

Chemiluminescence

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Lesson Summary for Grade 1

Our eyes allow us to see when there is light present. One of the things we can see is the light produced by fireflies (also called lightning bugs or glow worms). Fireflies, like all living things, need some basic things to survive, including air, water, and food. In this lesson students explore fireflies and many other things by listening to and reading stories. Cross-curricular links to math, social studies, and language arts are provided.

Science Activity: Chemiluminescence

Students become familiar with common sources of light and learn that a chemical reaction produces light in both lightning bugs and lightsticks.

Source: Gertz, S.E.; Portman, D.J.; Sarquis, M. *Teaching Physical Science Through Children's Literature*; McGraw-Hill: New York, 1996; pp 155–162.
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Key Science Topics:

- production of light
- effect of temperature on rate of chemical reaction
- fireflies

Ohio Fourth Grade Proficiency Learning Outcomes for Science:

6. Evaluate a simple procedure to carry out an exploration.
8. Evaluate observations and measurements made by other persons.
9. Demonstrate an understanding of safe use of materials and/or devices in science activities.
17. Identify ways in which organisms react to changing environments.

Follow the instructions and read the book *Fireflies!* to the class. Then complete the science activity. Discuss with the children that in order to see the glow of fireflies, we need to use a part of our bodies. Have them tell you which part of the body sees (the eyes). Explain to the children that without any light at all, we would be unable to see. If possible, take the class into a room where there are no windows to demonstrate this. Cover the bottom of the door with a towel and turn off the lights. If there is truly no light in the room, it will be impossible to see anything. Make sure you take in a small flashlight to turn on. This demonstrates to the children that even just a little bit of light allows us to see some things. Also, the flashlight may come in handy if any of the children are afraid of the dark!

Math Activity

Students graph terms referring to a glowing insect.

The terms “firefly,” “lightning bug,” and “glow worm” are used interchangeably to mean the insect in the beetle family that displays bioluminescence. This math activity should be completed before the grammar lesson on synonyms. Materials needed for this activity are: one large-size Post-it[®] note per child, chalkboard and chalk or chart paper and markers, pencils for children, and graph paper or plain white paper. Note: If plain paper is used, children will need more help in constructing the graph.

Give each child a Post-it note on which he or she writes his or her name. On the chalkboard or chart paper, write three labels: Firefly, Lightning Bug, Glow Worm. Direct the children to close their eyes and imagine they are running around in their yards just as it’s getting dark. They are catching insects that are lighting up and then putting them in a jar. They fill their jars and run inside the house to show their families. When they get inside, they say, “Look at all the _____ I caught!” Instruct the children to make a quick note as to what word they would put in the blank. Would they say fireflies, lightning bugs, or glow worms?

Each child takes turns coming up to the board or tablet and placing his or her Post-it note on the graph above the word they personally would use to describe the glowing insect. Emphasize to the children that there is not one correct term to use. All the above terms are equally correct, despite being different words.

Have helpers count the Post-it notes, tally each column, and describe the results in words. (For example: Ten people call them fireflies. That’s more than call them lightning bugs.) Discuss how making a graph makes it easy to see and understand results. Hopefully, there will be at least a few children who choose each term. If not, discuss why all or most of the class chose the same term. Often when there are synonyms for an object, different terms are used depending on the geographic location. For example, people in one area may call a long deli sandwich a hoagie, while others in a different location call it a submarine sandwich. Also, some people call a bubbly, sugary drink soda, pop, soda pop, or a soft drink, usually primarily depending on where they live or used to live.

Give children graph paper. Help them to re-create the class graph from the board, step by step. Be sure to include labels and a key.

Ohio Fourth Grade Proficiency Learning Outcomes for Math:

24. Make or use a table to record and sort information (in a problem-solving setting using simple and complex patterns in nature, art, or poetry as setting) and make identifications, comparisons, and predictions from tables, picture graphs, bar graphs, and labeled picture maps.

Grammar Activity

Students learn about synonyms.

The book, *Fireflies!* by Julie Brinckloe lends itself to the study of synonyms, or words that are different but mean the same thing. Note: This activity fits very nicely immediately after the math activity of graphing the different terms people use to describe the glowing insect. Materials needed are: Julie Brinckloe’s *Fireflies!*, chalkboard and chalk or chart paper and markers, and a thesaurus (optional). Ask children to describe a firefly. What does it look like? What does it do? Repeat this process with “lightning bug”

and “glow worm.” Guide the children in understanding that all three terms are used to describe and talk about the same thing.

Ask children to think of more pairs of synonyms or “word partners” that are different words but that have the same, or about the same, meaning. List the children’s ideas on chart paper or on the board, or you could use this opportunity to have the children help you through interactive writing. Some examples are: ocean/sea; small/little; big/large; thin/skinny; thick/fat; squishy/mushy; and tired /exhausted. Explain that while these pairs mean *almost* the same thing, there are slight differences in the way we sometimes use them. For example, exhausted is a *stronger* word than tired. You may want to choose some of the word partners (synonyms) the children listed and have volunteers act them out to show what they mean and their subtle differences. With more advanced students, you may want to introduce a thesaurus and how it helps people to be better writers. Spend some time looking up words and their synonyms with the children.

Ohio Fourth Grade Proficiency Learning Outcomes for Writing:

The student conveys a clear message that meets requirements for this grade level.

Writing Activity

Students write a personal response to a book.

Materials needed for this activity are: Julie Brinckloe’s *Fireflies!*, chart paper or large butcher paper and markers (for the word bank), children’s journals or paper on which to write, and pencils. Reread the book, *Fireflies!* by Julie Brinckloe to the class. Ask students to pay special attention to the author’s use of “describing words” (adjectives). Also have the children note the character’s feelings and how those feelings change during the course of the story (anticipation to excitement to elation to pride to guilt to sadness and happiness at the same time). Have the children describe the character and give evidence from the story to back up what they say. (For example: He is kind because he lets the fireflies go at the end.) Ask children to remember a time when they’ve caught or played with an insect or an animal. Give them time to share their personal experiences. Guide the children to make connections to the book. How were their experiences similar to those of the main character? How were they different?

Make a word bank with the children, focusing on words related to fireflies and to the story. Some words to include are: fireflies, lightning bugs, dark, night, light, flashing, glow, jar, breathe, air, fly, free, caught, as well as any others which are relevant to the children in the class. Have children write in their journals. They may relate a personal experience, a make-believe/fictional story about catching fireflies, or a personal response to Brinckloe’s book. Remind the children to use the word bank and word wall to help them get ideas and/or spell words in their writing.

Ohio Fourth Grade Proficiency Learning Outcomes for Writing:

The student conveys a clear message that meets requirements for this grade level.

Social Studies Activity

Students discuss and list the basic needs of living things.

Materials needed for this activity are: Julie Brinckloe’s *Fireflies!*, chalkboard and chalk or chart paper and markers, paper on which to record chart, children’s journals, and

pencils. Discuss the end of Brinckloe's book with the class. Were they surprised that the child let the fireflies go? Ask them why they think he decided to set them free. Record their answers on chart paper or on the board. If children do not understand that the fireflies were not as happy in the jar and probably would have died there, guide them to this idea.

Move into a discussion about the basic needs of all living things. Have the class work together to list what they consider absolutely essential for living things to have in order to stay alive. You may want to channel the children's thinking to include the needs for people to stay alive. While the answers will vary depending on the children's ideas, there will most likely be some answers such as "Nintendo" or "toys." List *all* the answers the children give. Next, have the class work together to sort the answers into two categories: "Things We Need to Live" and "Things We Have that Make Us Happier." When finished with sorting, the children can record the chart and/or respond to the activity in their journals.

Ohio Fourth Grade Proficiency Learning Outcomes for Citizenship:

1. Demonstrate knowledge of and ability to think about the relationship among events by: d. Identifying cause-and-effect relationships.

Art Activity

Students make paper fireflies.

Each child makes a paper firefly with the title of his or her favorite book written on it. Provide students with construction paper and other art materials to draw, paint, or create a paper firefly. (You can provide students with a photocopied page that illustrates a simple firefly, if desired.) When finished with the fireflies, invite students to think of their favorite books and write the titles on the fireflies. Have the children help you post them on the bulletin board where you have already posted the words, "Reading Lights Up Our Lives!"

Reading Activity

Students listen and discuss a story.

Turn off or dim the lights in the classroom and gather the children to listen to a story. Read Eric Carle's *The Very Lonely Firefly*. Discuss with the children how the fireflies at the end of the book resemble real fireflies, like in Julie Brinckloe's book, *Fireflies!*. Also, discuss how they are different from real insects. If used with a unit about the study of insects, Carle's book could be used to introduce the concept of the lifecycle of insects and their need to find a mate. Another great book to read to the children is *Lightning Bug Thunder* by Katie Burke.

Ohio Fourth Grade Proficiency Learning Outcome for Reading:

7. Compare and/or contrast elements such as characters, settings, or events.

References

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