

Title: Survival Skills

By: Jessica Milam and Amanda Carey

Major Science Concepts: Adaptations; Vertebrates; Caves; Bats; Echolocate; Sound

Suggested Grade Levels: 4-5

Time Needed:

Day 1: **Engage**- Survival Skills PowerPoint and O-W-L chart, **Explain**- Read Aloud and Discussion (Thinking Strategy: Determining Importance), **Explore**-Loss of Sight Investigation

Day 2: **Elaborate**-Can You Echolocate Investigation

Day 3: **Evaluate**- Cave Adaptation Foldable

Day 4: **Engage**-Read Aloud (Thinking Strategy: Schema), **Explore**- Does it Make Scents? Investigation Part 1

Day 5: **Explain**-Read Aloud and Discussion, **Elaborate**- Does it Make Scents? Investigation Part 2, **Evaluate**- Cave Adaptation Quiz

Lesson Objectives: Connecting to the GLEs

⊕ Science 4th Grade

- 4.1.A.a (DOK 1) - Among Organisms and Their Environment; Identify the ways a specific organism may interact with other organisms or with the environment (e.g., pollination, shelter, seed dispersal, camouflage, migration, hibernation, defensive mechanism)
- 4.3.C.b (DOK 2)-Identify specialized structures and senses and describe how they help animals survive in their environment (e.g., antennae, body covering, teeth, beaks, whiskers, appendages)
- 4.3.C.c (DOK 1)- Identify internal cues (e.g., hunger) and external cues (e.g., changes in the environment) that cause organisms to behave in certain ways (e.g., hunting, migration, hibernation)
- 4.3.C.d (DOK 2)- Predict which plant or animal will be able to survive in a specific environment based on its special structures or behaviors.

⊕ Science 5th Grade

- 3.1.D.a (DOK 2)– *Scope and Sequence – Classification of Plants and Animals*; Compare structures (e.g., wings vs. fins vs. legs; gills vs. lungs; feathers vs. hair vs. scales) that serve similar functions for animals belonging to different vertebrate classes
- 3.1.E.a-c(DOK 1)- *Scope and Sequence – Classification of Plants and Animals*; Classify animals as vertebrates and invertebrates
- 3.1.E.a -d(DOK 1)- *Scope and Sequence – Classification of Plants and Animals*; Classify vertebrates animals into classes (amphibians, birds, reptiles, mammals, fish) based on their characteristics.

⊕ Communication Arts GLEs

- Reading 1G (DOK 2)- During reading, utilize strategies to: determine meaning of unknown words, infer, summarize

- Reading 1I (DOK 3)- Compare, contrast and analyze connections between text to text, text to self, and text to world
- Reading 2A (DOK 1)- Use grade level text to locate, interpret and apply information in title, table of contents and glossary locate and recognize the text features of fiction, poetry and drama
- Reading 2C (DOK 2)- Use details from text to demonstrate comprehension skills previously introduced, make inferences, compare and contrast, identify and explain cause and effect, explain author's purpose, identify setting, character traits, problems and solutions, and story events

⊕ **Content Standard: Inquiry and Technology**

- **7.1.A-c.** Conduct a fair test to answer a question
- **7.1.B-a.** Make qualitative observations using the five senses.
- **7.1.C-a.** Use quantitative and qualitative data as support for reasonable explanations.
- **7.1.D-a.** Evaluate the reasonableness of an explanation
- **7.1.E-a.** Communicate the procedures and results of investigations and explanations through oral presentations, drawings and maps, data tables, graphs, and writings.

Materials:

Per class:

- ⊕ PowerPoint: Survival Skills
- ⊕ Handouts: O-W-L Student Handout, Can You Echolocate Student Handout, Cave Adaptation Quiz (see attachments)
- ⊕ Books: See book list below, the first three are used for this lesson.

Per pair for Loss of Sight Investigation:

- ⊕ Blindfold (use an old shirt to save money)

Per group for Can You Echolocate? Investigation:

- ⊕ Empty Gallon Bucket
- ⊕ Blindfold
- ⊕ Timer
- ⊕ 2 Wiffle Balls
- ⊕ Meter Stick (or tape)
- ⊕ Token or Marker

Per student or group for cave adaptation foldable:

- ⊕ 1 - 12 x 18 paper
- ⊕ 3 – 8 ½ x 11 paper
- ⊕ Color Writing Utensils (markers, color pencils, etc.)
- ⊕ O-W-L Handout

Per group or class for Does It Make Scents? Investigation:

- ⊕ Black or Brown Card Stock
- ⊕ Student Created Bats (can also use Ellison machine to make bats to save time)
- ⊕ Scissors
- ⊕ 5 Blindfolds
- ⊕ 4 Scents: Suggested: Cinnamon, Vanilla Extract, Almond Extract, Orange Extract.
- ⊕ 5 Zip Lock Bags (large enough to hold bats)

General Misconceptions:

Misconception	How They Can Be Addressed
Animals have always looked the way they do right now.	A salamander is born with sight, but becomes blind as an adult.
Cave animals cannot see.	Some animals, such as bats can see, but is not their primary way of finding things. They use their sense of hearing and smell to help them move and locate food.
Cave animals are not mammals.	Bats are mammals.
All parts of a cave are dark.	There are different cave zones. Some cave zones receive more natural light than others.

Bat Misconceptions:

Misconception	How They Can Be Addressed
Bats are blind.	A bat can see as well as we can. Bats live in dark places.
All bats live in caves.	Bats can live in caves, but can also live in other dark places. (e.g., holes in trees and rocks, the attics and ceilings of barns and buildings; under bridges; in manmade bat houses.
All bats have rabies.	Any mammal can have rabies, including bats. More people die from dog bites than bat bites.
Bats get tangled in your hair.	Bat echolocation is precise enough to catch a tiny bug in the air. A bat can easily avoid human hair.
There are two types of bats; fruit bats and vampire bats.	There are over 1000 species of bats, 14 of which live in Missouri.
Bats are not mammals.	Bats are mammals. They have fur, are warm-blooded, and give birth to live young.

Academic Vocabulary Words: Definitions and Context

- ⊕ **Adaptation:** traits developed over time that help organisms meet their basic needs and survive.
 - *Context:* The bat's ability to use echolocation is an adaptation for capturing food and flying in the dark.
- ⊕ **Echolocation:** the ability to create a mental map of surroundings based on echoes
 - *Context:* Bats use echolocation to navigate and hunt where it is too dark to see.
- ⊕ **Insectivore:** insect-eating animal
 - *Context:* Most bats are insectivores, eating many bugs that are harmful to crops.

- ⊕ **Migration:** seasonal movement of animals, fish and birds in search of food or shelter, sometimes covering great distances
 - *Context:* Some species of bats migrate to a warmer climate to deal with cold winters, others use torpor to survive the winter.
- ⊕ **Morphology:** description of an organism's form and structure, with special emphasis on external features.
 - *Context:* The morphology of a bat's face, including tragus, nose leaf, and ear shape may give clues to how the bat uses echolocation.
- ⊕ **Nocturnal:** active at night
 - *Context:* Bats are nocturnal and sleep during the day.
- ⊕ **Species:** a population of animals that are more or less alike; a category of biological classification immediately below the genus or subgenus.
 - *Context:* There are many species of bats.
- ⊕ **Troglobites:** True cave dwellers; only live in caves.
 - *Context:* To survive, troglobites have adapted to the dark and most would not be able to survive anywhere else.
- ⊕ **Troglophiles:** “Cave Lovers”; can (and often do) complete their life cycle in a cave; however, they may also live in suitable habitats outside of caves.
 - *Context:* Troglophiles are so cool because they could live their whole life in or out of the cave.
- ⊕ **Trogloxenes:** enter caves, but return periodically to the surface for some living requirements, often food
 - *Context:* Trogloxenes are cave guest using the cave for hibernation, shelter during bad storms, or as a bedroom for some shut eye.

Evaluation: Assessment Tool to Determine Students’ Knowledge BEFORE the activity.

Grade	Method of Assessment
4 th & 5 th	Assess student knowledge during read aloud & during the Observe section of the foldable being filled out.

Engage: DOK Level- 2

PowerPoint Discussion: Students will become aware of different cave dwelling species by studying images in the PowerPoint Survival Skills.

O-W-L (**O**bservations, **W**onderings, and **L**earning’s) Chart: As the class goes through the PowerPoint they will be able to contribute thoughts to the observations and wondering columns on their O-W-L chart as well as writing down any notes they may have onto their foldable. Take time for students to share their observations and wonderings throughout the PowerPoint presentation. Share with students that they will be learning the answers to some of their questions over the next few days. Encourage them to continue to add their thinking to their foldable that will later become part of their science notebooks.

Explain: DOK Level- 1

Read Aloud: Read Animals with No Eyes Cave Adaptation by Kelly Regan Barnhill chapter 1 and 2 aloud. This book highlights different cave animals and their adaptations. This non-fiction text will clarify and further explain the term adaptations and concepts regarding cave dwelling animals.



Thinking Strategy: Determining Importance.

Teacher Think Aloud: Model what good reader's do when determining importance in a non-fiction text. Pointing out how the author has used different information text boxes to highlight important vocabulary. Also, share how the pictures and labels play an important part in helping the reader understand what they are studying.

Explore: DOK Level- 3

Safety Procedure: Make sure students are aware of how to properly use the blind folds and navigate while being blindfold so they do not hurt themselves. 😊

Directed Inquiry: Loss of Sight Simulation

Discuss with students that caves receive little to no natural light. (Some students might need this better clarified that some parts of cave receive more light; such as the cave opening.) Prompt students through open ended questioning to identify that the sense of sight is affected due to the lack of light in caves.

- Divide the class into 2 groups. One group can work in the classroom while the other is working in the hallway.
- Have each group create an "obstacle course" they can use cones (borrowed from PE teacher), books or desks.
- Next the two groups will lead each other through the others obstacle course.
- The students must first assign sounds to an action, for example snapping fingers would mean go right, clapping would mean go left. **Teacher Tip you may want the signals to be the same for the whole class so it will be less confusing between groups.
- The paired students will lead the "cave animal" through the "obstacle course" using sound clue directions, students will then switch roles. After the simulation, the class will meet to discuss what they observed in the lab due to the loss of sight.

Elaborate: DOK Level- 3

Directed Inquiry: Can You Echolocate?

Safety Procedure: Model what spinning looks and sounds like and how to use the equipment involved in this directed inquiry.

Now that students have an understanding of how the lack of light affects cave animals; students will explore how echolocate helps some cave animals survive. Students will complete the handout *Can You Echolocate?* To be placed in their science notebooks after completing the lab.

Ask students:



What would happen if they shouted into an empty bucket? (It would produce an echo like sound)

Have students' turn-and-talk to share their thinking. Next, the students will take turns shouting into a bucket. As a class discuss the terms; echo and locate.

- *Echo*: a repetition of sound produced by the reflection of sound waves from a wall, mountain, or other obstructing surface; a sound heard again near its source after being reflected.
- *Locate*: to identify or discover the place or location of.
- *Echolocation*: the ability to create a mental map of surroundings based on echoes

Tell students that they will need to use what they know about sound and echoes to conduct an investigation to locate objects using echolocation. Pass out the *Can You Echolocate?* student page, and have students work in groups to complete the investigation. Share with students that the section *think, question, and reflect* is for them to record any ideas or further questions or notes during the investigation. Make sure that students understand the safety procedures for using blind folds and what constitutes as "spinning".

Procedure:

1. Give each group (around three or four members) a timer, blind fold, and two Wiffle balls.
2. Have students create a hypothesis of how they will know which wall is closer using their sense of hearing.
3. Each group will need a time keeper, recorder, and a roller. (Teacher Tip: You may prefer to do as a whole-group activity and act as the time keeper yourself.) Explain that it will be very important for the time keeper and recorder to not share any data with the roller until after completing step nine.
4. Have members of the group blind fold the "roller" and lead them to a specific location. (Teacher Tip: The specific location is greatly depended on the number of students and space available. A hallway or gym is suggested.)
 - Extend: Play cave sounds to help catch student's attention and create interest throughout the investigation.
5. Have the recorder and time keeper mark the location of the "roller" with the token/marker. Giving the "roller" the two Wiffle balls, have them spin for five seconds.
6. After spinning the roller needs to roll one ball straight out in front of them. The timer needs to time the roll until the roller shares that they have heard the ball hit the wall. Without letting the roller know the recorder needs to record the time.
7. The roller needs to then turn to the right and roll the second ball. Listening for when the ball hits the wall. The timer needs to time the roll until the roller shares that they have heard the ball hit the wall. The timer and recorder will record the amount of time it takes for the roller to hear the ball hit the wall.
8. Prior to removing the blind fold the "roller" needs to identify which wall is located closer to them by what they observed using the sense of sound.
9. After removing the blind fold the group needs to record the distance the ball traveled and compare it to the prediction made by the "roller".

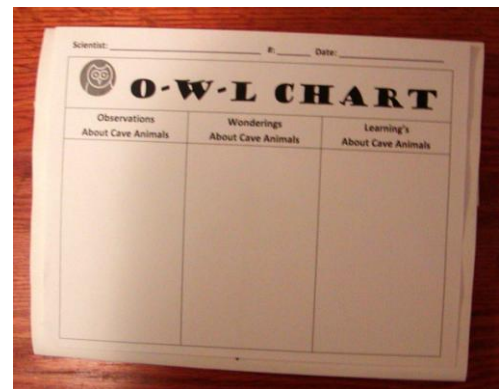
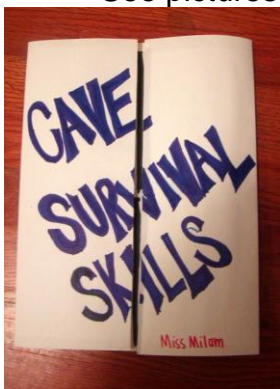
10. Conclusion: Have students look at their own data and answer the questions: Was your hypothesis confirmed or contradicted? Why? ; Imagine you ran the experiment again by changing your location to larger area. Name some controlled variables (things to keep the same to make sure the experiment is fair); and using what you learned, describe how echolocate helps bats and other cave animals.
11. Have students share their findings with the class. Comparing and contrasting the results and recording any of their notes onto foldable.

Evaluate: DOK Level- 2

Cave Survival Skill Foldable

Tell students that they are going to have a chance to demonstrate what they learned about cave animals and their adaptations. Give each student a copy of the Foldable Scoring Guide: Cave Adaptations (there are two scoring guides to a page to save paper), 1 -12 x 18 piece of paper, markers, and 3 sheets of 8 ½ x 11 paper.

- Have students take the 12 x 18 piece of paper and create a shutter fold.
- Students will write the title Cave Survival Skills and their name on the front cover.
- Fold one of the 8 ½ x 11 sheets of paper into a hot dog fold and open, then cut 6 flaps to the crease that was made.
- Open foldable and glue this strip vertically onto the left flap.
- Label the six flaps: adaptations, species, troglobites, troglaphiles, troglonexes, echolocation
- Next take the two other 8 ½ x 11 sheets and fold them hamburger fold and open, then cut the one flap to the crease making two flaps.
- Glue one side of the flap down inside the middle of the foldable.
- Label the right flap notes/reflections
- On the back of the foldable glue the OWL chart
- See pictures below for help



Engage: DOK Level- 1

Read Aloud: Read Are You My Mother aloud. This book takes readers on a journey as a bird tries to find his mother after getting lost. This is a fiction story that will catch the student's attention and engage them to think about how bats and bat pups have a special adaptation.



Thinking Strategy: Schema

While reading the book Are You My Mother, the teacher will have student's activate their schema by questioning students to make connections:



Have you ever been separated from an adult? What did you do to find them or what did they do to find you?



Have you ever observed an animal or person trying to find someone or something? Share what you observed?

Explore: DOK Level- 2

Directed Inquiry: Does It Make Scents?

Ask students



What kinds of things would you do if you went to a place with over 500 kids and you needed to find your guardian? (Discuss what different things could be done, specifically with different senses that would help the students find their parents.)

Next, read Animal Neighbors: Bat by Stephen Savage and explain to the students what a nursery colony is.

Ask students



What kinds of things would affect a bat's ability to find its pup? (the lack of light, the large number of bats and pups in a nursery colony, etc.)

Teacher Preparation Procedures:

1. On the day/hour prior to the lesson:
 - Have each student create a bat using black or gray construction paper. Collect the bats and divide them into groups (as equal as possible).
 - Without student's knowledge take one group of bats and place a couple drops of extract (cinnamon) on each bat using the same oil (cinnamon) then place the bats into a zip-lock bag for storage until tomorrow's lesson.
 - Repeat this process until each group of bats has a different scent.

Tell students that you have designed an investigation to demonstrate how a mother bat finds her pup.

Safety Procedure: Discuss with students what it means to smell an object as a scientist by reviewing the whiffing process.

Procedures:

1. Designate a student for each scent bag to play the role of the "adult bat". Send those "adult bats" out of the room and give each of the remaining students a bat cut out letting them know that you have put a scent on their bats and that they are not to discuss their scent with other students. On one side of the room have the pups line up against the wall or stand in a circle (depending on the space available).



2. Blindfold one “adult bat” and hand them a scented bat cut out. Tell the “adult bat” to walk across the room and find the pup that matches his/her scent.
3. As a class on the board record the time it took for the “adult bat” to find the pups that match the scent.
4. Next, blindfold the second adult and repeat the process. Continue until all the adult bats have found their pups and the times have been recorded.
5. Conclusion: Lead a class discussion on what they learned and what further questions they have.

Explain: DOK Level- 1

Read Aloud: Read pages 8-12 in [Animal Neighbors: Bat](#) by Stephen Savage. The teacher should further explain that each bat pup and its mother have their own scent.

Elaborate: DOK Level- 2

Ask students

-  How do bats and other cave animals often find food without using their sense of sight? (echolocate; sense of hearing)
-  How do you think an adult bat can use its sense of hearing and sense of smell to help it locate its young?

Procedure:

1. Designate a different student for each scent bag to play the role of the “adult bat”. Send those “adult bats” out of the room. Have each group of students in the room playing the role of the pups figure out a special click (or clap) for their scent.
2. Have the pups go to one side of the room. Blindfold the first adult on the other side of the room then have one of the pups demonstrate the sound that the “adult pup” is to seek. Mix the pups around. Have the pups do their special click quietly. The adult will try to find its pup by using not only scent but also sound. Let each adult be blindfolded and find its pup.
3. As a class on the board record the time it took for the “adult bat” to find the pups that match their scent and sound.
4. Conclusion: Have students look at the data and answer the question, “Is a mother bat more effective locating her pups when using smell alone or when using smell and sound?”
5. Have students reflect and share their thinking by leading a class discussion.

Evaluate: DOK Level- 3

Review what students have learned about caves and animal adaptations. Then hand out the assessment student page, Cave Adaptation Quiz (attached).

Featured Books:

Title: Animals with No Eyes

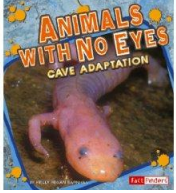
Author: Kelly Regan Barnhill

Publisher: Capstone Press

Year: 2008

Genre: Non-fiction

Summary: They don't have eyes. They're so pale you can almost see through them. What are they? They're the animals that live in caves. Grab your flashlight. We're headed underground to discover how creatures survive dark cave life.



Title: Animal Neighbors: Bats

Author: Stephen Savage

Publisher: The Rosen Publishing Group

Year: 2009

Genre: Fiction

Summary: Discover the exciting world of the bat, from inner-city homes to remote woodlands - explore some of the different habitats that are the bat's home. Find out how bats catch their prey in the dark, what happens to them in winter, and how you can look for signs of a bat in your neighborhood



Title: Are You My Mother?

Author: P.D. Eastman

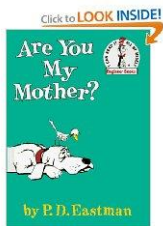
Illustrator: P.D. Eastman

Publisher: Beginner Books; A Division of Random House, Inc.

Year: 1960

Genre: Fiction

Summary: A baby bird is hatched while his mother is away. Fallen from his nest, he sets out to look for her and asks everyone he meets -- including a dog, a cow, and a plane -- "Are you my mother?"



Other Texts that Support this Lesson

Title: The Salamander Room

Author: Anne Mazer

Illustrator: Steve Johnson

Publisher: A Trumpet Club Special Edition; Scholastic Inc.

Year: 1991

Genre: Fiction

Summary: A beautiful illustrated book that explores the cause and effect of what a salamander needs in order to live in its natural habitat.

Title: Reading Essentials In Science; Energy Works! Sound.

Author: Jenny Karpelenia

Publisher: Perfection Learning Company

Year: 2004

Genre: Nonfiction

Summary: Page 25 of this text explains echolocation and gives an investigation to better understand how echoes are produced.

Title: Castles, Caves, and Honeycombs

Author: Linda Ashman

Illustrator: Lauren Stringer

Publisher: Harcourt, Inc.

Year: 2001

Genre: Illustrated Nonfiction

Summary: A simple story exploring different animal habitats.

Title: Life in a Cave

Author: Clare Oliver

Publisher: Raintree Steck-Vaughn Publishers

Year: 2002

Genre: Nonfiction

Summary: Describes the different parts of caves and cave life. Vocabulary terms are defined throughout the text.

Title: Animals After Dark: Bats Hunters of the Night

Author: Elaine Landau

Publisher: Enslow Publishers, Inc.

Year: 2008

Genre: Nonfiction

Summary: Describes and explains vocabulary related to bats and their cave habitat.

Title: Hide and Seek Nighttime Animals

Author: Valarie Davies

Illustrator: Gill Tomblin

Publisher: Blackbirch Press

Year: 2004

Genre: Nonfiction

Summary: Explores different habitats across the globe, including caves. Great illustrations and labels help connect the reader to the text.

Title: Black Out! Animals That Live In the Dark

Author: Ginjer L Clarke

Illustrator: Pete Mueller

Publisher: Grosset & Dunlap

Year: 2008

Genre: Nonfiction

Summary: Explores different animals that live in the dark. The text features different cave animals including: big brown bats, cave crayfish, blind cave fish, blind salamander, blind wolf spider, and glowworm. Highlights different adaptations that cave animals have to help them survive.

Title: Animal Families: Bats

Author: John Jackson

Publisher: Grolier Educational

Year: 2001

Genre: Nonfiction

Summary: Pictures and text help the reader better understand bats and how they survive. Features a special section on bat pups and youngsters. *** Teacher should preview book prior to sharing with students. Some material might not be suitable for younger students.

Extension:

View: A true and false quiz about caves by American Cave Conservation Association

<http://www.cavern.org/acca/truefalse.php>

View: A comparison of cave animal adaptation pictures by going to the website created by Texas

Parks and Wildlife <http://www.tpwd.state.tx.us/learning/webcasts/caves/adaptations.phtml>

Go to <http://art-smart.ci.manchester.ct.us/easy-bat/easy-bat.html> to find directions on making an origami bat that students could construct and write bat facts on for display. **Teachers beware when printing, you may want to copy and paste directions to avoid a HUGE printout.

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