ocean waves to create renewable energy. Explore both links below to learn about two different methods that are under research:

- <https://www.youtube.com/watch?v=1LJpBnxzG30>
- <https://www.sciencenewsforstudents.org/article/ocean-energy-could-be-wave-future>

Which of these two methods seems like the more viable option? Research to determine if there are additional methods being explored. Have any of the methods been used before now to generate electricity?

What are your thoughts about the barriers in making this a common energy source? Record your ideas in your science notebook.



RESEARCH EXPLORATIONS

You work for a design company that specializes in harnessing water energy. Your city wants to use hydroelectric power instead of coal as an energy source to limit air pollution. Your engineering team will design and test several water wheels for the firm to create the most efficient design for the city. Calculate the power created and work done by measuring force, distance, and time for your team.

Watch the video for instructions on how to create a waterwheel use the H2O solutions sheet at this website to make your calculations: https://www.teachengineering.org/activities/view/cub_energy_lesson02_activity1

H2O Solutions Sheet: https://www.teachengineering.org/content/cub /activities/cub_energy/cub_energy_lesson02_activity1_waterwheelworksheet.pdf



MATH

The Juno spacecraft became the most distant solar-powered spacecraft in 2016. To gather enough power during its journey, Juno has three, 30-foot arms covered in solar cells.

Scientists use the inverse square law to determine the solar power required for a journey. Visible light follows the inverse square law, which is represented as $1/r^2$. Jupiter is 5 times farther away from the Sun than Earth. Using the inverse square law, $1/(5^2)$, Jupiter has only $1/25$ as much available light as Earth.

Demonstrate how the inverse square law helps determine the required solar power for space trips. Did your findings meet the requirements of the inverse square law? Explain. Why is it important for scientists to understand this relationship on space missions?

Use this link to help you with your demonstration: <https://www.jpl.nasa.gov/edu/teach/activity/collecting-light-inverse-square-law-demo/>



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GRADES

8–9

Energy



ENGLISH LANGUAGE ARTS

You work for an investment firm that is dedicated to supporting renewable resources while also turning a profit. You have been tasked with researching all possible investments in renewable resource energy, evaluating environmental impact and production cost, and deciding on the best investment for your company. Doing well on this task could result in a promotion, so it is important to be thorough and prepared.

Your boss has asked you to prepare the following:

- A one-page argument supporting your claim regarding which renewable resource is the best choice for the firm, using valid reasoning and sufficient evidence.
- A presentation to share with the board that includes options and arguments for the best choice.



SOCIAL STUDIES

In the early 1940s, the Tennessee Valley Authority (TVA) built the Fontana Dam in western North Carolina to provide power for the war effort. While it provided flood control measures and made electricity possible for those who lived in the region, many towns were flooded under Fontana Lake's deep waters. This phenomenon is also true in other manmade lakes in neighboring states.

Explore the links provided below, as well as ones you find on your own to learn more. Create a presentation that showcases how the creation of these hydroelectric lakes affected the quality of life and settlement patterns. Remember to cite your sources.

- <https://bit.ly/3qAYLJF>
- https://www.sosnc.gov/divisions/publications/kids_page_history



SCIENCE

The sun produces energy through radiation. This is the energy source that people use when they have solar panels, but any of us can use the sun's radiation to cook.

With parent/guardian permission, follow the link below and create a solar oven with a handful of household items such as a box, aluminum foil, plastic wrap, tape, a pie tin (or more aluminum foil), a skewer or a stick, and a black sheet of paper.

How to create a Solar Oven link: <https://www.youtube.com/watch?v=kBmy-Aelzp0>

There are several recipes available at the recipes link. In your science notebook, record the steps you take as well as the results for each recipe you try!

Recipes Link: <https://www.sunshineonmyshoulder.com/6-easy-recipes-for-kids/>



MINDFULNESS

Lack of energy can hinder our ability to focus. Feeling energized can be as simple as getting enough sleep, exercising, or taking mental breaks. Follow these steps to take a mental break:

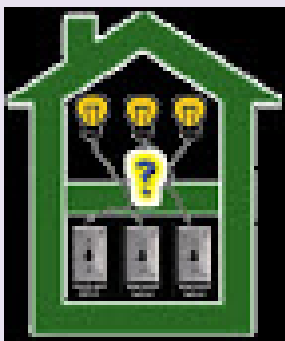
- Hold your arms out in a circular shape in front of your chest with your fingers loosely touching, as if holding a big ball.
- Close your eyes and visualize energy flowing in a counterclockwise direction through the circle created by your arms.
- Imagine the energy is like a gush of water in a huge hose, powerful and unstoppable.
- Focus on the energy flowing through your arms.
- Hold this pose as long as you can.
- Shake your arms out and try again.
- Do this several times each week until you can hold your arms out several times without feeling tired.

Energy



LOGIC PUZZLE

You have three light switches in the basement of your house. The lights are on the top floor of your house and are turned off. You do not know which switch is connected to which light. You can go upstairs only once to check the results after you are finished with changing the light settings (i.e. turn switches). Given these restrictions, how do you find out the connectivity between all switches and bulbs?



FIELD STUDIES

In 1977 in the Soviet Union, the first nuclear reactor at Chernobyl appeared online. When all of the reactors were built, they supplied 10% of the power for the state of Ukraine. In 1986, a design flaw led to a power surge during a test to reactor #4 and the nuclear core reactor overheated. While more than 100 individuals died as a direct result of the radiation, there have been thousands more deaths attributed to the radiation that was released.

Only eight months after the accident, a sarcophagus was built over reactor #4 to help contain the ongoing radiation. In 2017, another layer of containment was added since the first sarcophagus had deteriorated. Learn about this process and more about the Chernobyl accident at this link: <https://youtu.be/oY3fZH9VWhc>

In your science notebook, reflect on what happened at Chernobyl and how it has impacted the lives of those who lived in the area.



RESEARCH EXPLORATIONS

The first law of thermodynamics states that energy is neither created nor destroyed. As a pendulum swings, it will convert between potential energy and kinetic energy. Will a pendulum starting at a higher height go faster?

Visit the link and create an experiment to help answer that question: https://www.teachengineering.org/activities/view/cub_energy_lesson03_activity2

Engineers use math and science to solve technical problems. How could an engineer use the results of your experiment to solve a practical problem?



MATH

The energy that an item possesses due to its motion is called kinetic energy. The kinetic energy of an object, measured in joules, varies jointly with the mass of the object and the square of its velocity. If the kinetic energy of a 3 kg ball traveling 12 m/s is 216 Joules, what is the mass of a ball that generates 250 joules of energy when traveling at 10 m/s?

Predict what would happen to the ball's energy as its mass doubles. Predict what happens to the ball's energy as its velocity doubles. Calculate and compare your prediction with the actual results. Did your prediction align with the actual results? Explain your reasoning.

For more information about measuring energy and joint variation, visit the following websites: <https://www.onlinemathlearning.com/joint-variation.html>

For more information about joint variation: <https://youtu.be/v-k5L0BP0mc>



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GRADES
10-12

Energy



ENGLISH LANGUAGE ARTS

The American Energy Innovation Act was recently passed by Congress. This Act supports long-term innovation in the solar industry and works to advance America's clean energy portfolio: <https://www.tdworld.com/utility-business/article/21151118/us-senate-passes-american-energy-innovation-act>

- How do you feel about environmental protection?
- What are your concerns about the depleting fossil fuel crisis?
- What are ways you and your family can help promote clean energy?

Research effective practices that will benefit Earth by using cleaner energy. What are ways you and your family can help promote clean energy? Brainstorm and create a poster highlighting a few simple ideas that your neighborhood or school communities can put into practice to protect the environment.



SOCIAL STUDIES

In 1935 the Hoover Dam tamed the once wild Colorado River and provided water and hydroelectric power to the southwest. Read more here: <https://www.history.com/topics/great-depression/hoover-dam>

If the opportunity to build something similar came up again, how would you advise Congress to act, based on historical evidence?

Create a multimedia presentation defending your position. Consider the following questions:

- What happened in the southwest to urge the government to build this marvel?
- How has the Hoover Dam impacted the economies in surrounding states?
- What other states possess the natural resources that could benefit from hydroelectricity?
- How is the Hoover Dam a symbol for American grit and ingenuity?



SCIENCE

Have you ever considered alternative energy forms for the world's energy crisis? This means not solar, water, or wind - really alternative. Capturing methane emissions from cows, excrement from microorganisms, or coffee grounds - could these options actually work?

Read more about alternative energy solutions at the following link: <https://science.howstuffworks.com/environmental/green-science/five-forms-alternative-energy1.html>

Which option(s) in the article do you think could be the most successful? How could this option be used on a larger scale? In addition to environmental benefits, what other benefits would emerge?

Create a set of 10 interview questions that you would ask the "inventor" of this alternate form of energy.



MINDFULNESS

Pay careful attention to your mood, energy and health after a poor night's sleep versus a good one. Ask yourself, "How often do I get a good night's sleep?" Like a good diet and exercise, sleep is a critical component to overall health.

Do you have a healthy sleep routine? The amount of sleep a person gets has a direct correlation with the amount of energy a person has. Follow the healthy sleep tips on The Sleep Foundation's website below: <https://www.sleepfoundation.org/articles/how-much-sleep-do-we-really-need>

Keep a sleep diary for a few weeks. Make sure to record your hours of sleep and how much energy you had the next day. At the end of the week, review this information and develop your own plan to ensure you get the appropriate amount of sleep to stay healthy.

Energy



LOGIC PUZZLE

A frog is at the bottom of a 30-meter well. Each day he summons enough energy for one 3-meter leap up the well. Exhausted, he then hangs there for the rest of the day. At night, while he is asleep, he slips 2 meters backwards. How many days does it take him to escape from the well?

Note: Assume after the first leap that his hind legs are exactly three meters up the well. His hind legs must clear the well for him to escape.



FIELD STUDIES

Through a process called cellular respiration, the energy in food is converted into energy that can be used by the body's cells. How do our cells access the energy we need? What happens when the mitochondria don't do their job and cellular respiration does not occur?

Take a journey inside the mitochondria to explore the process on the following website: <https://www.youtube.com/watch?v=39HTpUG1MwQ>

Create your own graphic model to explain the process that takes place inside of the mitochondria.

Use the model to explain the process to a friend or family member.



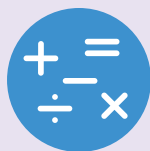
RESEARCH EXPLORATIONS

Coffee and energy drinks are very popular among Americans. Many people feel they need the energy boost that caffeine, the main stimulant found in these drinks, provides to help with clarity, alertness, and to just feel "normal" for the day.

Scientifically, how does caffeine impact the brain? body? How much caffeine is too much? Do people require more and more of the stimulant as their body gets used to it? How does your energy level change with the types of chemicals you put in your body?

The TED Ed video below gives an excellent description of how the brain uses caffeine: <https://www.youtube.com/watch?v=foLf5Bi9qXs>

Consider your own caffeine consumption. Is this something you need to control? Research ways to boost your energy naturally. Write a reflective journal that includes a way to cut excess caffeine from your diet.



MATH

The concept of living "off the grid" has become a more popular idea. There are many web articles, books, and even HGTV shows all dedicated to this topic. Off the grid living involves finding your own energy sources for your home.

Would you be happy living off the grid? What are some energy sources you would utilize for your private residence? Would you use solar, wind, moving water, or another option to create power?

Imagine you are moving "off the grid" and will not return to a store for months. Generate a list of things you would need to build or purchase to create your own energy source for your "off the grid" home. For more fun, make a price list to see how much it would cost for the supplies.



Energy

Reference Guide

6-7 Logic Puzzle:

Solution: Light both ends of rope A and one end of rope B. After 30 minutes, rope A will be completely burned up and there will be 30 minutes of rope B left. Light the other end of rope B; it will burn up in 15 minutes. Total time elapsed since starting the ropes on fire: 45 minutes.

8-9 Logic Puzzle:

Solution: Number the switches 1, 2 and 3. Switch on number 1 for 1 minute, then switch it off. Switch on number 2. Go upstairs and examine the lights. The light that is on is connected to switch 2. The light that is off and warm is connected to switch 1. The light that is off and cold is connected to switch 3!!

8-9 Field Studies:

If you are interested in learning more about how nuclear energy works, visit:

<https://www.nationalgeographic.org/video/what-nuclear-energy>

10-12 Logic Puzzle:

Solution: 28

Each day he makes it up another meter, and then on the twenty-seventh day he can leap three meters and climb out.