**Teaching Through Trade Books**

**The Sun’s Energy**

**Introduction**

 Energy is a topic that spans across many different areas in the standards is one of the Crosscutting Concepts that bridges different disciplines. In the activities presented this month, younger students are examining how energy is produced by the sun and reaches the earth as sunlight. This sunlight warms the Earth’s surface and students explore that materials of different colors absorb or reflect the sunlight at different rates. Through simple investigations, students determine that different materials can be used to protect themselves from the sun’s energy. The older students are examining how the energy from the sun is the basis for all of the life on Earth and how it progresses through food chains and food webs. They develop food chains and food webs to show how all begin with plants at the first stage which get their energy from the sun.

**This Month’s Trade Books**

[Show less](http://www.amazon.com/Roaring-Rockets-Amazing-Machines-Mitton/dp/0753453053/ref%3Dpd_sim_b_5)

Sun and Shade

Mary Lindeen

ISBN: 978-1-68404-091-9

Norwood House Press

32 pages

Grades K-2

**Synopsis:**

Through very basic language and using text that is focused on emerging readers, information is presented related to the idea of sun and shade. Discussions around how sun helps certain things and what can create shade for other things is addressed through real life photos.



Pass the Energy, Please![Show less](http://www.amazon.com/Best-Book-Spaceships-Ian-Graham/dp/0753451336/ref%3Dsr_1_1?s=books&ie=UTF8&qid=1364854249&sr=1-1&keywords=the+best+book+of+spaceships)

[Show More](http://www.amazon.com/How-Did-That-Get-Lunchbox/dp/0763650056/ref%3Dsr_1_1?ie=UTF8&qid=1340240561&sr=8-1&keywords=how+did+that+get+in+my+lunch+box)

[Show Less](http://www.amazon.com/How-Did-That-Get-Lunchbox/dp/0763650056/ref%3Dsr_1_1?ie=UTF8&qid=1340240561&sr=8-1&keywords=how+did+that+get+in+my+lunch+box)

By Barbara Shaw McKinney

Illustrated by Chad Wallace

ISBN: 978-0-06-445177-2

Harper Collins Publisher

32 pages

Grades 1-4

**Synopsis:**

This book focuses on a food chains and how energy is passed from one animal or plant to the next along the way. It utilizes a rhyming pattern and incorporates herbivores, carnivores, insects, and plants into the food chain increasing the steps of the food chain throughout the book.

**Grades K-2: Sunny Days**

**Purpose:** Students will discuss the ideas of sun and shade and then identify whether black or white objects absorb or reflect the sun’s energy Students will then use that information to help build a structure that reduces the warming effect of sunlight on the area.

**Materials:** *Sun and Shade*, umbrella, What Happens to the Ice Cube data sheet, My Island Visit Sheet, black and white construction paper, clear plastic cups, or Ziploc bags, ice cubes, photos of various shelters, building materials (construction paper, popsicle sticks, skewers, tape)

**Engage:**

Begin by showing the students an umbrella and ask the students where they would use an umbrella. While the common answer is “in the rain”, continue to prompt students for other times and if necessary, show them either a picture of a beach umbrella or the cover of the book to help them generate additional answers. Once students connect the idea that an umbrella is often used at the beach or even at home on a patio as well, ask them to consider “why they would use an umbrella at the beach?”

Read *Sun and Shade* to the students. After reading it through once, ask the students to discuss the following questions. Refer back to the story if necessary.

* How does the sun help plants and animals and even people stay alive?
* Can you describe a time where you were outside in the sun and it felt too hot or it was too bright out?
* Looking at the picture of the girl on page 14, why do you think she is sitting under an umbrella? If you were sitting in the shade, what are you doing to the sunlight?
* What are other objects that help to create shade that can protect plants, animals, and people?
* Compare the temperature you think you would feel in the sun and the shade. Which do you think would be warmer? Cooler?

**Explore**

 In this activity, students are going to first examine how sunlight warms the Earth’s surface; and second how color absorbs or reflects light and determine how that impacts the temperature of an object or place. Begin this exploration but providing the students with a sheet of black construction paper and a sheet of white construction paper and asking them to consider the color clothes someone wears in the summer in warm locations and in the winter when it is cooler. While there are other variables such as fiber, texture, and weight associated with clothing types, the goal here is to help them focus on the color of the clothing. It is possible to pose: “If they only had t-shirts that were black or white –which would they prefer to wear to a warm location?” Allow the students time to consider this and then discuss their reasons. Most students without realizing it will associate the color white with staying cooler or being cooler (think snow, ice, etc.). At each table, ask the students to place a small clear plastic cup with an ice cube in it or Ziploc bag with an ice cube in it on each sheet of paper (black and white) and place the sheets of paper in a sunny area such as a window sill or if possible do this activity outside on the playground. Repeat the activity but this time, place the ice cube under each sheet of paper (black and white) and make observations. Throughout both of these trials, students should first make a prediction and then record their observations on the What Happens to the Ice Cube student data sheet (see NSTA Connection).

**Explain**

 Once students have had the opportunity to make observations during the investigation, bring the class back together and discuss the findings. Questions to prompt the discussion include:

* In the first investigation where the ice cube was on top of the paper, who can tell me what you observed? How many students say the ice cube on the black paper melted first? The white paper? As some students may have made observations that indicate the ice cube on the white paper may have melted first, it is important to then discuss potential reasons or other variables. Students can speculate what may have caused that change such as the ice cubes were different sizes, the sheets of paper were in different amounts of sunlight etc.
* In the second investigation where the ice cube was under the sheets of paper, which one melted first? Was there a difference in how quick they melted? When under the sheets of paper, the ice cube under the black one will melt quicker than the white one, but also will take longer than the ones in the direct sunlight from the first investigation.
* Can you tell me how the first investigation is similar to when you are at the beach and in the sunlight? Although the ice cube melts and you won’t, what might happen if you stay in the sun too long? How is the second investigation similar to using an umbrella for shade? What happens to the energy or heat we get from the sun when we use an umbrella for shade?
* When sunlight hits the umbrella or a light-colored surface it bounces back or is reflected off of the surface. Can you draw what you think this looks like on the student data sheet? Dark colors help to absorb or soak up the sunlight and make an object feel warmer. Can you draw what you think this looks like on the student data sheet?

Using the photos of various types of outdoor shelters, ask the students to describe how each shelter helps to reflect sunlight and keep the inside or underneath part of the shelter cooler.

**Elaborate:**

 The elaborate section is where students are now asked to demonstrate their understanding that dark colors or black absorb sunlight and light colors or white will reflect sunlight, as well as, the fact that certain types of shelter will help keep an area cooler. Provide groups of students with building materials including different color construction paper, popsicle sticks or skewers (insert safety note about sharp skewers), tape, and the My Island Visit Sheet. Pose the following challenge to them:

*You want to go to an island for a vacation and the island gets lots of sun during the day.*

*You do not want to get sunburned and want to stay cool as well during the day---*

 *so you need to build a shelter (you do not have any sunscreen).*

 *The first task is to explain to your parents what color of clothing*

 *you should wear for your island visit?*

*The second task is to build a shelter once you get there using the materials provided that will help to reduce the warming effect of sunlight on the area and help you stay cooler.*

Allow students time to consider their first task and record it on the My Island Visit Student Sheet (see NSTA Connection). Ask them to sketch or draw the color shirt they would wear and color it in as well as writing why they chose that color. For the second activity, ask students to first sketch their shelter design and label the parts that they can before building it. Once drawn, ask them to build their shelter using the materials provided. Have each group describe their shelter to the teacher and explain why they think it will keep them cooler than being in the direct sunlight.

 Once all shelters are constructed, test them outside on the playground by placing an ice cube in a plastic cup or Ziploc bag and placing it under the shelter while you place another ice cube in the same container next to the shelter. It is important for the teacher to make sure that both ice cubes are on the same type of surface (i.e. both on blacktop or both on grass) and that neither is already in a shady area. Ask students to make observations about what happens to the ice cubes and record them on the sheet.

**Evaluate:**

Initial understanding of how the sun produces energy and how we can protect ourselves from the sun is explored through questioning. Students then make observations and draw conclusions about how the color of an object (either black or white) absorbs or reflects the sun’s energy. Finally, students are asked to put together their understanding of sun versus shade and color of objects and their impact on temperature in direct sunlight by determining what they should wear to an island and what type of structure they would build as a shelter.

**Grades 3-5: Energy Flows**

**Purpose:** Students will explain how energy from the sun is transferred from one plant or animal to the next in a food chain or web.

**Materials:** *Pass the Energy Please!,* Fabulous Food Chain Video (see internet resources), Pass the Energy, Please Student Data Sheet (see NSTA Connection), crayons, markers, or colored pencils, paper strips, tape or stapler, Online games: Build a Food Chain or Fun with Food webs (see internet resources)

**Engage:**

 Show the students the Fabulous Food Chain Video (see internet resources) and ask the students to focus on the idea that there are food chains and food webs, as well as, how energy from the sun is at the beginning of the chain. Stop at the following points in the video for discussion:

* (:24). Where does any living thing get its energy from that helps it to stay alive?
* (:53). Where are humans in the food chain?
* (1:36). What is a food chain? An ecosystem? What does a food chain do within an ecosystem?
* (2:40). What is the example of a food chain that was given in the video? Which animal was at the top of this food chain?

**Explore**

In the video the definition of a food chain is a model that shows how energy flows between living things in an ecosystem. Ask the students to break into groups and read the book (or have the teacher read the book aloud based on availability). Explain that with each page spread a food chain or link in a food chain is discussed. Ask the students to use their Pass the Energy, Please! Student Data Sheet (see NSTA Connection), to explore the different links in a food chain and to determine how many links are shown for each page spread. An example would be pages four to five which shows that there is a single link (at the top of the page) which is a green plant. Students would then explain that the plant obtains its energy from the sun and makes its own food by illustrating the food chain and/or describing it in words.

It is important that the students read the words and not simply look at the pictures. The key to the food chains are:

Page 6-7 – One link, seaweed is a plant and gets its energy from the sun.

Page 8-9 – Two links, large herbivores (gorillas, buffalo, pandas, etc., get their energy by eating large amounts of plant which get their energy from the sun).

Page 10-11 – Three links, cheetahs eat gazelles, which eat grass which gets their energy from the sun).

Page 12-15 –Four links, owls eat snakes which eat mice which eat milkweed seeds)

Page 16-19—Five links, polar bears eat seals which eat fish (anchovies) which eat zooplankton, which eat phytoplankton.) It may be necessary to discuss what zooplankton and phytoplankton are ahead of time.

Page 20-23 – Six links, a red fox eats a weasel which eats a bird (warbler) which eats spiders which ate a caterpillar which ate goldenrod plants)

When students arrive at page 24-26, ask them to consider why the links in the upper corner of the page appear broken and what is happening on that page. In this case there isn’t a chain but rather a variety of decomposers helping to break down a dead animal and obtain the energy they need from it. The decomposers are a vulture, beetle, maggot, moth, ant, bacteria, fungus, and earthworm.

**Explain**

 Once students have had the opportunity to explore various food chains, bring them back together and ask them to explain what links they have in each chain and to determine if there is agreement as to how the energy moves from one living thing to the next. Ask them to create links out of paper strips to show the animals on them and how the links of the food chain are connected. Use the chains as a model to show individual food chains. Ask the students to then use the following animal as the top consumer (top of the food chain) – a hawk—and to create as many potential food chains as possible showing the hawk at the top. Questions to ask include: are there places that these individual food chains could be connected together? Ask the students why this food web demonstrates what an ecosystem is?

**Elaborate**

 After the students have had a chance to discuss food chains and food webs, engage them in the online game Build a Food Chain or Fun with Food Webs (see internet resources) to demonstrate their understanding. After they have created their food webs or food chains, ask them to turn their sheet over and write a short narrative about what a food web and food chain is.

**Evaluate**

Students are first asked to connect their understanding about food chains and ecosystems before they are asked to construct food chains from information provided in the story narrative. Finally, through the online game and written narrative, they are demonstrating their ability to construct a food chain/food web on their own and explain the steps within it.

**References:**

Common Core Standards for English/Language Arts <http://www.corestandards.org/the-standards/english-language-arts-standards>

*DCI arrangements of the next generation science standards* (2013). Washington, DC: Achieve, Inc. <http://www.nextgenscience.org/search-standards-dci>

**Internet Resources**

Build a Food Chain Game <https://www.cserc.org/sierra-fun/games/build-food-chain/>

Fabulous Food Chains <https://www.youtube.com/watch?v=MuKs9o1s8h8>

Food Chain, Food Web Video for Kids <https://www.youtube.com/watch?v=FFloV2J-eKI>

Fun with Food Webs <http://www.harcourtschool.com/activity/food/food_menu.html>

The Dirt on Decomposers <https://www.youtube.com/watch?annotation_id=annotation_738381753&feature=iv&src_vid=MuKs9o1s8h8&v=uB61rfeeAsM>

**Teaching Through Trade Books Connections**

Royce, C. A. (2018). Energy explorations. *Science and Children 55*(5), 20-25.

**Connecting to the *Common Core Standards* (NAGC and CCSSO 2010)**

This section provides the Common Core for English Language Arts and/or Mathematics standards addressed in this column to allow for cross-curricular planning and integration. The Standards state that students should be able to do the following at grade level.

**English/Language Arts**

Reading Standards for Informational Texts K-5 – Key Ideas and Details

* Grade 4 standard asks students to “refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.”

Language Standards

Writing Standards Research to Build and Present Knowledge

* Grade K standard asks students to “With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.”

Writing Standards K-5- Text Types and Purposes

* Grade K students will “use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic.”
* Grade 2 students will “write informative/explanatory texts in which they introduce a topic, use facts and definitions to develop points, and provide a concluding statement or section.
* Grade 4 students will “write informative/explanatory texts to examine a topic and convey ideas and information clearly.”

Vocabulary Acquisition and Use is one of the standards for language. This particular standard is across grade levels. “Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade [appropriate] reading and content.”

Speaking and Listening – Comprehension and Collaboration

Grade 1 students should “participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups.”

Speaking and Listening Standards K–5—Presentation of Knowledge and Ideas

•Kindergarten students should “add drawings or other visual displays to descriptions as desired to provide additional details.”

• Grade 1 students will “add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.”

Furthermore, the Common Core for ELA provide a standard related to the Range of Text Types for K–5 where it indicates that students in K–5 should apply the Reading standards to a wide range of texts to include informational science books

**Connecting to the *Next Generation Science Standards* (NGSS Lead States, 2013)**

K-2 Sunny Days

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| **K-PS3 Energy**<https://www.nextgenscience.org/dci-arrangement/k-ps3-energy>*The chart below makes one set of connections between the instruction outlined in this article and the NGSS. Other valid connections are likely, however space restrictions prevent us from listing all possibilities. The materials, lessons, and activities outlined in the article are just one step toward reaching the performance expectations listed below*.  |
| Performance ExpectationK-PS3-2 Use tools and materials provided to design and build a structure that will reduce the warming effect of sunlight on an area.  | Connections to Classroom Activity***Students:**** design, build, and explain how a structure to keep themselves cooler on a sunny island.
 |
| Science and Engineering Practices |  |  |
| Constructing Explanations and Designing Solutions | describe which type of clothing they would wear at the beach and a type of shelter they would build to protect themselves from the sun. |
| Disciplinary Core Idea |  |
| PS3.B Conservation of Energy and Energy TransferSunlight warms Earth’s surface | * investigate which color absorbs more sunlight and heat and melt an ice cube.
 |
| Crosscutting Concepts |  |
| [Cause and Effect](http://www.nap.edu/openbook.php?record_id=13165&page=87)  | * investigate how different colors absorb or reflect the sun’s energy.
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3-5 Energy Flows

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| --- |
| **5-PS3 Energy**<https://www.nextgenscience.org/dci-arrangement/5-ps3-energy>*The chart below makes one set of connections between the instruction outlined in this article and the NGSS. Other valid connections are likely, however space restrictions prevent us from listing all possibilities. The materials, lessons, and activities outlined in the article are just one step toward reaching the performance expectations listed below*.  |
| Performance Expectation**5-PS3-1** Use models to describe that the energy in animals’ food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun. | Connections to Classroom Activity***Students:**** create paper models representing various food chains with different lengths.
* engage in an online game where they simulate food chains and write about these representations.
 |
| Science and Engineering Practices |  |  |
| [Developing](http://www.nap.edu/openbook.php?record_id=13165&page=59) and Using Models  | develop models that demonstrate how various organisms are part of a food chain. |
| Disciplinary Core Idea |  |
| PS3.D energy in Chemical Processes and Everyday Life* The energy released from food was once energy from the sun that was captured by plants in the chemical process that forms plant matter.
 | * describe how plants get their energy from the sun and provide energy to other organisms that consume them.
 |
| Crosscutting Concepts |  |
| [Energy and Matter](http://www.nap.edu/openbook.php?record_id=13165&page=94)  | * explain how energy from the sun is transferred to different organisms in a food chain.
 |