

Chapter 3: A Strange Lunch in the Cave

The flashlight had gone out, and the children were lost again in the pitch black of the cave. Somebody sniffled in the dark.

“Carlos, caves are dangerous, I think,” whispered Jenny, rubbing her nose on her sleeve. “We could be lost in here and nobody would ever know where to look for us. Thank heavens we brought our lunch.”

Carlos agreed. He thought about the dark and the moldy tunnel they had crawled through. He remembered slipping on damp loose rocks, and the stream. He thought of the slippery mud all over his boots.

Calm down kids, squeaked Bat. You just have to follow instructions. I'll get you out.

“Yes, but you are used to the dark. We're scared and both of us are cold and wet.” Jenny sniffed again, and rubbed her nose on her sleeve. She shivered.

Then a new thought hit her. “Carlos! We've got sweaters in our backpacks. Oh, I'm going to put mine on right now.”

The two friends took off their packs and pulled out their warm, wooly sweaters. They put the sweaters on under their jackets. They felt better right away.

The Bat squeaked, *Let's go. I want to get out in time for supper, too.*

Bat swooped down from a rock overhead. *Kneel down*, he squeaked. He warned that they were about to crawl through another tunnel, and this tunnel followed the same stream where Jenny had scared the fish. Bat told Carlos to switch off the flashlight and carry it in his backpack, even though it didn't work anymore.

Don't leave it lying around. Battery chemicals can get in the water and hurt the fish.

“Oh — that's pollution,” Carlos said. “We learned about that in science camp.” As he placed the flashlight in his pack, his fingers touched the peanut butter sandwich he had brought along for lunch. His stomach growled hungrily.

“I sure hope we can get out of this tunnel and stop for lunch pretty soon,” he told Bat.

Bat tried to encourage them. *Try to stay on the side of the tunnel so you don't get wet. I'm sorry it's hard, but this is really the shortest way out, kids.*

Splash! Splash! The children got wet anyway. They stumbled through the stream tunnel. Now and then they stopped to rest. They grabbed each others' hands for a few minutes. Carlos was surprised to find out that he really did feel scared. He tried to think about hot chocolate instead. Even thinking about it made him feel better.

Hey, let's keep moving. This is hard on me, too. Normally I sleep all day. With all this extra flying, I'm getting tired. I'll have to catch a million extra bugs when I go out to feed tonight.

“You wouldn't leave us here and go out to catch bugs, would you, Bat?” Jenny worried.

Don't worry, I'll get you out of here in good time for us to have supper. But I'm hungry like you. I'm running low on energy, too. I have to make it to the cave entrance soon.

We can all rest soon though. I was thinking you could eat your lunch at the Bateteria room. You could meet my family, and just about all the cave animals eat there. How 'bout it?

Jenny groaned. “What's that? A bat lunch room? Oh, I'd rather die.”

“Shush, Jenny. Be polite,” said Carlos. Carlos asked the bat, “Will we get there soon? If it's just a few minutes, we could wait.”

It's just around the corner, said Bat. In fact we're out of the tunnel now. I'm going to hang myself up on the ceiling and rest for a bit.

Bat told Carlos to get his lunch and the flashlight out of his backpack.

Let's try something. Shake the flashlight, said Bat.

Carlos did. To his great surprise, the light flickered and came back on.

The Bat explained. *I saw that happen with the cave explorers once. Now walk quietly and whisper.*

Look up now, with the flashlight. See all the bats?

When the children looked up, they were amazed to see hundreds and hundreds and hundreds of bats. Instead of flying around, they were hanging upside down from the ceiling, holding on by their tiny feet.

We're under the bat colony. This is where the mom bats and the bat pups live. See the pups, hanging onto

the moms? I grew up there. Don't shine the light directly on the ceiling. Everybody's still sleeping until sunset.

Carlos and Jenny peered at the mass of bats above them. It was hard to figure out just which bats looked like their Bat and his little sister. Hundreds of mother bats and bat pups hung from the stone ceiling. Most were asleep. Or maybe it was thousands, Carlos thought. It certainly sounded like millions of squeaks and chirps overhead as bats stirred in their sleep and made little murmuring noises. When Carlos looked closely he could see the babies nestled against their mothers' breasts.

Look down now, said the bat. You can see a million troglobites eating here.

A foul smell filled the room.

"Bat, what's that awful smell?" asked Carlos.

Bat ignored the question. He was used to the smell. *Put your hats back on, he warned. They pulled their hats, still wet from the rain, out of their jacket pockets.*

They soon understood why Bat had warned about hats. Carlos heard the steady *Ping! Ping!* of something falling on their hats.

Carlos shone the light on Jenny's hat.

"Jenny, uh . . . There's bug and bat droppings falling on your hat. And mine too! It's lice and mites and things. Don't take your hat off, for heaven's sakes!"

"Bat droppings? Ugh, how awful!"

Bat was insulted. *Oh no. We're very proud of our guano pile. He pointed to a huge mound of grey bat droppings under the bat colony. Valuable stuff. Sometimes part of the guano dissolves and forms rocks. And we feed the troglobites with it. Without bat guano, there would be no food to eat in here. All the crickets and salamanders and such would starve.*

The children were not impressed. "The odor. It smells moldy and awful," Carlos said.

Well, lean over and see how many animals are eating the guano. They're not so fussy, Bat replied. A whole bunch of them — especially the little white springtails that hop all over the ground — eat the guano. And then there are the ones that eat the springtails — like the crickets and the beetles. Up top, there are the spiders that eat all the other guys. It's quite a system.

The children obeyed — careful to keep their hats on their heads. They leaned over and looked at the guano. The flashlight showed hundreds — perhaps millions — of bugs crawling about. Pale white millipedes zipped across the pile. Pale wispy crickets with long, graceful feelers jumped about, along with long-legged daddy longlegs. Tiny springtails hid in the cracks.

Some of the bugs eat the guano, and other bugs eat those bugs. Without us bats making guano, they'd all starve to death. We eat bugs out there, and turn it into food for the troglobites in here.

"Why can't they eat plants?" Carlos asked.

Do you see any plants here? asked Bat. *And what do plants need?*

Then Carlos remembered. Plants need *light* to grow, of course! How silly to forget a thing like that.

Jenny and Carlos found a flat rock outside the bat guano area. They sat down to eat their sandwiches. They were used to the guano smell now, and they tried to ignore all the bugs around them. Inside their packs were peanut butter and jelly sandwiches, celery sticks, an apple, and a container of juice. In spite of the smell of the guano, they were very hungry and gobbled up their simple lunches.

"Look, Carlos. Look, Bat," Jenny said quietly. "The troglobites are coming here for lunch." She pointed the flashlight. On a spot near their rock, bread crumbs and celery leaves had fallen on the ground. Crickets and other bugs were busy carrying the crumbs away.

You guys are kind of like bats, noted Bat. You're bringing food for cave critters. Just be sure you don't leave garbage behind.

The children put their paper bags and containers back into their backpacks. They took a last look at the bats hanging from the ceiling, and followed the bat out of the Bateteria into a dark, damp passage.

I wish your noses were as good as troglobite noses, squeaked Bat. You could find your way out of the cave. Lots of these animals smell their own trails to find their way around in the dark.

Carlos imagined crawling around, smelling his own muddy footsteps. No thank you. He decided he'd rather put up with bossy Bat.

<i>Grade Levels</i>	K, 1, 2, 3
<i>Science Topics</i>	Geology Biology
<i>Disciplines</i>	Science Reading

LESSON 3.1 Reading Follow-up Activity

Educational Goals

Students will be able to:

- Describe the living arrangements of a bat colony.
- Define the word “guano.”

Materials Provided

- Handout 6: Reading Follow-up Coloring Page

Procedure

1. Distribute Handout 6: Reading Follow-up Coloring Page.
2. While students are coloring, talk about Discussion Questions, below.
3. Incorporate New Words into writing and vocabulary lessons.
4. Assign writing topics to advanced students.

Discussion Questions

1. What are the three groups of cave animals? (*Troglobites, troglonexes, and troglophiles.*) Encourage the class to pronounce the words out loud as a group. Although the words are long, they have a musical, amusing sound. Revisit the *Rock Music* song to help.
2. In which categories are the following animals: bat, pale cave fish, earthworm?

3. What would happen to cave animals if a bat colony were scared away?

Imagine a cave with no bat colony. What would happen if a bat colony moved in?

4. Where on your picture are crickets, the bat colony, and guano? Why are the bats upside down?

New Words:

All grades colony, droppings, energy, guano, millipede

Kindergarten hard, ice, loose, rocks, sleep

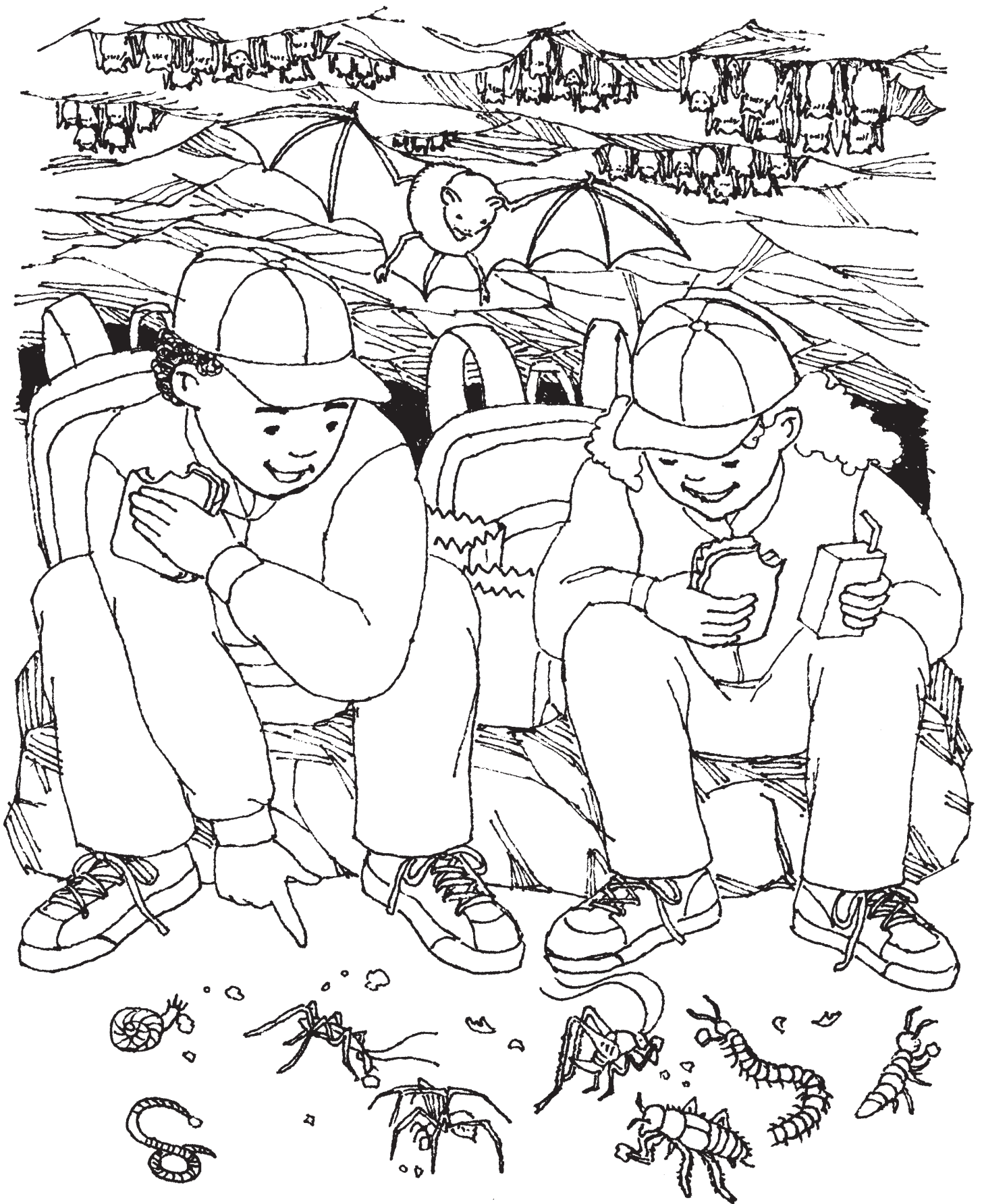
Grade 1 butter, chatter, children, finger, joke, knee, scared, splash

Grade 2 sandwich, secret, stomach, supper, flashlight

Grade 3 stiff, critter, cricket, celery, odor, peanut

Writing Assignment

Write a poem about cave animals that live in the dark. How can they find things in the dark? What do they eat? Do they have strange names?



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<i>Science Topics</i>	Geology Biology
<i>Disciplines</i>	Science Reading

LESSON 3.2 Adapting to the Dark — Bats and People

Activity Summary

Both animals and humans adapt to where they live in many ways. Both behavior and bodies are adapted to climate, food availability, and special features of the habitat. In the cave environment, bats have adapted superbly to a unique habitat. The students will consider how cavers also make adaptations to the cave. Finally, students will meet a real-life blind person, Joni, who makes adaptations to life in the dark.

Educational Goals

Students will be able to define the word “adaptation.”

Students will be able to name:

- Three kinds of strategies for adapting: body changes, behavior changes (changing the way we act), and technology (special tools).
- Four aspects of the cave environment that require special adaptations.
- Five ways in which a bat’s anatomy or behavior has adapted to the cave environment.
- Three ways in which cavers adapt to the cave.
- Three ways in which blind people adapt to the dark.

Materials Provided

- Handout 7: *Joni Adapts to the Dark*

Teacher Background

Adaptation can be a useful concept for understanding both nature and ourselves. The cave environment requires adaptations of many kinds. This activity compares adaptations on an evolutionary scale — in the bat — and adaptations that can be made with behavior

changes and technology. It takes the student from adaptations of cave inhabitants to adaptations people make in their lives.

Included in this lesson is a true account of one person’s personal adaptation to the world of darkness, based on an original interview. Both blind people and many cave animals rely on memory, organization, and learning routine routes around their homes. Bats are so reliant on these routes that they sometimes fly without “turning on” their sonar. An unexpected change in the cave can cause a mid-flight crash. Other cave animals — insects, snails, and rats — leave scented trails wherever they go. They follow the scent to get back to their nests. The person in our interview gets her homing signal from the garbage dumpster in her parking lot.

See the List of Multimedia Resources for additional materials concerning the blind.

Procedure

1. Write the word “adapt” in the middle of the blackboard. Discuss the definition: *Making changes that help an animal or a person get along better, or fit better in her or his environment.*

What kind of changes can animals and people make? Write down students’ ideas on the blackboard and draw out examples. Then ask them to generalize. Lead them toward three ways of adapting: body changes (evolution), changes in the way one acts or behaves (learning), and finding new tools or technology. (Just as astronauts use technology to adapt to space.)

Give examples from daily life:

If your house got cold because the electricity went off, how would you adapt? (*Wear a sweater and mittens, or cuddle in a blanket.*)

Animals have adapted in two ways:

- changes in how they behave or act
- changes in their bodies (shape, color, senses, functions, etc.).

In nature, most kinds of adaptations have taken millions of years. Body adaptations often go along with behavior adaptations.

Ask students: “What is the purpose of adapting?” (The answer, of course, is *survival*.)

2. Make three columns on the blackboard underneath three words: *cave, bat, caver*.
3. Under the *cave* column, ask students to list things about caves that might require animals to adapt. The list should include:
 - darkness
 - wet cave floor and surfaces
 - flying insects
 - cool, steady year-round temperatures
 - hunting animals (predators) on the cave floor (bears, mountain lions, cave rats, other mammals)
 - scarce food in the cave.
4. Under the *bat* column, ask students to list things about a bat’s body and behavior that help it adapt to cave life. The list should include:
 - *big ears* for sonar navigation in the dark
 - *claws* on hind feet and wings, for hanging from the cave ceiling. Hanging from the ceiling keeps bats dry and away from predators.
 - *sharp teeth* for catching insects in the air
 - *wings* — Bats’ long, thin finger bones and thin skin make wings. Flying makes them safe from predators in the cave, keeps them dry, allows them to move easily through cave caverns and passages, and allows them to capture flying insects for food.
 - *fur* to keep them warm in the cool cave
 - *hibernation* — This keeps their bodies from losing too much energy as heat. In the summer, they roost outside the cave.
5. Under the *caver* column, ask students to describe how cavers adapt when they explore caves. The list should include:
 - wearing overalls and boots to prevent cold, wet
 - using helmet lamps for seeing in the dark
 - using ropes and mountain climbing equipment
 - using backpacks for food and drinking water

- learning cave safety to prevent getting lost, getting too cold, having accidents
- carrying first aid kits.

6. Go down the *bat* and the *caver* lists. Decide whether each cave adaptation is a change of behavior (something learned) or body (something that has evolved). Which adaptations are older (a body change developed or passed on over millions of years)? Go over Discussion Questions 1–3.
7. Distribute Handout 7: *Joni Adapts to the Dark*. Go over Discussion Questions 4–6.

Discussion Questions

1. Troglodites are animals adapted to living in the cave for their whole lives. What adaptations have cave fish and insects made for cave living?
2. In the bat story, who is better adapted to the cave: the bat, or Jenny and Carlos? (*The Bat. Even with the proper equipment, humans would not survive as long as a bat in a cave.*)
3. Caves can be dark, wet, and cold. Why would animals choose to start living and adapting to a cave? (*Because so few animals have cave adaptations, caves might offer more safety from predators. Cave darkness also hides animals from predators. Because caves have a moderate temperature, they offer shelter from temperature extremes.*)
4. Joni has many adaptations for living in the dark. Which are adaptations of her behavior? Which are tools or technology?
5. How well would Joni do if she got lost in a cave? Would she do better than Jenny and Carlos? Would she do better than cavers?
6. If you became blind, you could go to school to learn some of Joni’s adaptations. You could also get a special dog to help you. Does it surprise you that Joni can earn a living and do so many things?

New Words

All grades adapt, behavior, roost

Grade 1 claw, dark, boots, climb

Grade 2 mountain

Grade 3 roost, overall, blind

Writing Assignment

Write a paragraph about what adaptations you would have to make in your life if you lost your hearing. What problems would you have at school?

• JONI ADAPTS TO THE DARK •

Joni Colver doesn't look like a bat. She is a pretty woman with short brown hair and a wide smile. In some ways, though, she is like a bat. She doesn't live in a cave, but you might call her a troglobite. Both Joni and the bat have *adapted* to living in the dark.

Joni Colver has been blind since she was a baby girl.

Now, Joni works in a hospital in Nashville, Tennessee. Doctors call her on the telephone. She types their reports about sick people into her computer. Her computer is an adaptation that helps her make a living.

"I'm in love with my computer," she says. Her computer talks out loud to her. It tells her when she makes a spelling mistake. It also helps her to go back in the report and make changes.

Like a bat, Joni's adaptations also help her get around. "My most important adaptation is using my other senses," said Joni.

"I listen to traffic noises to tell me when to cross the street, for instance."

Joni walks with a four-foot white cane in front of her. She taps the cane to check for the edge of the sidewalk. The cane also warns her before she bumps into things.

Joni adapts her touch to help read. She can't see type in books. Instead, she feels *Braille*

with her fingertips. Braille books have dots punched in paper instead of letters. Joni writes by making dots with a special pen called a *stylus*. She might punch 150 dots to write a ten-word sentence.

Joni also uses her touch to tell the difference between dollar bills. She keeps one-dollar bills flat. She folds the upper right corner of five-dollar bills, and folds ten-dollar bills in half. The only problem is that other people don't fold money like she does!

"Another important adaptation is my memory," says Joni. "I have to be really organized, and remember everything I do. If I leave the dishwasher door open and forget, *Baam!* I bang into it."

Joni also adapts with her nose and ears. In a shopping mall, she knows when she's at the cookie store, the radio store, or the leather store. Coming home, she walks through the parking lot until she smells the dumpster. Then she turns left to get home.

Joni does not have adaptations for everything. Her husband must read restaurant menus to her. "And I don't wear makeup," she says. "I wouldn't know what to do with it."

<i>Grade Levels</i>	K, 1, 2, 3
<i>Science Topics</i>	Geology Mineralogy Hydrology Biology Anthropology
<i>Disciplines</i>	Science Reading
<i>Special Skills</i>	Computer

LESSON 3.3 **Let's Visit a Cave**

Activity Summary

We recommend organizing a field trip to a “show cave,” if possible. Barring a real visit, however, students can “visit” a cave in several other ways: books, the Internet, a class visit from a caver or geologist, brochures from show caves, and movies/videos.

Educational Goals

Students will be able to describe the cave environment in detail.

Procedure

Choose one or more of the following methods for a class “visit” to a cave:

1. If you live near a “show cave,” arrange an actual field trip. Do not attempt to explore a “wild cave” with untrained students or adults.
2. Read a well-illustrated book.
(See the List of Multimedia Resources.)
3. Use computer access to visit caves around the world on the World Wide Web. Teachers and students can use Web addresses in the List of Multimedia Resources. Other sites may be located by searches under “caves,” “spelunking,” “speleological,” and related terms.
4. Arrange a class visit by a local cave enthusiast or geologist or other cave expert. Many are avid

photographers and could be persuaded to show slides of their cave explorations. Ask them to bring caving equipment as well (be sure to have students smell coveralls and boots — this will give them a real cave experience).

You can find cavers by:

- (1) Searching Internet member lists, by combining search words “cave” and “spelunking” and “karst” and “speleology” with local geographic names. Some Web services allow members to list their hobbies and interests. (*Caution: teachers should check out these lists themselves. Under “cave,” some people list themselves with erotic descriptions.*)
- (2) Requesting local referrals from the National Speleological Society or a local caving group. (Local groups often call themselves “grottoes.”)
- (3) Calling the geology department of a nearby university or college. Ask for someone studying caves or karst geology.
5. Ask students to write to national, State, and commercial show caves for free flyers and information. Post flyers that arrive on the classroom wall and discuss the differences and similarities among the caves.