Activity: Bats

Lesson Summary
Read "The Story of Echo the Bat" to learn about the life cycle of the bat, how echolocation and the structure of the wings allows the bat to catch insects in the air. Students will become bat experts using the Jigsaw strategy. The culmination of butterflies and bats will include a comparison diagram, e.g., Venn or H diagram.

Ohio Standards Correlations
Standard: Life Sciences

Grades 3-5 Benchmark A: Differentiate between the life cycles of different plants and animals.

Indicator(s)
Grade Three
1. Compare the life cycles of different animals including birth to adulthood, reproduction and death (e.g., egg-tadpole-frog, egg-caterpillar-chrysalis-butterfly).

Grades 3-5 Benchmark B: Analyze plant and animal structures and functions needed for survival and describe the flow of energy through a system that all organisms use to survive.

Indicator(s)
Grade Three
2. Relate animal structures to their specific survival functions (e.g., obtaining food, escaping or hiding from enemies).

Standard: Physical Sciences

Grades 3-5 Benchmark C: Describe the forces that directly affect objects and their motion.

Indicator(s):
Grade Three
1. Describe an object's position by locating it relative to another object or the background.

Standard: Scientific Inquiry

Grades 3-5 Benchmark B: Organize and evaluate observations, measurements and other data to formulate inferences and conclusions.

Indicator(s)
Grade Three
2. Discuss observations and measurements made by other people.

Grade Three
6. Communicate scientific findings to others through a variety of methods (e.g., pictures, written, oral and recorded observations).

Time 4 30-minute periods

Materials
For the teacher: Assessment checklist for Bat Writing (Attachment E), Compare the butterfly to the bat answer key (Attachment H)
For whole class: The Adventures of Echo the Bat book, blindfold
For each student: The Parts of a Bat (Attachment A), Bat Writing (Attachment D), Big Brown Bat coloring page (Attachment I), Bat Information (Attachment C), Compare the butterfly to bat Venn diagram (Attachment F) or Compare the butterfly to bat H diagram (Attachment G)
Per group: 1 set Bat Facts cards (Attachment B)

Background
How much can a bat eat?
Many bats can eat up to half their weight in food in a single night. One little brown bat can eat more than 600 mosquitoes in a single hour. Different bats eat different kinds of food. Some bats eat flies, mosquitoes, and other insects. Other bats eat fish, frogs, birds or mice. In the tropics, fruit bats eat fruit or drink nectar like in the popular children's book, Stellaluna. Vampire bats are the only bats that feed on the blood of cattle, sheep or other animals.

How many kinds of bats are there?
There are over 900 different species of bats. Most bats are found in the tropics. A bat can be a Megachiroptera (Mega-Bat) or a Microchiroptera (Micro-Bat). A Mega-Bat is the largest bat. You can find this bat in the countries of Africa or in Australia. Another name for this large bat is the "flying fox" bat. Their face resembles a fox. This bat weighs over two pounds and has a wing span of 6 feet. They eat fruit or drink nectar from flowers. Micro-Bats are small bats found everywhere. You can find these bats in the United States. The big brown and small brown bats are common in Ohio. They eat mostly insects. They use echolocation to find their food. They weigh about ½ ounce. The smallest bat is the bumble-bee bat. This bat weighs about the same as a dime or ¼ ounce and has a wing span of 6 inches.

How do bats find food?
How a bat finds food depends on the type of bat it is. A small bat will use echolocation to find insects. They send out high frequency sounds that bounce off of objects. The bat listens for the returning echo to identify food and location of objects. If you yell in a closed room, you will hear your voice bounce off of the wall. However, the sound a bat makes cannot be heard by people. A large bat will use their sense of smell to find food. Fruit bats eat fruit and drinks nectar. Some bats will eat spiders.

How do bats live in the winter?

During cold weather, most bats will migrate to a warmer place to live. Some bats will hibernate during the winter. A brown bat in Ohio will hibernate with other bats sleeping until warm weather arrives. Their heart beat gets very slow when they hibernate to save their energy.

What is the body of a bat like?

It is not a bird. Bats have fur on their body, not feathers. They can fly like a bird but their wings are different from a bird's. They have wings whose bone structure is made up of very long fingers covered by skin. The wing bones are like fingers and a thumb. The thumb ends in a claw type appendage. They can fly for a long time about 15 miles per hour about as fast as you can drive through a school zone. Their wings are strong but their feet are weak so they do not walk very much. They have feet with five toes and claws. Some have short tails, some have no tails.

How do bats help people?

Bats help farmers by eating the insects before the insects eat the food the farmer is growing. The fruit eating bats help scatter the seeds of fruit. The nectar-feeding bats help spread pollen from flower to flower like bees do.

How do bats sleep?

When they rest or sleep, they hang upside down. They use the long, curved claws on their feet for hanging from branches in trees, caves, or other surfaces. Most bats hang upside down for most of the day. They can sleep up to 20 hours. Most bats are nocturnal...they sleep during the day and hunt at night.

Where do bats live?

Bats can live in trees, a cave, an attic, or a forest. They sleep in dark places. Their home is called a roost. They do not make nests. Sometimes thousands of bats live together in the same place like a cave. In some places, people have made bat roosts to help the bat population in their area find a safe place to live.

What are bat babies called?

The mother bat has one baby called a pup. The pup stays with the mother for one year. The bat is a mammal so the baby is born alive not from eggs like birds. The mother gives it milk. The pups and their mothers live in a nursery cave or tree. The mothers recognize their pup by its squeaking cry.

Misconceptions:

Bats are blind. Bats have eyes and can usually see in black and white. They use their hearing and echolocation (ultrasonic chirp) to find food and other things as they fly in the night.

Bats attack people and drink their blood. Bats are more afraid of people than we are of them. Bats eat insects and fruit. The vampire bat feeds on cattle and other animals but rarely bites humans.

Bats are dirty animals. Bats spend a lot of time grooming themselves. Hanging by one foot a bat will use its teeth and tongue and other foot to clean its fur and wings.

Bats get tangled up in people's hair. Bats are shy and timid around people. They do not try to get into people's hair. Bats do not need hair to build nests, they roost.
Bats carry rabies, a dangerous disease. Bats can get rabies like any other animal, including humans. The chance of a person getting rabies from a bat is rare. To be safe, do not pick up or try to catch a bat. (Good advise for any wild creature.)

Teacher Tips
Teach the monarch butterfly lesson first as most students have some experience with seeing them. Then introduce the bat information. Culminate with the Venn or H diagram to compare the bat to the butterfly.

Procedures

Getting Started
Begin reading "The Adventures of Echo the Bat" pages 1 and 2.
Use "The Parts of a Bat" drawing (Attachment A) to locate the thumb and 4 digits which make up the bat's wings. Identify the leg, knee, foot and tail. Ask the students to look at their fingers to compare them to the bat's wing. Have the students find the bat's forearm then find their own. Ask students: Does the bat seem to have an elbow and an upper arm that is connected to its body? How similar is the bat's wing to our hand and arm. So why can't we fly? (No membrane or skin attached to our arms and hands and we are too heavy)
Ask students: How does a bat use its wings to fly?
Compare the student's legs to the bat's leg in a similar manner. After looking at the bat's legs, ask the students: Why aren't bats strong walkers? (Not enough muscle strength to support the bat's body weight.)
Discuss with students any questions that they may have about Echo, the bat. The discussion may include topics such as how Echo got its name, why it has big ears and how the mother bats keep their babies warm.
Read the rest of the story.
Discuss with the class each of the following topics:
the description of echolocation,
ways the mother bat identifies her young,
food the bats eat,
animals (carnivores)that eat bats,
places they find to sleep during the day
reasons for migration
Pass out the Big Brown Bat coloring page (Attachment I) and have students do in class or assign as homework)
Extension: To help the students understand echolocation, have them play the Bat and Moth Activity. This activity is similar to the pool game called "Marco Polo". The student playing the "Bat" is blindfolded. The student playing the moth is not blindfolded. The moth must say "moth" every time the bat says "bat". The object of the game is to use only hearing for the bat to catch the moth. The rest of the students in the class will remain silent.

Doing Science

Jigsaw with Bat Facts (Attachment B)

The jigsaw strategy is very simple to use, just follow these steps:

Divide students into 9 person Jigsaw groups. The groups should be diverse in terms of gender, ethnicity, race and ability.

Appoint one student from each group as the leader. Initially, this person should be the most mature student in the group.

The Bat Facts Cards lesson is divided into 9 segments.

Assign each student to learn one Bat Fact Card segment. Make sure students have direct access only to their own segment.

Give students time to read over their segment at least twice and become familiar with it. There is no need for them to memorize it.

Form expert groups for each Bat Fact Card segment by having one student from each jigsaw group join other students assigned to the same segment. For example all the students with Bat Facts Card 1 will meet together to work on their information and become experts.

Give students in these expert groups time to discuss the main points of their segment and to rehearse the presentations they will make to their jigsaw group. Students may draw pictures or act out or present verbal information.

TEACHER NOTE: Move from group to group, observing the process. If any group is having trouble (e.g., a member is dominating or disruptive), make an appropriate intervention.

Bring the students back into the original jigsaw groups.

Ask each student to present her or his segment to the group. Encourage others in the group to ask questions for clarification.

Students will fill in the Bat information chart (Attachment C) as each person presents.

Wrapping Up

Bat Writing Evaluation (Attachment D)

Fill in the sentences with available word choices or student choices.

After creating sentences, have the students write a paragraph about bats.

Use the checklist to grade the writing.

Compare the butterfly to the bat Venn or H diagram (Attachment F & G).

This lesson can be a summative assessment after finishing both units of study about butterflies and bats OR

It can be a full class review about the information which they learned about an insect and a mammal.

Extensions:

Bat Survival Game

HYPERLINK "http://members.aol.com/bats4kids2/survival/survivalgame.htm" http://members.aol.com/bats4kids2/survival/survivalgame.htm

Bats, Why Should You Care?

HYPERLINK "http://www.cccoe.k12.ca.us/bats/index.htm" http://www.cccoe.k12.ca.us/bats/index.htm

Notes

Bat Facts 1

How much can a bat eat?

Many bats can eat up to half their weight in food in a single night. One little brown bat can eat more than 600 mosquitoes in a single hour. Different bats eat different kinds of food. Some bats eat flies, mosquitoes, and other insects. Other bats eat fish, frogs, birds or mice. In the tropics, certain bats eat fruit or drink nectar like in the book, Stellaluna.

Vampire bats are the only bats that feed on the blood of cattle, sheep or other animals. ***How much would you have to eat, to eat half of your body weight?***

Bat Facts 2

What are bat babies called?

The mother bat has one baby called a pup. The pup stays with the mother for one year. The bat is a mammal so the baby is born alive not from eggs like butterflies or birds. The mother gives it milk. The pups and their mothers live and sleep in a nursery cave or nursery tree. The mothers recognize their pup by its squeaking cry. ***How does your mother recognize you?***

Bat Facts 3

How do bats find food?

A small bat uses echolocation to find insects. While it is flying, the bat sends out sounds that bounce off of objects. The sound bounces off an insect and the bat listens for the echo to come back so the bat can find the insect. The sound a bat makes cannot be heard by people. A large bat that uses its sense of smell to find food. The fruit bats smell the air to find fruit. Some bats will eat spiders. ***Do you make sounds at your food to find it? How do you find your food?***

Bat Facts 4

How do bats live in the winter?

During cold weather, most bats will move or migrate to a warmer place to live. The reason for moving is to find food. Some bats will hibernate or sleep during the winter. A brown bat in Ohio will hibernate with other bats. They will sleep until warm weather comes in the spring. When they are hibernating their heart beat gets very slow to save their energy. ***What do you do in the winter to keep warm?***

Bat Facts 5

What is the body of a bat like?

Bats have fur on its body, not feathers. They can fly like birds but their wings are different from a bird. Their wings are covered by skin not feathers. Their wing bones are like four fingers and a thumb. Their wings are strong but their legs and feet are weak. They have feet with five very long toes with claws. They have big ears to catch sound better. Some have short tails, some have no tails. They can fly for a long time at about 15 miles per hour. That is as fast as you should drive through a school zone. ***Compare your body to a bat's.***

Bat Facts 6

How do bats help people?

Bats help people by eating insects like mosquitoes. Mosquito bites can make people sick. Bats help farmers by eating the insects on the crops in the fields. The fruit eating bats help scatter the seeds of fruit. When the seeds are spread around more fruit plants will grow. The bats that eat nectar from the flowers help spread pollen from flower to flower like bees do. ***List 2 things that you do to help people.***

Bat Facts 7

How do bats sleep?

When they rest or sleep, they hang upside down. They use the long, curved claws on their feet for hanging from branches in trees, caves or other places. Most bats hang upside down for most of the day. They can sleep up to 20 hours. Most bats are nocturnal. They sleep during the day and hunt at night. ***Where do you sleep?. For how long do you sleep each night?***

Bat Facts 8

Where do bats live?

Bats can live in a tree, a cave, an attic, or a bat house. They sleep in places that are dark during the day. Their home is called a roost. They do not make nests. Sometimes thousands of bats live together in the same place like a cave. ***Where do you live? With how many people do you live?***

Bat Facts 9

How many kinds of bats are there?

There are over 900 different species of bats found around the world. Mega-Bats are the largest kind of bat. One of the large bats is the "flying fox" bat. Their face looks like a fox. This bat weighs over two pounds. Its wings measure 6 feet from tip to tip. They eat fruit and all parts of flowers: petals, nectar and pollen.

Many types of bats are found in the United States. One type is a Micro-Bat or a small bat. A small bat found in Ohio is called the brown bat. They weigh ½ ounce. Its wings measure 13 inches from tip to tip. They have hair on their toes and have pointed ears. They eat insects like flies, beetles and mosquitoes. The smallest bat in the world is the bumble bee bat. This bat weighs about the same as a dime or about ¼ ounce. Its wings measure 6 inches from tip to tip. Bumble bee bats have a nose like a pig's and no tail. ***Compare the flying fox, the brown and the bumble bee bats' weight and wing measurements. Report your findings to your class.***

Bat Facts 10

What is the life cycle of the bat?

A baby bat begins in its mother as an egg. Bats are mammals so the babies are born alive and look like their parents. Bats have one baby at a time. The baby bat is called a pup. The baby bat drinks its mother's milk. The baby stays warm by being wrapped in its mother's wings at night in the baby bat nursery. When the pup is about 3 weeks old it begins to fly and then hunt for food.

The adult bat spends its days sleeping and its nights hunting for food. It usually lives in a colony of bats in a tree or cave or building. ***How is the bat's life cycle similar to your life cycle?***

Name _____

Bat Information
Attachment C

As the expert talks, write your notes under the question.

How much can a bat eat?

What are bat babies called?

How do bats find food?

How do bats live in the winter?

What is the body of a bat like?

How do bats help people?

How do bats sleep?

Where do bats live?

How many kinds of bats are there?

What is the life cycle of the bat?

Your question about bats

Name _____

Bat Writing
Attachment D

Directions: Finish each sentence. Choose the words given or use your own words.

Bats have _____ (mothers, fur, good eyesight)

Bats fly _____ (at night, far, with wings)

Bats do not have _____ (feathers, cold blood)

Bats are _____ (mammals, nocturnal, clean)

Bats eat _____ (insects, mosquitoes)

Bats have wings with _____ (a leathery covering)

Bats find their food using _____ (sound, echoes)

Bats sleep _____ (with other bats, in a cave)

Use the information above and what you know about bats to write a paragraph about bats

Teacher Answer Key – Attachment E

Assessment Checklist for Bat Writing

Students need to include information from at least 10 questions or statements below to be proficient on this assignment.

Bat Facts

How much can a bat eat?
How many kinds of bats are there?
How do bats find food?
How do bats live in the winter?
What is the body of a bat like?
How do bats help people?
How do bats sleep?
Where do bats live?
What are bat babies called?

Misconceptions:

Bats are blind.
Bats attack people and drink their blood.
Bats are dirty animals.
Bats get tangled up in people's hair.
Bats carry rabies, a dangerous disease.

Teacher Answer Key
Compare the butterfly to the bat
Attachment H

Students need to have correct information in all three areas and have 5 topics of comparison under butterfly and bat to be proficient on this assignment.

Butterfly information

insect
diurnal or eats during the day
colorful scales covering wings
hatches from eggs
mother lays eggs and leaves forever
life cycle is egg to caterpillar (larva) to pupa (chrysalis) to adult
caterpillar eats plants
adult eats flower nectar, fluid from plant sap, rotting fruit, dung and water from moist sand and/or mud
body parts are head, body (thorax and abdomen), 2 compound eyes, mouth with coiled proboscis, 2 antennae, 6 legs, 6 feet, 4 wings,
tastes with feet to identify plants correctly
predators are ants, wasps, birds, preying mantis,

Both

fly
pollinate flowers
caterpillars and bats have teeth

Bat information

mammal
nocturnal or eats at dusk through night
leathery skin covering on wings
born alive
mother stays with pup for about 1 year
life cycle is pup to adult
eats plants, insects
body parts are head, 2 ears, 2 eyes, nose, mouth with teeth and tongue, body, 2 wings, 2 legs, 2 feet with 5 clawed toes
tastes with mouth parts
grooms their fur, wings and feet to keep clean
predators are owls, hawks, snakes, raccoons, foxes, house cats

Big Brown Bat

Attachment I

The big brown bat is one of the most common bats found in Ohio.
It can be seen flying above ponds, lakes, marshes and your neighborhood as it searches for insects to eat. It eats ½ of its body weight in insects every night. If it weighs ½ ounce, what part of an ounce does it have to eat each night?

Directions: Color the bat using Echo the Bat book.
Body: light brown to dark brown
Ears and Wings: dark brown to black

Type 1 Writing

What is it?
This type of writing is an informal "quick write". It gives students an opportunity to "think" on paper and also promotes an increase in the frequency of writing. A Type 1 writing limits the time that writing occurs (7-8 minutes) and gives a minimum line limit. It engages all students and is *not* a test or formal assessment.

How are they assessed?
The total time for Type 1 writing is 7 – 8 minutes and this includes the assessment of the writing. Just think, there isn't a bundle of papers to haul around, take home and grade! The assessment is done quickly by the teacher as the students are writing. The teacher is only assessing the completion of the writing. There is no correct answer. It is ok to be wrong. This isn't meant to carry as much weight as a test grade or a homework assignment. A suggestion is to complete a Type 1 writing twice a week where each write is only worth 5 points. At the end of the grading period, add all of the points up and give it the weight of one quiz or homework assignment. Keep in mind that the goal is to get students writing!!

How does it look in the science classroom?
At the beginning of a new unit, ask the students to "write 6 lines in 4 minutes about what you know or think you know about _____." If students know nothing about the topic, they could always write down questions that they have about the math concept.

A Type 1 writing could be used to check for prior knowledge or the understanding of a concept currently being taught in your classroom. The teacher could also provide some of the vocabulary from a current unit of study and then students could use these words in their writing and <u>underline</u> them.

What are the benefits of this type of writing?
It focuses your students on what you want them to do and it forces their engagement. Now instead of asking a question and seeing 6 hands raised to answer it, you are asking all students to participate. Students will become more comfortable and confident with the written word and it helps to develop fluency.

TIPS
• Have students skip lines when writing. To help them remember them, have them make an "X" on every other line of their paper.
• After they have finished, have students draw a line under the last line that they wrote. When going over this as a class, have them write down any ideas they do not already have on their paper below the line. This will keep them more engaged during the class discussion.

***Please remember that a Type 1 writing will **NOT** build writing skills but it does make students fluent!

Type 2 Writing

What is it?

This type of writing is an informal "quick write". It shows that the writer knows something about a topic or has a thought about a topic. It has a correct answer to a teacher's prompt. Type two writing assignments ask for definitions, facts, explanations or opinions supported with facts. The prompt should be one that requires a *limited*, *specific* predictable response. Open-ended questions should be reserved for Type One writing.

How are they assessed?

Type 2 writing is best used as a quiz. The only criteria used when evaluating a Type 2 writing is that the content is correct.

Evaluation should be kept simple. The best systems are pass/fail or point systems. The teacher should be able to scan the paper for a quick evaluation. Other options for grading that work are points for each correct answer or a letter grade off for each definition, fact that is incorrect.

The more frequent this type of writing given in a grading period, the better.

What are the benefits of this type of writing?

This type of writing provides potential for easy to evaluate writing assignments.

Research supports that testing soon after material is introduced promotes learning. In addition, frequent, spaced testing results in higher levels of achievement than does infrequent testing. Finally the use of cumulative questions on tests is one of the keys to effective learning. Type 2 writing is a vehicle to put this research into practice with little burden on the teacher.

Type 3 Writing

What is it?

This type of writing is more formal, has substantive content and meets up to three specific standards called Focus Correction Areas (FCA's). The FCA's are written at the top of the page and can have point values assigned to them. It is wise to only have one mechanical FCA in a writing piece and it is okay to have different FCA's to meet different student's needs.

The writers create a draft and read it aloud in a one inch voice. As they read, students should ask themselves three key questions.

1. Have I completed the assignment given?

Have I produced a readable work?

3. Have I met the assigned criteria? The students must find three places where they can improve their original draft (misspelled word, better word choice, description . . .) and make those changes right on the draft.

How are they assessed?

Students are assesses solely on the three predetermined FCA's. It is easier to assess Type 3 writing if point values are assigned to each FCA. If students miss a FCA, or left out part of a FCA, points are deducted. Comments can be made right next to each FCA to indicate why points were deducted. Also, comments are only made about the predetermined FCA's. This assessment should not be burdensome because the focus has been narrowed to three criteria. It is also helpful to have students underline key points that meet the FCA's so the paper is easier to scan.

How does it look in the classroom?

Type three writing could be used after completing a unit or concept to determine student comprehension.

Notes

The Parts of a Bat

Attachment A

Attachment B

Name _____

Compare the butterfly to the bat.

Attachment F

bat

both

butterfly

bat

both

butterfly

Name _____

Compare the butterfly to the bat.

Attachment G