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LEARNING



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TEACHING GUIDE

Vol 1 • Issue 5 • Level 2

Ages 7-8 years

Dear Educator,

Happy New Year! We are delighted to bring you the January 2018 issue of **Engage Learning** magazine. We are dedicated to offering you the best in educational value. With this issue, we continue to update our teaching guide by making it more activity-based, integrating science and literacy. We are committed to making **Engage Learning** and all our resources increasingly project-based.

Through the magazine, we have given students unparalleled depth in content, exposure to real scientists doing real science and connections to the real world. As important as reading about science is, it is not doing science. We also use our science content to help you teach vital language arts skills.

In this issue, you will find three new stories. The first story expands the learning we presented in issue 1 by teaching students about the phases of the moon. The moon goes through a monthly cycle by appearing to change its shape from night to night. Each shape is given a specific name.

The second story explores energy and how it can be converted from one form into another. Students will learn how India is using renewable energy sources, especially solar energy.

The third story is about tiny animals all around us – spiders. Students will learn about some kinds of spiders and how they live.

Note: There are three teaching guides, one each for Level 1, one for Level 2 and a combined guide for Levels 3-4. You may look at all of them for more ideas and activities, which you can adapt for the class level you are teaching. You might also want to use different levels for differentiated learning.

Your last issue of **Engage Learning** for the school year will be in February 2018.

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MEET THESE STANDARDS

✓ LANGUAGE ARTS

- Students learn to determine the meaning of content vocabulary.
- Students will summarise a story.
- Students use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to conduct an interview effectively.

✓ EARTH SCIENCE

Students will be able to demonstrate and identify the position of Earth, the moon and the sun for each phase of the moon. They will explain what causes the phases of the moon, and will draw a diagram that explains a natural phenomenon.

✓ PHYSICAL SCIENCE

Energy exists in different forms and is converted from one form to another.

✓ LIFE SCIENCE

Students will use observable features to distinguish between insects and spiders.

IS THE MOON MISSING?

LANGUAGE ARTS OUTCOME: Students learn to determine the meaning of content vocabulary.

SPACE OUTCOMES: Students will be able to demonstrate and identify the position of Earth, the moon and the sun for each phase of the moon. They will explain what causes the phases of the moon, and will draw a diagram that explains a natural phenomenon.

CURRICULUM CONNECTIONS

Many natural phenomena occur as cycles. The rock cycle, the rain cycle and the moon's phases are all examples of cycles. In this story, students will learn how interactions between Earth, the moon and the sun causes the moon's phases.

BUILD BACKGROUND

Begin the lesson by showing students this video: <https://www.flocabulary.com/unit/moon-phases/>. It uses a rap song to introduce students to the moon's phases.

After showing the video several times and having students rap along with it, build more background by conducting a 3-2-1 bridge activity. In this activity:

1. Direct students to write three things they know about the moon.
2. Direct students to write two things they wonder about the moon.
3. Direct students to write one thing they could teach someone else about the moon.

After students have finished writing the 3-2-1 bridge activity, have them share their responses in pairs and then share the responses with the whole class.



READY TO READ

Begin by telling the students that they are now going to read about the moon's changing phases. Have them read pages 1-11 underlining content vocabulary as they read. The content words should include:

- New moon
- Waxing
- Waning
- Waxing crescent
- First-quarter moon
- Waxing gibbous moon
- Full moon
- Waning gibbous moon
- Waning crescent moon

After students finish reading, pick several students to read aloud the words they underlined. List the words on the board. Ask students to define each word. You may have to look up some words in a dictionary or on the internet. After students are familiar with the vocabulary, you might engage in a flash vocabulary quiz. One at a time, point to each word and have students shout out its meaning. Repeat at least twice, moving faster and faster. Remember, studies show that students need to be exposed to a word seven times before they own it.

AFTER READING

ACTIVITY 1: Moon Phase Diagram

Direct students to draw a picture of their neighborhood. Then tell them they should go outside at the same time for a month. They should draw the moon as it appears in the sky and write the date next to each drawing. At the end of the month, have students compare their observations with published data.

For example:



As an extension to this activity, you can see what the youngest waxing crescent moon students can see in the sky. Some experienced observers are able to see a crescent moon less than 24 hours after a new moon.

Keeping track of the visibility of the moon as it cycles through its phases can be a fascinating (and instructive) thing to do. Moon-tracking activities could follow a wealth of different paths – from precise timing of moonrise and moonset to a more general noting of where the moon is (and what phase it's in) each time you see it.

MOON PHASES AND TIME OF DAY

Phase	Rises	In Eastern Sky	Highest in Sky	In Western Sky	Sets
New	[~sunrise]	[morning]	[noon]	[afternoon]	[~sunset]
Waxing Crescent	[just after sunrise]	[morning]	[just after noon]	[afternoon]	just after sunset
First Quarter	~noon	afternoon	~sunset	night (pm)	~midnight
Waxing Gibbous	afternoon	~sunset	night (pm)	~midnight	night (am)
Full	~sunset	night (pm)	~midnight	night (am)	~sunrise
Waning Gibbous	night (pm)	~midnight	night (am)	~sunrise	morning
Third Quarter	~midnight	night (am)	~sunrise	morning	noon
Waning Crescent	just before sunrise	[morning]	[just before noon]	[afternoon]	[just before sunset]

Times in brackets [] indicate that the moon can't be seen because it's too close to the sun in the sky.

As students observe the moon closely, they may notice several other phenomena. For example, they may see the moon during the daytime. This is not unusual. As the moon orbits Earth, it can sometimes be seen during the daylight hours. A full moon rises at sunset.

When students see a bright crescent moon, they might see the rest of the moon dimly lit. The light is sunlight reflected off Earth. It is called Earthshine. On rare occasions, students might also see two full moons in a month. When this happens, the second full moon is called a blue moon.

ACTIVITY 2: The Moon's Phases

Begin by explaining the moon's phases. Go over the eight phases of the moon: new moon, waxing crescent, first quarter, waxing gibbous, full moon, waning gibbous, third quarter and waning crescent. Explain the name of the phase, how the Earth and the moon are positioned in relation to the sun, and what the phase looks like on Earth. Also, point out to your students that it takes 28 days for the moon to complete its cycle of eight phases. When the moon is waxing, it appears as though the moon is growing bigger and when the moon is waning, it's growing smaller.

Moon as Seen from Earth



Tell the students that they are going to demonstrate this by doing the activity on pages 12-13 of **Engage Learning** magazine.

When doing this activity:

1. Make sure the lights are off in the classroom when doing the demonstration.
2. Use a tennis or softball as the moon, the beach ball as Earth, and the flashlight as the sun.
3. One student holds the moon (tennis or softball), one holds the sun (flashlight), and one student holds Earth (beach ball).
4. Using the materials the students should rotate and act like each of the object to reenact the phases of the moon.
5. At each phase have the students stop and name the phase, describe what it looks like, and allow students time to really look at the phase.
6. After demonstrating each phase, play a moon phase game with your students. For the game, demonstrate one of the moon phases (using the tennis or softball, flashlight and beach ball) and see if students can guess the name of the phase. Repeat this process until you think the students have developed a good understanding of the phases of the moon.

ACTIVITY 3: Cookie Moon

Begin by dividing students into pairs. Copy and pass out the moon phase diagram on the next page. Then ask them to create an Earth and sun cut out. Then hand out the following materials to each pair of students.

You need:

- 8 Oreo cookies
- a paper plate
- plastic knife or spoon

To do:

1. Students places all their cookies on a paper plate. Then they carefully separate their Oreo cookies so that all the filling is on one of the halves.

2. Using the plastic knife or spoon, students scrape the cream filling on each of their eight cookies so that it looks like one of the eight phases. For the full moon, they do not have to do anything since it should already resemble a full moon. Remind students that they are making both the waxing and waning phases.
3. Remind students to look at their moon phase diagrams to help them throughout the activity.
4. Once they have made each of the eight cookies look like the eight phases, have students situate Earth, sun and moon (Oreo cookie) in the correct position to show the new moon phase.
5. Students can repeat the above for each phase working with their partner.

VIDEO HUB

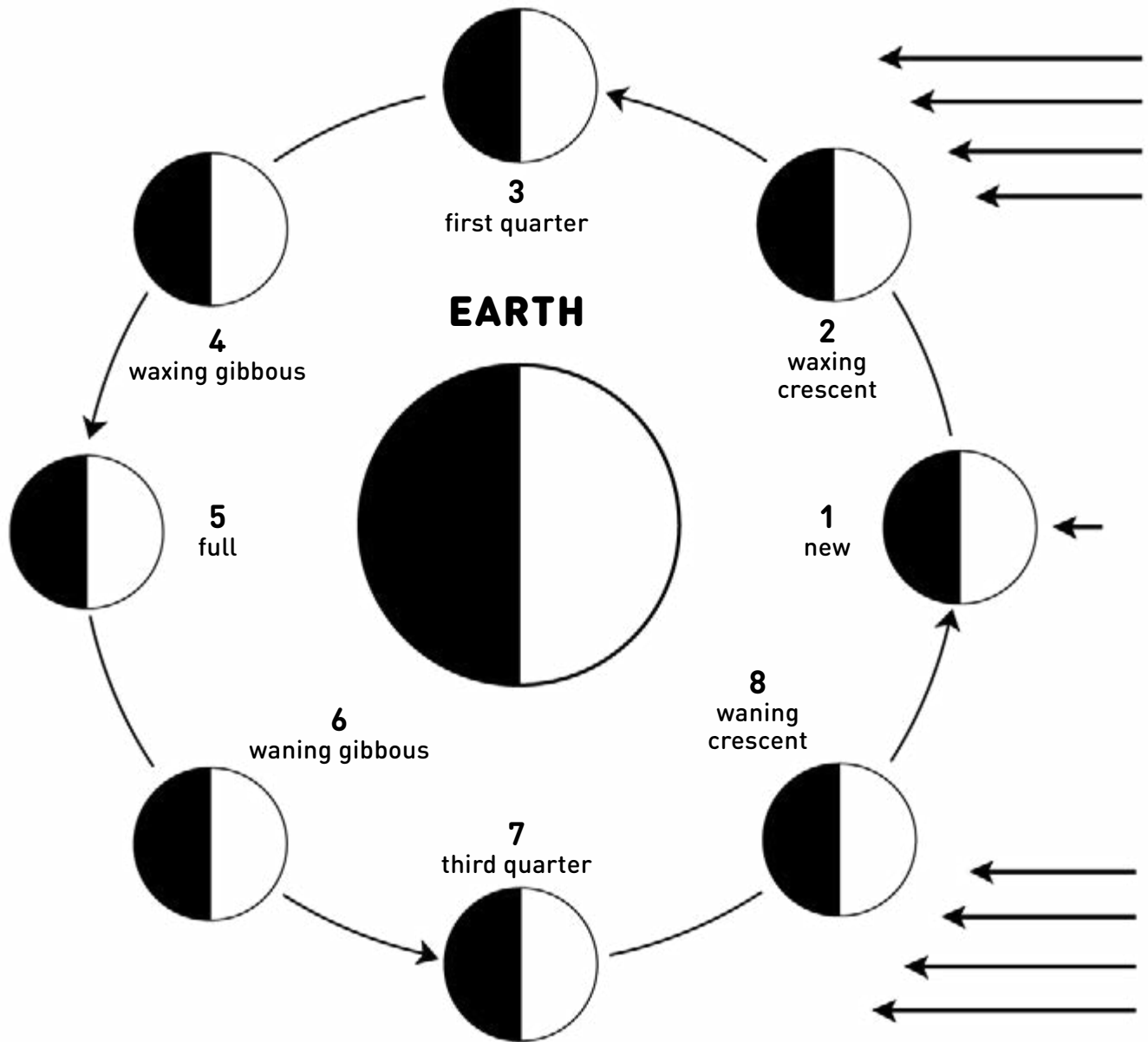
Phases of the Moon

- <https://www.youtube.com/watch?v=bWeaQctUp1c&t=81s>
- <https://www.youtube.com/watch?v=f4ZHdzl6ZWg&t=47s>

Moon Phases Demonstration <https://www.youtube.com/watch?v=wz01pTvuma0&t=34s>

COOKIE MOON

You only see part of the moon as it goes around Earth. In the drawing, only the part inside the curved arrows can be seen from Earth. These are the phases of the moon.



POWER FOR ALL

LANGUAGE ARTS OUTCOME: Students will summarise a story.

PHYSICAL OUTCOME: Energy exists in different forms and is converted from one form to another.



CURRICULUM CONNECTION

By reading this story, students will learn that energy can be converted one form to another. For example, they will learn that solar energy can be converted into electrical energy

TAP PRIOR KNOWLEDGE

Begin the lesson by asking students questions about energy. We've listed several examples, but add more questions as needed.

- ➔ How do you use energy every day? (Suggested Answer: *I use electrical energy everyday when the lights are turned on, heat energy is used every day when I cook dinner on the stove, etc.*)
- ➔ What are the different forms of energy you see throughout the day? (Suggested Answer: *Chemical energy is used to power cars in the form of gasoline, sound energy is used when we watch TV, etc.*)
- ➔ Is there anything that different forms of energy have in common? (Suggested Answer: *All energy makes something happen, often different forms of energy are used together to power an object, etc.*)
- ➔ What are some differences in different forms of energy? (Suggested Answer: *Light energy is different from sound energy because light can travel through space but sound cannot.*)

READY TO READ

Direct students to turn to pages 14-15 of their copies of **Engage Learning** magazine and the photo illustration of the streams of electricity which sparkle in a plasma ball. ASK: What comes

to your mind when you see this? Energy! Bring the discussion in the classroom to forms of energy.

Students may come up with several kinds of energy as examples of what energy is. Make a list of students' responses. Some examples are listed below:

- heat (warming a house, warming up liquids such as water)
- mechanical work (moving things around)
- electrical (lighting, cooking, lightning)
- chemical (burning in engines, explosions)
- light (solar cells and solar heating)
- nuclear (power plants, atomic bombs)

Next, have students read the story. You can have them read independently, in small groups or guided reading. Once they read the story in the magazine, have them list and classify the different forms of energy described in the story. Correlate what is written in the story with the responses they give.

When students finish reading ask them to orally summarise the story. Pick a couple of students to tell their summaries. You can ask other students to fill in missing details.

Explain to students that good readers always summarise a story after they finish reading it. By developing their own summaries and explaining a story in their own words, students will remember more of what they read.

AFTER READING

ACTIVITY 1: Energy Sort

You need:

- enough wall space for six groups to hang pictures
- pictures of different forms of energy
- enough tape or glue for six groups

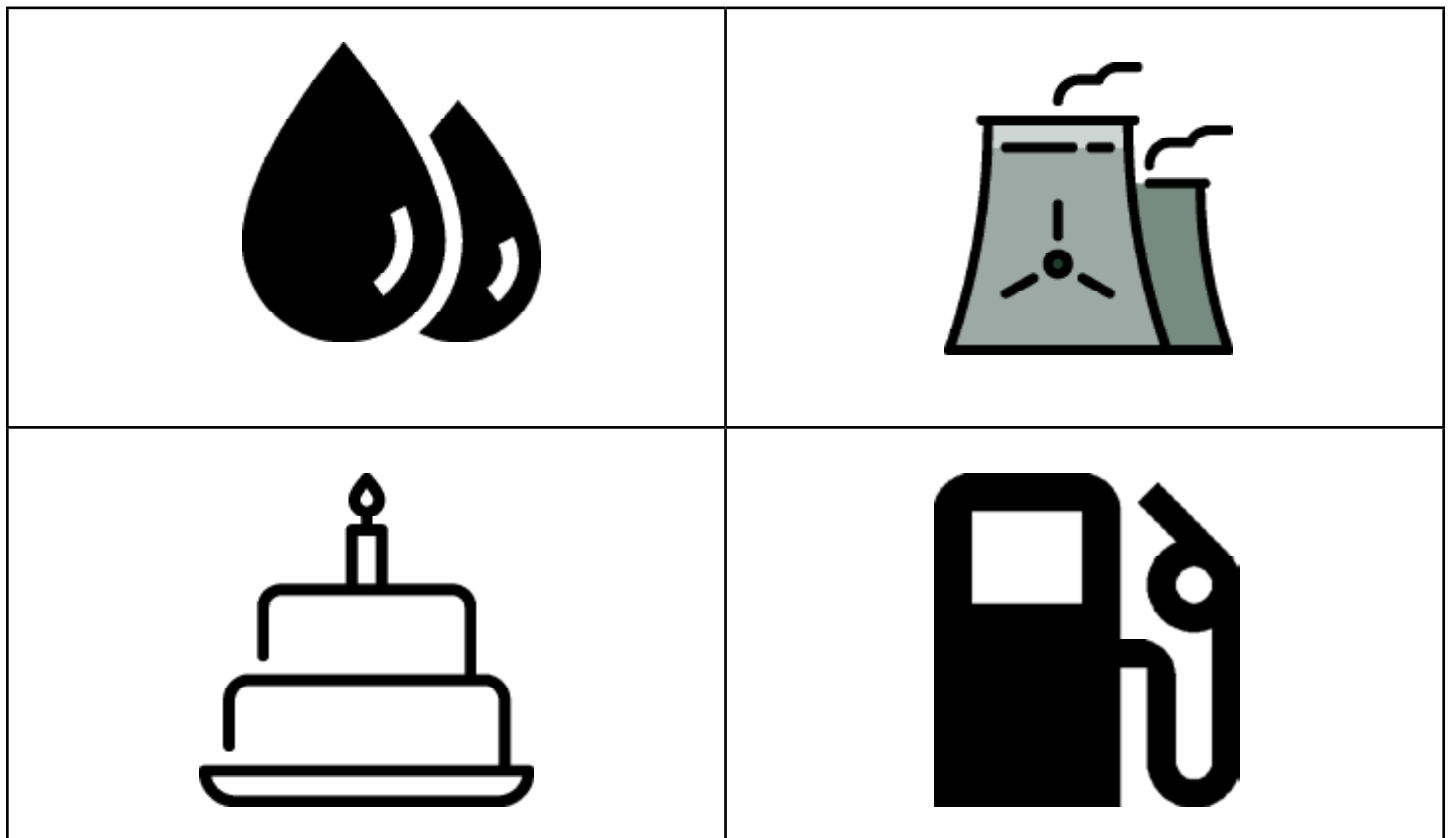
To do:

1. Post the following six headings in six distinct areas of the classroom. Each area must have enough room for students to tape four to six drawings under each heading. Use the following headings:
 - Mechanical Energy
 - Chemical Energy
 - Electrical Energy
 - Sound Energy
 - Heat Energy
 - Light Energy

2. Divide the class into groups of six and have those groups sit together.
3. Copy and pass out a set of pictures on the following pages.
4. Pass out enough tape or glue for each group.
5. Instruct students to discuss with their group mates what form of energy they believe is portrayed in each of their pictures.
6. After students finish their discussions, they can cut out and tape/glue each picture under the appropriate heading.
7. To close the lesson, have groups explain why they put each picture under the form of energy they chose.

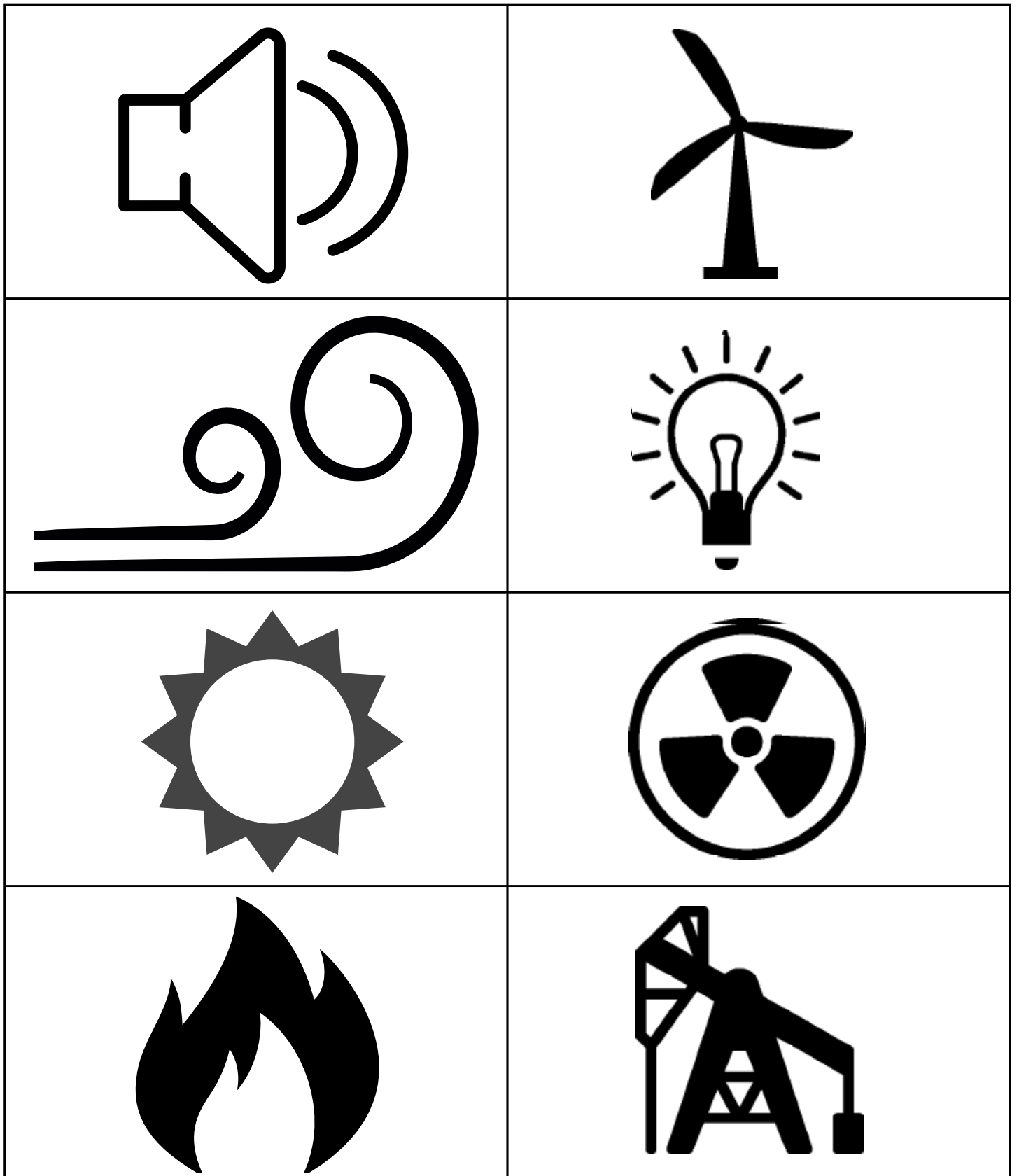
ENERGY SORT CARDS

Copy and cut the cards. Hand out the cards to students.



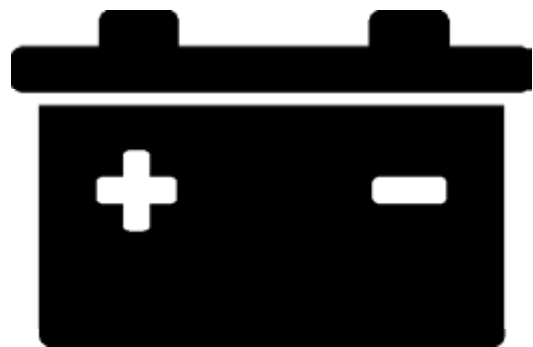
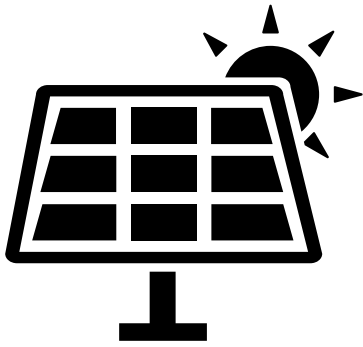
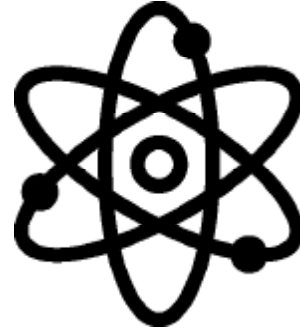
ENERGY SORT CARDS

Copy and cut the cards. Hand out the cards to students.



ENERGY SORT CARDS

Copy and cut the cards. Hand out the cards to students.



ACTIVITY 2: Energy Conversion

Tell students that energy occurs in many forms and that one form of energy can be changed into another form of energy.

GOAL: Students will complete a chart of energy conversion examples.

You need:

- matches (for the teacher only)
- battery powered toys brought from home
- pencil

To do:

1. Turn the lights in the classroom off and back on. Tell students that you just changed electrical energy into light energy. Now, if it is alright with your school administration, strike a match. Tell students that you have just changed chemical energy into light energy and heat energy.
2. Have a student run around his/her seat two or three times. Tell students that the runner just changed chemical energy from food into mechanical energy.
3. Have a student demonstrate a battery-powered toy. Explain that the student just changed chemical energy in the battery into motion or heat or light energy. The type of energy will depend on the type of toy.
4. Write the six forms of energy used earlier in a column on the board. Write the same six forms in a second column.
 - Mechanical Energy
 - Chemical Energy
 - Electrical Energy
 - Sound Energy
 - Heat Energy
 - Light Energy
5. Have students come to the board one at a time and draw a line between two forms of energy. Have the students explain how one form of energy they chose can be changed to the other form of energy they chose.

Activity 3: Six Degrees of the Sun Game

This game will work best if you take your class to an open space, such as outside or the gym. You can also move desks and chairs toward the walls of the classroom so there is an open space in the middle of the room.

To do:

1. Laminate and cut out the cards on the following pages.

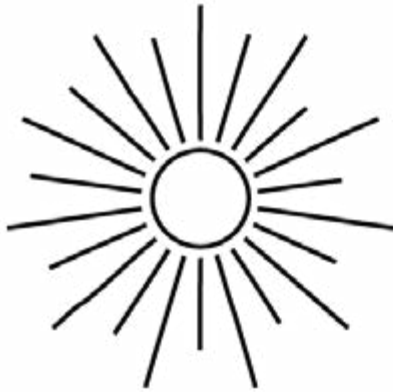
2. Begin the game by discussing with your class the role of the sun and its importance to life on Earth. Ask the following questions:
 - What is the sun? (The sun is a star that is the source of light and heat for the planets in our solar system.)
 - What are some reasons that Earth needs the sun? (Life on earth would not exist without the heat and light provided by the sun. The sun's gravity also helps keep the earth in its orbit, causes weather phenomena and plays a role in ocean tides.)
3. Share the following facts:
 - In terms of energy generated, burning all the coal, oil, gas and wood on Earth would only equal a few days of energy output by the sun.
 - The total amount of energy humans generated by burning fossil fuels since the start of civilization is less than all the energy produced by the sun in just 30 days.
 - More energy from the sun falls on Earth in one hour than all the people on Earth use in one year.
 - Renewable energy could account for almost 80% of the world's energy supply within four decades, but only if governments, businesses and individuals pursue the policies.
4. After asking questions and sharing the facts, you are ready to begin the game with your students.
5. Assign one student to become the sun and have him/her stand in the middle of the room. Ask the remainder of the students to draw a card out of the pile. The card will have a picture or a word on it that links to another picture/word and will eventually come back to the sun.
6. Give the students ten minutes to find classmates so they can trace their energy back to the sun. For instance, a student who has a card with a picture of a hamburger will find the student who has a picture of a cow, who will find a student with a picture of grass.
7. Together, they will line up in order (i.e., grass, cow and hamburger) next to the sun.
8. Eventually, the class should form "rays" around the sun in their lines.

VIDEO HUB

- **Solar micro-grid project, Dharnai Village, India** <https://www.youtube.com/watch?v=97QpEHQKlq4&t=21s>
- **Solar water pumps** <https://www.youtube.com/watch?v=SDOq3BIZMj8&t=25s>

ENERGY FLOW CARDS

Laminate and cut out these cards. Then distribute them to students so they can play the Six Degrees of the Sun Game.



THE SUN



THE SUN



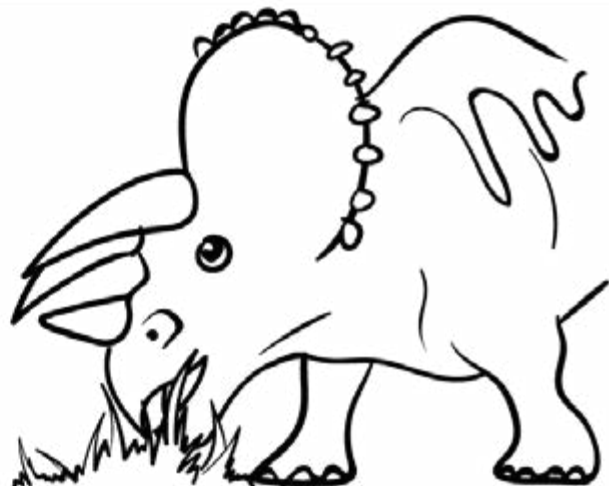
GRASS



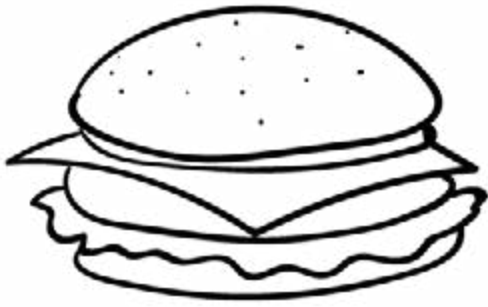
GRASS



COW EATING GRASS



DINOSAUR EATING GRASS



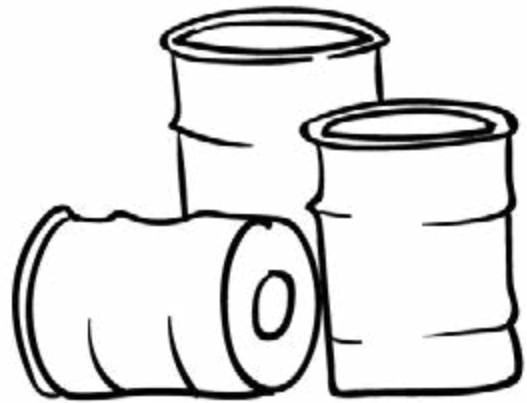
HAMBURGER



DINOSAUR FOSSIL



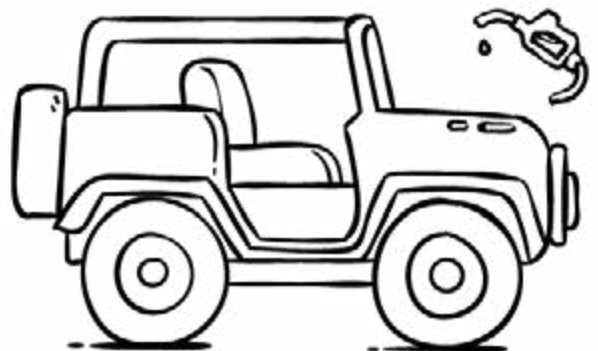
EATING A HAMBURGER



FOSSIL FUELS



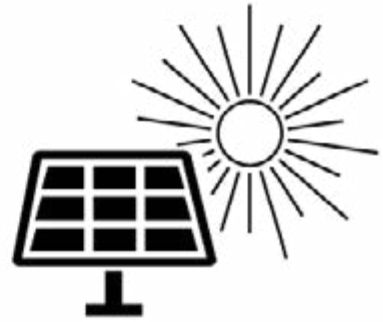
PLAYING SOCCER



CAR GETTING FUEL



TEMPERATURES - HOT EQUATOR, COLD POLES



SOLAR PHOTOVOLTAIC PANEL



WINDS



ELECTRIC TRANSMISSION



FLYING A KITE



ELECTRIC PLUG



RUBBER TREE



CHARGING YOUR SMART PHONE



BASKETBALL

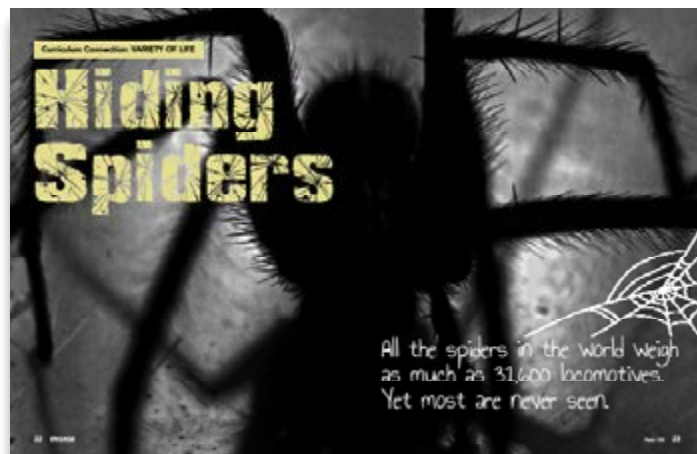


ANGRY BIRDS

HIDING SPIDERS

LANGUAGE ARTS OUTCOME: Students use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to conduct an interview effectively.

LIFE OUTCOME: Students will use observable features to distinguish between arachnids and spiders.



CURRICULUM CONNECTION

A variety of organisms live on Earth. These organisms have different traits that make them unique, even if they look alike. Scientists classify them into different categories. This story will help students understand the importance of classifying organisms and objects to increase understanding.

BUILD BACKGROUND

Direct students to turn to pages 22-23 of their magazines. Ask them what kind of animal is shown in the photo. (*Spider.*) Ask them to list the characteristics of a spider. This could include body parts, number of legs and other features. List these on the board. Then take a vote, asking if spiders are a kind of insect. Write the results on the board.

READY TO READ

Have students read pages 24-29 of **Engage Learning** magazine. They can read the article independently, in small groups or in guided reading sessions. Conduct the reading in a manner that works best for your students. You may also want to differentiate the instruction by working with struggling readers in guided reading sessions and letting high-level readers read the article independently. Have all students complete the activity on pages 28-29.

AFTER READING

After students finish reading, return to the list of features you made earlier. Ask students to update it based on their reading and the activity on pages 28-29. After the list is updated, conduct another vote to see how many students still think spiders are insects.

ACTIVITY 1: *Diary of a Spider*

Tell students that they are going to pretend that they are a spider. Have them choose one of the spiders from the story or another kind of spider. The students may use books and/or the Internet to research the spider of their choice. Then as the students to write a diary entry explaining what a day in the life of the spider is like. Remind them that since this is a diary entry, it should be written in the first person. Have them draw one of the events described in the diary entry to illustrate it.

ACTIVITY 1: *Spider Words*

Write the word "spider" on the board. Then have students come to the board and use the letters in spider to make a new word. Go around the room until students can no longer come up with new words. (*Words could include, but are not limited to: pride, prides, spired, dries, drips, piers, pried, pries, rides, ripe, sire, rise, rip, rips, sped, red, per, sip, dip, is, pi, l, id.*)

VIDEO HUB

- **Spider With Three Super Powers** <https://www.youtube.com/watch?v=UDtlvZGmHYk>
- **Kung Fu Mantis Vs Jumping Spider** <https://www.youtube.com/watch?v=7wKu13wmHog>
- **Desert Centipede Vs Trapdoor Spider** <https://www.youtube.com/watch?v=vutTYCBIA5M>
- **Most AMAZING Spiders In The World!** <https://www.youtube.com/watch?v=AOYsD2zQP4>