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YOUTH DEVELOPMENT THROUGH VETERINARY SCIENCE 11

Is Your Snake Sick?

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Subject Overview and Background Information

Snakes belong to the group of animals called reptiles, which also includes crocodiles, lizards, and turtles. There are about 2,400 species of snakes in the world. Snakes can survive in a wide variety of habitats, including land, trees, underground, freshwater, and salt water.

Snakes are considered **cold-blooded**, or **ectothermic**, because they cannot control their own body temperature. Rather, they rely on the surrounding environment to maintain a steady body temperature. They can raise their temperature by lying in the sun or lower their temperature by crawling into the shade.

Snakes have long, thin bodies that are covered in dry scales. Since snakes do not have legs, they move by sliding on their bellies. Snakes have very elastic skin, allowing them to move easily and swallow their prey (big or small) whole. Their eyes are protected by clear scales, allowing them to keep them constantly open. They flick their forked tongue repeatedly to sense different odors in their environment.

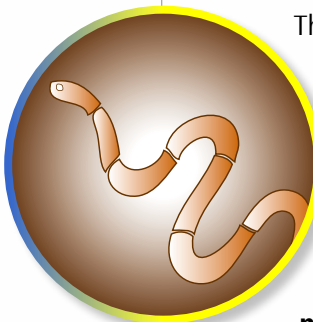
If you are considering getting a snake for a pet, it is important to know the original source of the snake. Snakes

should be obtained from a reputable breeder. It is illegal to catch snakes from the wild. Adult wild-caught snakes don't make good pets because they are hard to tame and may have diseases. Talk to a **herpetologist** (a reptile specialist) or read books on breeds of snakes to pick one that best suits your interests and lifestyle. Carefully examine the snake before purchasing it. Make sure the skin is smooth and clear. The eyes should be bright and alert and free from crust or **mucous**.

The **vent** (external opening near the snake's tail) should be clear from any discharge. If housed with other snakes, check for any signs of **external parasites**. If possible, collect and send newly-deposited feces to your **veterinarian** for analysis before purchasing the snake; your veterinarian can let you know whether the snake is free from any **internal parasites**. If you have other snakes, always quarantine a new snake before introducing it to other snakes to prevent the spread of parasites or diseases.

Snakes can make good pets, but before getting a snake, it is important to know their needs and behavior. If you are knowledgeable about snakes before you obtain one as a pet, you will be better able to provide them with the proper diet, environment, and care.

Snakes require plenty of freshwater at all times. They drink the water, but more importantly they soak their entire



body in water to help with the shedding process. If there isn't enough water available, it can cause **skin shed retention**. Therefore, it is important to have a water dish or container that is big enough to fit the entire snake without tipping over.

You can help keep a snake nourished and healthy by establishing an appropriate feeding routine and maintaining a proper body weight. You will need to research your particular species of snake to know what and how often to feed it. In the wild, snakes get plenty of exercise while collecting their food, and at times, they can go a few days without catching any food. However, in captivity, since snakes don't have to catch their food, obesity can become a problem, especially when fed too often.

Having a heating pad under your snake's tank is essential for proper digestion of food and to prevent diseases. If your snake gets too cold, it can get an **upper respiratory infection**, which is like a cold. A snake's immune system can weaken if it is housed improperly or is neglected, stressed, or malnourished. This can increase the chance of a snake getting diseases. For example, if a snake gets a cut in its mouth and gets **bacteria** in it, the snake can develop **ulcerative stomatitis (mouth rot)** if its immune system isn't strong enough. Therefore, it is important to clean the cage regularly and minimize any stress the snake may encounter.

Certain veterinarians specialize in taking care of snakes and other reptiles, so before purchasing a snake, find a local reptile veterinarian and schedule a visit soon after you purchase the snake.

◆ Activity Concepts and Vocabulary

- **Bacterial infection:** A disease caused by germs called bacteria.
- **Bacterium (bak-teer-ee-um):** An organism that cannot be seen with a naked eye. Some bacteria (germs) can cause diseases. Pneumonia, a disease that affects animals' lungs, can be caused by a bacterium.
- **Cold-blooded animal, or ectotherm (ek-tuh-thurm):** An animal that relies on the heat (e.g., sunlight) in the surrounding environment to maintain and regulate its body temperature.
- **Inflammation (in-fluh-may-shuh n):** A local reaction of a tissue to irritation that causes pain and swelling.

- **Parasite (par-uh-site):** An organism (e.g., bacterium, worm, tick) that receives food and energy from another. A common parasite that affects animals is tapeworm.
- **Veterinarian (vet-er-uh-nair-ee-uh n):** A doctor who takes care of animals.
- **Virus:** A type of germ that causes diseases. Rabies is a disease caused by a virus.
- **Zoonotic diseases (zoe-eh-notick):** Any disease that affects an animal that can also be passed to humans.

◆ Life Skills

- **Head:** Keeping records, planning and organizing, critical thinking, problem solving, decision making
- **Heart:** Concern for others, communication, sharing, empathy
- **Hands:** Teamwork, self-motivation
- **Health:** Disease prevention, self-responsibility, personal safety

◆ Subject Links

Science and Language Arts

◆ State Content Standards

Science

- Third Grade
 - *Investigation and Experimentation: 5e*
- Fourth Grade
 - *Investigation and Experimentation: 6c*
- Fifth Grade
 - *Investigation and Experimentation: 6h, 6i*
- Sixth Grade
 - *Investigation and Experimentation: 7d*

Language Arts

- Third Grade
 - *Reading Comprehension: 2.2, 2.6*
- Fourth Grade
 - *Reading Comprehension: 2.3*
 - *Listening and Speaking Strategies: 1.7*
- Fifth Grade
 - *Reading Comprehension: 2.3, 2.4*
 - *Listening and Speaking Strategies: 1.5*
- Sixth Grade
 - *Listening and Speaking Strategies: 1.5*
 - *Speaking Applications: 2.5b*

◆ Purpose of Activities

To help youth learn about the proper maintenance and care of snakes. Youth will also investigate the causes and symptoms of several snake diseases.

ACTIVITY 1

Monitoring Snake Health Day by Day

Overview of the activity



The main goal of this activity is for youth to learn to make good physical and behavioral observations of snakes by reading and analyzing descriptive journal entries. Youth will then use these observations to make inferences regarding the health of their snake.

◆ Time Required

Approximately 90 minutes

◆ Suggested Grouping

Pairs or small groups of 3 to 4

◆ Materials Needed for Each Pair or Group

(*Materials provided in curriculum)

- Writing utensils
- Flip chart paper (one piece per group)
- *Health assessment journals
- *Snake disease information sheet
- *Health assessment checklist

◆ Getting Ready

- Photocopy enough health assessment journals, snake disease information sheets, and health assessment checklists for the groups.

Opening Questions

Ask the youth to respond to each question below by sharing their ideas verbally and/or by recording them on the flip chart paper provided.

- ◆ What are some ways you can tell when you are sick? Ask the youth to record their ideas verbally and/or record on the flip chart paper provided.

1. What signs might your parents, teacher, friends, or doctor use to recognize that you are sick?
2. What are some things you can do to avoid becoming sick?
3. If your animal is sick, what are some changes you might notice about him or her?
4. What are some of the responsibilities you have to keep your pet or project animal healthy?

Procedure (Experiencing)

- **Volunteer Tip:** Set up the following scenario for the youth: The youth in each group will be playing the role of a snake owner. Each group will receive one of the health assessment journals, one day at a time. As a group, the youth will go through the journal entry of each specific day and record important facts onto the health assessment checklist they have been given. At the end, using the checklists they have made, they will compare their findings with the snake disease information and draw a conclusion regarding what disease, if any, their snake has.

1. Give each group of snake owners Journal Entry 1 from their health assessment journals. The group should read the entry and record important findings on their health assessment checklist.
2. When the groups have completed Journal Entry 1, take away that journal entry and give them Journal Entry 2. Have them read the entry and record important findings on their checklist.
3. Continue this pattern for the remaining days until each journal entry has been assessed.
4. When the group is done with the last day, remove this entry and pass out the snake disease information sheet. Have the groups review the data that they recorded on their health assessment checklist and record their diagnosis of their snake's symptoms along with the reasons why they chose that diagnosis.

Sharing, Processing, and Generalizing

Have each group share their diagnosis and indicate which parts of their checklist helped them make that

determination. Follow the lines of thinking developed through the general thoughts, observations, and questions raised by the youth. If necessary, use more targeted questions as prompts to get to particular points, such the following. Ask the youth to respond to each question below by sharing their ideas verbally and/or by recording them on the flip chart paper provided.

1. What might be some advantages to keeping a daily health assessment journal for your snake?
2. What are some examples of the symptoms you used to tell you when to be concerned with your snake's health?
3. What do you think might happen if you ignored those symptoms and didn't seek veterinary care for your snake?
4. Check the groups' diagnosis of their snake with the answer key. If there are any discrepancies, have the youth discuss what lead them to their conclusion.

Snake Disease Diagnosis Key

- Rory: upper respiratory disease
- Lefty: skin shed retention
- Racer: normal
- Rosetta: external parasites (mites)
- Freddie: internal parasites
- Leroy: ulcerative stomatitis

Concept and Term Introduction

Volunteers need to ensure that the concepts and terms **bacterium, cold-blooded (ectotherm), inflammation, parasite, veterinarian, virus, and zoonotic diseases** have been introduced.

- **Note:** The goal is to have the youth develop these concepts through their exploration and define the terms using their own words.

Concept Application

An application for these skills is presented in Activity 2 of this unit. Youth who own a snake may apply Activity 2 to their own pet, while youth who do not own a snake may seek permission from a friend or family member to use their snake in this exercise.

References

- Bartlett, R., and P. Bartlett. 1999. Corn snakes. Hauppauge: Barron's Educational Series.
- Brough, C. Basic reptile and amphibian care. Animal-World Web site, <http://animal-world.com/encyclo/reptiles/information/reptilecare.php>.
- Centini, R. 2004. Green tree python and emerald tree boa: Management, reproduction, and diseases. Extracted from Captive management, reproduction, and disease of the green tree python (*Morelia viridis*) and the emerald tree boa (*Corallus caninus*), 2004 Annual Conference of the Association of Reptilian and Amphibian Veterinarians. Animal Planet Reptile Guide, Diseases and Conditions Web site, http://animal.discovery.com/guides/reptiles/snakes/pythonboa_02.html.
- De Vosjoli, P., R. Klingenberg, T. Barker, and D. Barker. 1997. The ball python manual. Laguna Hills, CA: Advanced Vivarium Systems.
- Jepson, L. Anatomical and physiological considerations of clinical importance, or why aren't reptiles mammals?
- Love, B., and K. Love. 2000. The corn snake manual. Laguna Hills, CA: Advanced Vivarium Systems.
- Root, B., and P. Hollander. 1995. Care sheet for snakes. Animal Allsorts Web site, <http://www.reptileallsorts.com/sngeneral-cs.htm>.
- Rossi, J., and B. Rossi. 1997. What's wrong with my snake? Laguna Hills, CA: Advanced Vivarium Systems.
- Veterinary Associates Stonefield. Care of snakes. Veterinary Associates Stonefield Web site, www.vetcity.com/Infocenter/snakecare.html.
- Veterinary Services Department, Drs. Foster and Smith, Inc. Infectious stomatitis (mouth rot). Animal Planet Reptile Guide, Diseases and Conditions Web site, <http://animal.discovery.com/guides/reptiles/diseases/stomatitis.html>.
- Woerpel, R. W., and W. J. Rosskopf Jr. 1988. Snake diseases/infections. In Woerpel and Rosskopf, Avian-exotic animal care. Goleta, CA: American Veterinary Publications. Animal Hospitals USA Web site, http://www.animalhospitals-usa.com/reptiles/snake_diseases_infections.html.
- . 1988. Snake diseases/parasites. In Woerpel and Rosskopf, Avian-exotic animal care. Goleta, CA: American Veterinary Publications. Animal Hospitals USA Web site, http://www.animalhospitals-usa.com/reptiles/snake_diseases_parasitic.html.

HEALTH ASSESSMENT JOURNALS

Journal 1

Snake name: Rory
Species: Ball python
Gender: unknown
Age: 2 years



Dave Parker

<http://www.flickr.com/photos/daveparker/2393855533/>

Journal Entry 1

Today, I took a quick look at Rory before I took her out to show her to some friends. She looked alert. When I took her out, she was roaming around on my bed, trying to find dark places to hide like she usually does. I checked her cage (it was clean with no feces), the temperature was 90°F in the basking spot, and the humidity was at 90%. I changed her water bowl because there was some bedding in it. When I looked at her, her body was muscular, with her scales looking shiny and healthy. She was slithering around with little effort, and her eyes and tongue were alert to her surroundings. Her nose looked clear and clean. My friends all took turns holding her and petting her and then I put her back into the cage.

Journal 1

Snake name: Rory
Species: Ball python
Gender: unknown
Age: 2 years



Dave Parker

<http://www.flickr.com/photos/daveparker/2393855533/>

Journal Entry 2

I stayed home from school today because I had a fever and a cold. I checked Rory's feeding journal this morning and I saw she was slightly overdue (I usually feed her every other week). Before I took her out, I checked her behavior. She was sitting in her hiding spot curled up over the heat pad; when I checked the temperature, I saw that the basking temperature was down to 78°F but the humidity was still at 90%. I placed her in her plastic feeding box, thawed a rat, placed it in the box, and covered it with a blanket. While I waited, I cleaned her cage (she had some normal poop) and changed her water. After an hour, I checked on her and saw that she hadn't eaten yet. I decided to wait another hour and when I checked on her again, she still hadn't eaten. I took her out and put her back into her cage, throwing away the rat. When I was holding her, I saw her scales were shiny and she was very strong. Her eyes were bright, and her nose looked clean. I wonder why she didn't eat because she looks fine. She has been pretty good up until now.

Journal 1

Snake name: Rory
Species: Ball python
Gender: unknown
Age: 2 years



Dave Parker

<http://www.flickr.com/photos/daveparker/2393855533/>

Journal Entry 3

When I checked the basking temperature in the cage, it was still at 78°F; I noticed that the heat pad had become unplugged, so I plugged it back in. Rory looked OK in the cage, curled up in her hiding spot. When I took her out, she didn't seem to explore my bed as much as she usually does, but she was still poking around. Her eyes looked bright and her scales were a beautiful, shiny black and brown. While I was watching her in my bed, I heard this faint wheezing sound. It sounded funny, because I knew it wasn't a hiss, and she wasn't mad at anything. When I put my ear up to her nose, I thought I could hear something, but I wasn't sure; maybe it was the sound of air coming in the house. I changed her water and checked her cage, but it was clean. I listened to her for a while, but she didn't make the sound again, so I put her back and closed the cage.

Journal 1

Snake name: Rory
Species: Ball python
Gender: unknown
Age: 2 years



Dave Parker

<http://www.flickr.com/photos/daveparker/2393855533/>

Journal Entry 4

The temperature was at 90°F and the humidity was at 90%. Rory was curled up in the hiding spot. When I took her out, I felt her smooth scales and muscular body. I decided to try feeding her again. I thawed a rat and put it in the feeding box. I then put Rory in the box and covered it with a blanket. I checked her cage (it was clean) and changed the water. My little brother and his friends were running through the house and making a lot of noise. I was afraid that all the activity might be stressful for Rory so I checked on her and I saw that she hadn't eaten yet. I left her for another hour, but she still didn't eat. Her eyes looked bright, and her nose was clean. She moved around the feeding box with ease, smelling every nook and cranny.

Journal 1

Snake name: Rory
Species: Ball python
Gender: unknown
Age: 2 years



Dave Parker

<http://www.flickr.com/photos/daveparker/2393855533/>

Journal Entry 5

The temperature was 90°F and humidity was 90%; Rory didn't look too happy in her hiding box. She seemed sluggish when I took her out, not gripping hard to my hand like usual; her scales were still shiny, though. She made the wheezing sound when I placed her on the bed. When I put my face next to her nose, there was a slight wheezing sound. She had some small crust on her nose, like mucous. She wasn't very active because she didn't explore my bed like she usually does. Her eyes looked normal and bright, and her cage was clean of poop. I changed her water, and decided to put her back after noticing that she didn't want to move at all.

Journal 2

Snake name: Lefty
Species: Corn snake
Gender: unknown
Age: 9 months



Neil Lawler

<http://www.flickr.com/photos/wheels3217/1859020178/>

Journal Entry 1

The cage temperature was 79°F. Today, I took Lefty out to hold him. He was moving around and smelling the air with his tongue. He kept trying to get into my sweater pocket, where he usually sits; he kept curling around my arm and holding on strongly. His scales were smooth and clean. His eyes and nose were clean and looking normal. I cleaned the normal poop I found in his cage. I also changed his water, which had some bedding floating in it. After I had been playing with him for about an hour, I realized that it was only 60°F in my room because the window was open. I don't know if Lefty felt cold or not, but I put him back in his cage. I also realized that I need to feed him soon because when I checked my feeding log, it has almost been a week since he last ate.

Journal 2

Snake name: Lefty
Species: Corn snake
Gender: unknown
Age: 9 months



Neil Lawler
<http://www.flickr.com/photos/wheels3217/1859020178/>

Journal Entry 2

I decided to feed Lefty today. Before taking him out, I saw that the temperature was at 79°F. Lefty was sitting in the water bowl; I took him out of his cage. I had already thawed a small mouse and had placed it into the bag, so I just put Lefty in the bag. I closed the top and put a paper clip over it. When I was checking his cage, it was clean. The water needed to be changed again because there was more bedding floating in it. After waiting 30 minutes for Lefty to eat, I checked on him. The mouse was still there, and Lefty was curled up in the corner away from the mouse. I did a full body check on him, noticing his smooth, clean scales and his clean eyes and nose. I put Lefty back into his cage and threw the mouse away.

Journal 2

Snake name: Lefty
Species: Corn snake
Gender: unknown
Age: 9 months



Neil Lawler

<http://www.flickr.com/photos/wheels3217/1859020178/>

Journal Entry 3

The cage temperature was the same as it was the other day; Lefty was curled up in his hiding box. When I went to take him out, I saw that his eyes were cloudy, or they were a lighter color. He wasn't in the water bowl, so I gave him fresh water. Lefty's cage had a little piece of poop; I spot-cleaned that out and put in some clean bedding in its place. He poked his head out of the hiding box and flicked his tongue, but he didn't slither out to see me like he often does. I didn't take him out because he looked comfortable curled up in his hideaway cave over his heating pad. His scales looked smooth and pretty; his nose was clean, too.

Journal 2

Snake name: Lefty
Species: Corn snake
Gender: unknown
Age: 9 months



Neil Lawler

<http://www.flickr.com/photos/wheels3217/1859020178/>

Journal Entry 4

The cage temperature was about 80°F. Lefty's eyes looked different than they did yesterday. Today, they were clear instead of cloudy. His nose and scales were clean, too, and he was slithering around my bed. His water had bedding in it again, so I changed it. He was smelling my bed, trying to look for places to hide. I had him out for an hour, walking around the house with him. I even took him outside for a little while to get some fresh air. While we were outside, I collected some rocks and plants and put them into his cage to give him some interesting things to explore.

Journal 2

Snake name: Lefty
Species: Corn snake
Gender: unknown
Age: 9 months



Neil Lawler

<http://www.flickr.com/photos/wheels3217/1859020178/>

Journal Entry 5

The cage temperature was normal; however, Lefty didn't look well. His entire body was cloudy, like his eyes were the other day. He was just sitting in the water bowl. His nose was clean otherwise, and when I saw him leaving the water bowl, he moved easily. I thought maybe he was hungry so I gave him a mouse, but he did not seem interested in eating. He just sat in his water bowl and was very still. I removed the new rocks and plants from his cage in case they were bothering him.

Journal 2

Snake name: Lefty
Species: Corn snake
Gender: unknown
Age: 9 months



Neil Lawler

<http://www.flickr.com/photos/wheels3217/1859020178/>

Journal Entry 6

Today, there were small pieces of skin in Lefty's cage, and his water bowl had skin and bedding in it. One eye was clear and bright, but the other one was still cloudy. He was smelling and moving around as usual, and his scales looked brand new. The cage temperature was 79°F, and his cage was clean of poop.

Journal 3

Name: Racer
Species: California kingsnake
Gender: Male
Age: unknown



Vlad Butsky

<http://www.flickr.com/photos/butsky/332168233/>

Journal Entry 1

Racer was moving around his cage as usual. The temperature at the basking side of the cage was 85°F, and there were no signs of poop. I opened the lid and pulled him out. He resisted a little by latching onto his hiding spot, so I knew that he was healthy muscle-wise. His skin was very smooth, the whites contrasting the blacks perfectly. His eyes were alert, and he had a clean nose. I played with him for a while, walking him around the house. I put him on the couch and he quickly slithered away and got under the cushions. I had to remove all of the cushions from the couch in order to catch him again. He is very, very quick! I changed his water before I put him back in his cage.

Journal 3

Name: Racer
Species: California kingsnake
Gender: Male
Age: unknown



Vlad Butsky

<http://www.flickr.com/photos/butsky/332168233/>

Journal Entry 2

When I checked on Racer, he was very active. He was smelling all around his cage, and trying to get out. When I went to take off the lid, he was almost out of the cage before I put it on the ground. He's so fast! He didn't want to come off the cage, so I had to battle with him for a while. He's very strong and determined to do what he wants. His scales were perfect, except for the ones I bent a little taking him off the cage. He was interested in everything, his eyes bright and attentive. There was some poop in his tank, which I spot-cleaned; I also changed his water. When I looked at the basking spot temperature, I saw that it was at 80°F. His nose had some marks on it. I tried to feed him, but he wasn't interested in the thawed mouse. He just wanted to race around!

Journal 3

Name: Racer

Species: California kingsnake

Gender: Male

Age: unknown



Vlad Butsky

<http://www.flickr.com/photos/butsky/332168233/>

Journal Entry 3

Racer wasn't interested in a lot today; he just wanted to sit in his hiding spot. The bulb in his heat lamp burnt out overnight, so the basking temperature was down to 77°F. I turned the heat up in his heat pad slightly to try to bring up the temperature. I will have to go and get a new bulb today. I took Racer out of the cage and let him explore on my bed. He didn't move around much. He slithered under the pillow and just stayed there. When I checked his scales, they were cold, but smooth. His eyes were bright, and his nose was clean. There was no poop in his cage, and his water needed changing (there was bedding in it, more so than before). I wanted him to move around more, but he was being boring. I decided to put him back.

Journal 3

Name: Racer
Species: California kingsnake
Gender: Male
Age: unknown



Vlad Butsky

<http://www.flickr.com/photos/butsky/332168233/>

Journal Entry 4

I saw that the basking temperature was at 82°F, and Racer was moving around the cage again. He had something on his nose, which I was able to clean off with a soft towel. His scales were smooth and clean, with some bent on his belly. His eyes were bright and attentive, his tongue flicking in and out, smelling the air. I tried to feed him again, and he ate the mouse readily. He finished it quickly and it seemed like he was looking for more, but I didn't give him another mouse. I put him back in his cage after he ate, giving him time to digest the mouse.

Journal 3

Name: Racer
Species: California kingsnake
Gender: Male
Age: unknown



Vlad Butsky

<http://www.flickr.com/photos/butsky/332168233/>

Journal Entry 5

I left Racer in the cage because he had eaten recently; I could still faintly see the mouse lump in his stomach. The basking temperature was at 85°F. He must have been playing in his water dish, because there was water spilled all over his cage. I had to remove all of the bedding because it was wet and replace it with new bedding. His cage smelled pretty bad. His eyes and nose were clean and clear. He didn't move too much because he was letting his mouse digest while he was on the heating pad.

Journal 4

Snake name: Rosetta
Species: Rosy boa
Gender: unknown
Age: unknown



Tonio H.
<http://www.flickr.com/photos/tonios-pics/378847467/>

Journal Entry 1

Today, I took a quick look at Rosetta before I took her out to show her to some friends. She looked beautiful! I just got her from a breeder two days ago, and she looks really great. The guy said she ate every week and that she was a nice snake (meaning she didn't bite at all). I checked her cage (it was clean with no poop), the temperature was 90°F in the basking spot, and the humidity was at 50%. There was bedding in her water bowl, so I changed it. When I looked at her, her body was muscular, with her scales looking shiny and complete. She was slithering around with little effort, and her eyes and tongue were alert to her surroundings. Her nose looked clear and clean. I let all of my friends hold her, but I didn't want to make her stressed so I put her back into the cage after playing with her a while.

Journal 4

Snake name: Rosetta
Species: Rosy boa
Gender: unknown
Age: unknown



Tonio H.

<http://www.flickr.com/photos/tonios-pics/378847467/>

Journal Entry 2

I couldn't feed Rosetta yet because I had just got her. I wanted to, just so I could see it for the first time! Before I took her out, I checked how she was acting. She was sitting in her hiding spot curled up over the heat pad; when I checked the temperature, I saw that the basking temperature was at 90°F and the humidity was 50%. I cleaned her cage (she had some normal poop) and changed her water. When I picked her up and held her, I saw her scales were shiny and she was very strong. Her eyes were bright, and her nose looked clean. I thought I saw something on her eye, but I didn't think it was anything because when I blew on it, it went away. While she was out of the cage I added some pea gravel so she would have a new place to explore.

Journal 4

Snake name: Rosetta
Species: Rosy boa
Gender: unknown
Age: unknown



Tonio H.

<http://www.flickr.com/photos/tonios-pics/378847467/>

Journal Entry 3

Rosetta wanted to be fed today! She was looking pretty hungry when I came home from the pet store; she got really alert when I came up to the cage. Must be the mouse smell I have from the pet store! Luckily, I had gotten one frozen mouse just in case she was ready. While I was thawing the mouse, I checked on her. Her eyes looked bright, and her scales were a beautiful, shiny red and cream. The cage was at her normal 90°F, with 50% humidity. When the mouse was thawed, I placed her in her plastic feeding box. I then placed the mouse in the box, and covered it with a blanket. Within one hour, she had eaten the mouse! I recorded the date that she ate in the food journal, and put her back into her cage. When I went to clean out her feeding box, I saw some black things in it. It was mouse poop; I just threw them away, not wanting to touch them.

Journal 4

Snake name: Rosetta

Species: Rosy boa

Gender: unknown

Age: unknown



Tonio H.

<http://www.flickr.com/photos/tonios-pics/378847467/>

Journal Entry 4

Rosetta was curled up in the hiding spot. The temperature was at 90°F and the humidity was at 50%. When I took her out, I felt her smooth scales and muscular body. Her eyes looked bright, and her nose was clean. Looking at her belly, I thought I saw some black speckles on it. I thought it might be some dust from the new gravel. While I was cleaning her bedding I noticed that it had some black specks in it too. I decided to remove the gravel from her cage and wash it.

Journal 4

Snake name: Rosetta
Species: Rosy boa
Gender: unknown
Age: unknown



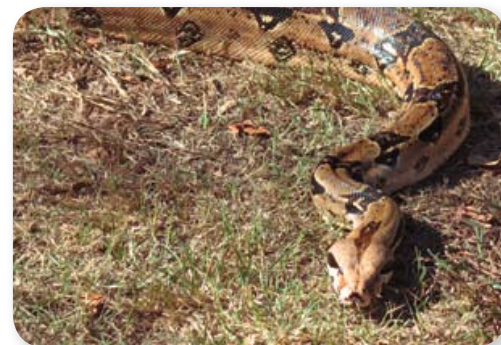
Tonio H.
<http://www.flickr.com/photos/tonios-pics/378847467/>

Journal Entry 5

The temperature was 90°F and humidity was 50%; Rosetta looked happy in her hiding box. At first I didn't want to take her out; I decided I wanted to because I had my cousin coming over to see her. I wanted to show her off to everyone, my new pet! Her eyes and nose looked clear, except there were some black dots on her. When I looked at her belly, there were more black dots on it than before. She didn't seem to care they were there. When I put her away, there were black crawly things on my hands! I tried to squish them, but it was hard. I washed my hands, and they went away down the drain. I wiped Rosetta off with a soft towel and more of the black crawly specks came off of her. It seemed like there were more and more of them.

Journal 5

Snake name: Freddie
Species: Boa constrictor
Gender: male
Age: 2 years



James Emery

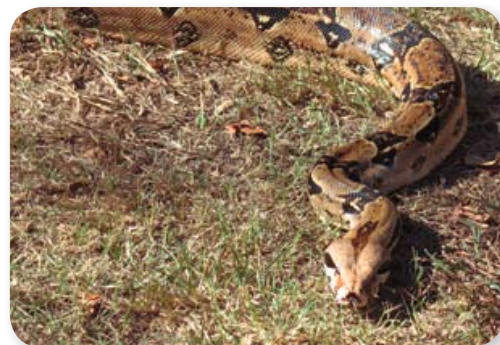
<http://www.flickr.com/photos/emeryjl/1695140816/>

Journal Entry 1

The cage temperature was at a comfortable 90°F in the basking spot, and the humidity was at 90%. Today I took Freddie out to hold him. He was moving around and smelling the air with his tongue. He was interested in my dog, who came up and smelled him. Freddie stopped for a moment, just smelling. Then when the dog went away, Freddie continued smelling around. He kept curling around my arm and holding on. His scales were smooth and clean, with a shiny black and brown coloring. His eyes and nose were clean and looking normal. I cleaned the normal poop I found in his cage. I also changed his water, which had some bedding floating in it. I need to feed him soon because when I checked my feeding log, it has almost been a week.

Journal 5

Snake name: Freddie
Species: Boa constrictor
Gender: male
Age: 2 years



James Emery

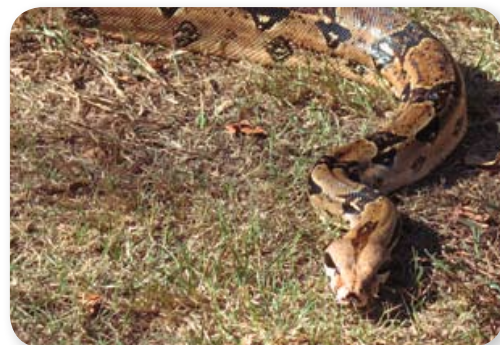
<http://www.flickr.com/photos/emeryjl/1695140816/>

Journal Entry 2

It was feeding day for Freddie. Before I took him out, I checked his behavior. He was sitting in his hiding spot curled up over the heat pad; when I checked the temperature, I saw that the basking temperature was 90°F and the humidity was at 90%. I placed him in his plastic feeding box, thawed a rat, placed it in the box, and covered it with a blanket. His cage smelled really bad, so while I waited, I cleaned his cage and changed his water. After an hour, I checked on him and saw that he had eaten. When I was holding him, I saw his scales were shiny and he was very strong. His eyes were bright, and his nose looked clean. I'm glad he ate, because he had been in hibernation the past couple months and hadn't eaten, so he was a little skinny.

Journal 5

Snake name: Freddie
Species: Boa constrictor
Gender: male
Age: 2 years



James Emery

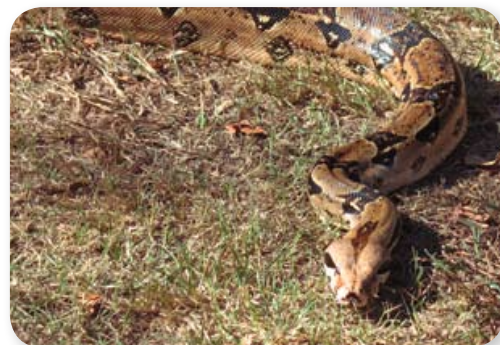
<http://www.flickr.com/photos/emeryjl/1695140816/>

Journal Entry 3

When I checked the basking temperature in the cage, it was at 90°F and the humidity was at 90%; Freddie looked OK in the cage, curled up in his hiding spot. Because he had eaten, I decided not to take him out for the next couple of days. He still had the bulge in his belly, so I just observed him from outside the cage. I saw that his water was dirty with bedding and poop, so I changed it. His cage seemed to smell bad, but after I changed the water it didn't smell at all. His eyes and nose looked clean, and his scales were perfect, except for the stretched out bulge. I'm glad he ate, he was looking skinny!

Journal 5

Snake name: Freddie
Species: Boa constrictor
Gender: male
Age: 2 years



James Emery

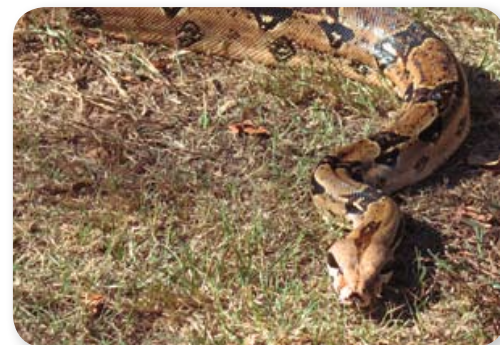
<http://www.flickr.com/photos/emeryjl/1695140816/>

Journal Entry 4

The temperature was at 90°F and the humidity was at 90%. Freddie was curled up in the hiding spot. I didn't want to take him out yet because he was still digesting his bulge of rat. His eyes looked bright, and his nose was clean. I watched him for a while as he looked around the cage. His water had poop in it, and so did his cage. It smelled awful, so I changed the water, thinking that was what smelled bad. When the smell still didn't go away, I had to clean the cage. I can't believe he made this much of a mess! I took out all the bedding and replaced it with new bedding. I also added some new rocks and a piece of driftwood that I got at the pet store so he could have some new things to explore.

Journal 5

Snake name: Freddie
Species: Boa constrictor
Gender: male
Age: 2 years



James Emery

<http://www.flickr.com/photos/emeryjl/1695140816/>

Journal Entry 5

The temperature was 90°F and humidity was 90%; Freddie was moving around his cage again, meaning his rat was digested. He was slithering on the new rocks I had given him. I was disappointed because he still looked skinny, even though I made sure to pick out an extra-fat rat. He had smelly poop in his cage and water bowl, which I changed quickly. When I saw the poop in the water bowl, it looked like it had white spots in it. They weren't the usual-looking poops snakes have; they were small and oblong, looking like pieces of small rice. I threw it away as soon as possible, because it smelled pretty bad. When I took him out, he was alert, and his nose and eyes were clean; he was holding on pretty strong, but his spine stuck out more than usual. Maybe I need to feed him again.

Journal 6

Name: Leroy
Species: Red tail boa
Gender: unknown
Age: 3 years



Tonio H.

<http://www.flickr.com/photos/tonios-pics/378847467/>

Journal Entry 1

Leroy was moving around his cage as usual. The temperature at the basking side of the cage was 85°F, and there were no signs of poop. I opened the lid and pulled him out. He resisted a little by latching onto his hiding spot, so I knew that he was healthy because he held on strong. His skin was very smooth, the brown and black contrasting with the red perfectly. His eyes were alert, and he had a clean nose. I held with him for a while, walking him around the house to show my family. Then I took him outside and let him play in the grass for a little while. I changed his water before I put him back.

Journal 6

Name: Leroy
Species: Red tail boa
Gender: unknown
Age: 3 years



Tonio H.
<http://www.flickr.com/photos/tonios-pics/378847467/>

Journal Entry 2

When I checked on Leroy, he was very active. He was smelling all around his cage and trying to get out. He's very strong and was determined to do what he wants. His scales were perfect. He was interested in everything, and his eyes were bright and attentive. There was some poop in his tank, which I spot-cleaned; I also changed his water. When I looked at the basking spot temperature, I saw that it was at 80°F. His nose had some marks on it. I tried to feed him, but he wasn't interested in the thawed rat. It was a little cooler out today, so I only took him outside for about 15 minutes. He slithered around in the grass and almost escaped into the wood pile, but I caught him in time.

Journal 6

Name: Leroy
Species: Red tail boa
Gender: unknown
Age: 3 years



Tonio H.

<http://www.flickr.com/photos/tonios-pics/378847467/>

Journal Entry 3

Leroy wasn't interested in a lot today; he just wanted to sit in his hiding spot. When I looked at the basking temperature, I saw that it was down to 77°F. I turned the heat up slightly and took him out. He was lazier than usual; when I checked his scales, I noticed that they were mostly smooth except for a few bumps on his belly. His eyes were bright, and his nose was clean. There were no poop in his cage, and his water needed changing (there was bedding in it, more so than before). I wanted him to move around more, but he was being boring. Even though it was cold out, I took him outside for a few minutes because I thought that might cheer him up. I didn't put him down on the ground, though because I didn't want him to try to escape again.

Journal 6

Name: Leroy
Species: Red tail boa
Gender: unknown
Age: 3 years



Tonio H.

<http://www.flickr.com/photos/tonios-pics/378847467/>

Journal Entry 4

I saw that the basking temperature was at 82°F, and Leroy was moving around the cage again. It looked like he had something on his nose, but when I took him out to inspect it, it seemed more like something in his mouth. It was like he was a kid hiding a piece of candy in his mouth, and I thought maybe it was a piece of bedding. When he rubbed the side of his head against the cage, it went away. There seemed to be some liquid on his mouth too, like he had just put his face in the water. His scales were smooth and clean, with some small bumps on his belly. His eyes were bright and attentive, his tongue flicking in and out, smelling the air. I tried to feed him again, but he didn't eat. I took him outside and let him play in the grass. The day was pretty warm and he seemed to enjoy being outdoors.

Journal 6

Name: Leroy
Species: Red tail boa
Gender: unknown
Age: 3 years



Tonio H.

<http://www.flickr.com/photos/tonios-pics/378847467/>

Journal Entry 5

The basking temperature was at 85°F. I changed Leroy's water (there was bedding in it). His cage was pretty dirty because I hadn't done a full cleaning in a few days. I gave him new bedding and cleaned the poop from the glass and rocks. His eyes and nose were clean and clear. When I looked at his mouth, it seemed like he was hiding a piece of candy again. This time, when he rubbed his head against the cage, some white stuff came out. I thought maybe he had picked up something when we were outside, but I couldn't think of what it might be.

Snake Disease Information Sheet

Skin shed retention

Snakes shed their skin often. The frequency of shedding usually depends on how fast they are growing. To prevent skin shed retention, make sure your snake has plenty of water and has the proper amount of humidity recommended for your particular type of snake.

If your snake hasn't had enough water or doesn't have a structure to rub against, the shedding process will be incomplete and pieces of old skin will be left on the body. Some sources recommend placing your snake in warm water for about 30 minutes and gently placing a towel over the snake to allow it to rub off the remaining skin. If the snake is unable to rub off the remaining skin by itself, bring your snake to a certified reptile veterinarian for treatment.

If the eyepiece does not shed, the snake will have a film on its eyes. This is called a **retained eye cap**. If skin shed retention does occur, don't try to remove the retained eye cap yourself. If you try to pull the skin off, it can be painful for the snake. The removal of the retained eye cap should be done by a veterinarian. Symptoms of skin shed retention may include

- pieces of shed skin in the cage
- pieces of skin still attached to underlying skin
- filmy eyes

Ulcerative Stomatitis (mouth rot)

Ulcerative stomatitis (ul-ser-a-tive sto-mah-tie-tiss) is a bacterial infection of the lining of a snake's mouth. This disease attacks snakes that are weak from stress, hunger, or neglect. This disease progresses in stages, with the first stage being increased salivation. Then, the mouth lining starts to bleed and produce pus, eventually becoming inflamed. In severe cases, teeth may fall out and the lower jaw bone may decay. The same infection may also cause small blisters and discoloration of the snake's scales. Mouth rot is highly infectious, so if you see signs of it immediately separate that snake from your other snakes and make sure that you wash your hands after each handling.

There are many effective treatments for mouth rot, but if left untreated this disease will almost always cause quick death. If you believe one of your snakes has mouth rot, take it to the reptile veterinarian immediately. Symptoms of ulcerative stomatitis may include

- increased salivation
- loss of appetite (not eating on schedule)
- pale or red color at mouth lining
- bleeding gums
- cheesy discharge from the mouth
- inflammation and pus within the mouth
- small skin blisters and discoloration of the scales

Respiratory infection

When their habitat is not kept at the correct temperature, snakes can catch colds, or respiratory infections. Snakes can also get respiratory infections due to unsanitary housing conditions, viral infections, or mouth rot (ulcerative stomatitis).

Symptoms of respiratory infections in snakes include runny noses and loud breathing because their windpipes are clogged. Open-mouthed breathing, coughing, and wheezing can also be observed. Respiratory infections are very contagious, so make sure you separate that snake from your other snakes. Just like you can spread a cold, so can a snake!

If you think one of your snakes has a cold, increase the temperature in your cage to 90°F and call your veterinarian immediately. In severe cases, the veterinarian may need to drain the fluids out of the snake's lungs so that it can breathe more easily. Symptoms of respiratory infections may include

- runny discharge from the nose
- loud breathing
- foamy saliva
- open-mouthed breathing
- wheezing
- coughing
- clicking or popping noises

Parasitism

Parasitism (par-uh-site-tiz-uh m) is a relationship between two different organisms in which one benefits from the other by causing harm to the other (usually not fatal). Two types of parasites can affect snakes: internal (inside the body) and external (outside of the body).

◆ Internal Parasites

Internal parasites come from the food snakes eat, from their environment, or from an infected snake. Snakes with internal parasites may lose weight even though they are eating. Other symptoms of internal parasitism are smelly, bloody, mucous-covered feces, loss of appetite, swollen throat, and difficulty breathing.

Internal parasites can be infectious, so make sure you separate the affected snake from any others you may have. Get a fresh fecal sample (no more than 2 hours old), and take it into your veterinarian to have it tested. You also might want to check the feces of any other snakes at the same time because symptoms can sometimes be delayed even though a snake is already infected. Symptoms of internal parasites may include

- no appropriate weight gain when feeding regularly
- smelly feces that are bloody or covered with mucous
- loss of appetite (refusing to feed)

- significant increase in appetite
- swollen throat
- difficulty breathing
- breathing with the mouth open

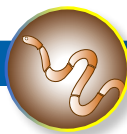
◆ External Parasites

When you look at your snake, do you notice small black dots moving around on it or under its scales? Do you see a buglike animal attached to your snake? If you see either one, your snake may have external parasites.

Mites and ticks can attach themselves over the entire body of a snake, especially under and between the scales and around the eyes. Snakes usually get these parasites through unsanitary housing and exposure to infected snakes. They can also be more susceptible to mites and ticks if they have a poor diet or are suffering from other diseases. While feeding on the blood of their hosts, mites and ticks can cause anemia (loss of red blood cells) and may transmit diseases such as viruses and blood parasites. It is very difficult to get rid of mite and ticks. The entire cage and all of its furnishings must be thoroughly disinfected. Contact your veterinarian for instructions on how to treat for external parasites. Symptoms of external parasites may include

- black spots (moving or non-moving) on the scales, mouth, nostrils, or vent

HEALTH ASSESSMENT CHECKLIST



Snake Name: _____ Breed: _____

Gender: _____ Age: _____

General Symptoms

Is there anything you notice that you should be concerned about?

Journal Entry 1: _____

Journal Entry 2: _____

Journal Entry 3: _____

Journal Entry 4: _____

Journal Entry 5: _____

Suspected Diagnosis: _____

(Use the snake disease information sheet)

Observations

Explain which symptoms from the above journal helped you indicate a problem, and explain why.

What other observations do you think might be important?

Why do you think recording daily observations of your snake would be helpful in monitoring your snake's health?

Your Snake's Health

Subject Overview and Background Information

Youth should use the skills and knowledge acquired from the previous activity to assess their snake's health in this application activity. As important as it is to teach the youth about animal health assessments, it is even more vital for the youth to apply their knowledge in the real world. This application activity allows the youth with animals to evaluate their pets' health and determine the right time to consult a veterinarian. The youth should be in a regular habit of checking their animal's overall health and notice any signs of abnormality.

The best way to assess the health of a snake is through observation. There is no clear-cut definition of normal; normal varies from snake to snake, so abnormal depends on your snake as well. Observing your snake daily is the best way to really get to know it and to be able to identify changes that might be symptoms of disease or injury.

In this activity youth will fill out the health assessment charts used in the previous activity, except that they will make observations on their own snakes. In addition, they should write a short journal entry on the back of the chart about what they did with their snake daily. The daily observations should last a minimum of 14 days.

Snakes can be difficult animals to handle and take vital measurements from. We suggest developing an inexpensive kit that may help the youth in their observation and measuring process. This kit could include the following:

- **Latex gloves:** for general use every time they examine the snake, especially when they make personal contact with sensitive areas of the snake. Wearing disposable gloves is highly recommended when performing any of these procedures to prevent the spread of disease from human to snake and vice versa.
- **Penlight:** for use when examining the snake's eyes and nostrils. Encourage the youth to note anything that

looks abnormal in these areas and compare this with observations from previous days.

- **Magnifying glass:** For use when looking at the snake's skin and scales. The youth can look closely at the skin and scales and note any interesting observations.

If youth own a young snake, they may want to measure and record its growth. A snake's girth (width) can be measured by placing a measuring tape around its stomach (or the widest part of the snake). The snake's length can also be measured from its head to tail.

The penlight and magnifying glass can be used to get a closer look at any part of the snake, especially the eyes or mouth. Do not flash the light directly in the snake's eyes; rather, pass the light back and forth slowly and steadily across the eyes. **Do not substitute a laser pointer for the light.** The magnifying glass also allows the youth to take a closer look at snake's scales.

It is important to let the youth know that they should not make immediate conclusions about their animal's health. Most of the youth will probably have perfectly healthy pets. Do not give them the impression that they must find something wrong with their animal. Emphasize the concept of **health care maintenance** rather than health diagnosis.

◆ Activity Concepts and Vocabulary

- **Health care maintenance:** The regular monitoring of an animal's health.

◆ Life Skills

- **Head:** Keeping records, problem solving, decision making, critical thinking
- **Heart:** Sharing, communication, concern for others, empathy
- **Hands:** Self-motivation
- **Health:** Disease prevention, self responsibility, personal safety

◆ Subject Links

Science and Language Arts

◆ State Content Standards

Science

- Third Grade
 - *Investigation and Experimentation: 5e*
- Fourth Grade
 - *Investigation and Experimentation: 6c*
- Fifth Grade
 - *Investigation and Experimentation: 6h, 6i*
- Sixth Grade
 - *Investigation and Experimentation: 7d*

Language Arts

- Fourth Grade
 - *Listening and Speaking Strategies: 1.7*
- Fifth Grade
 - *Listening and Speaking Strategies: 1.5*
- Sixth Grade
 - *Listening and Speaking Strategies: 1.5*

◆ Purpose of Activities

The purpose of this activity is to have youth record observations of their own snake over a period of time.

ACTIVITY 2

Snake Health Journal

Overview of the Activity



Youth will have the opportunity to assess the health of their snake for a minimum of 14 days.

They will make observations of their animal

and record what they observed for each day. They

will also write a journal entry each day on their animal's activity. During their group meetings, youth will have a chance to share their observations of their animal and discuss any potential diseases or illnesses with their group.

◆ Time Required

Approximately 15 minutes daily for at least 2 weeks

◆ Suggested Grouping

Individual

◆ Materials Needed for Each Youth

(*Materials provided in curriculum)

- Flip chart paper
- *Animal health journal
 - *Animal background information sheet*
 - *Animal health daily recording sheet for each day of observation*
- Health assessment kit:
 - *Latex (disposable) gloves*
 - *Penlight*
 - *Magnifying glass*
- Writing tool (pencil, pen, etc.)
- Disinfectant
- Tape measure

◆ Getting Ready

Each individual is expected to observe their snake for 14 to 28 days. Make an animal health journal for each youth, which consists of an animal background information sheet and one blank animal health daily recording sheets for each day the youth will observe their snake.

Opening Questions:

Ask the youth to respond to each question below by sharing their ideas verbally and/or by recording them on the flip chart paper provided.

1. When you are sick, what observations might your parents make that would lead them to take you to see the doctor?
2. Describe what you might notice about snakes that are not feeling well.
3. What kinds of observations about your snake would prompt you to call your veterinarian?
4. Why might keeping a daily journal about you or your snake be helpful to a doctor or veterinarian?

Procedure (Experiencing)

1. Give each individual an animal health journal packet, which includes an animal background information sheet and one animal health daily recording sheets for each day of observation.
2. Explain to the youth that they are to fill out the animal background information sheet. If they

have more than one animal, they may choose one to work with for this activity. They may need to work with their parents to answer the background information questions.

3. Youth will also fill out an animal health daily recording sheet every day for the chosen number of days (14 days are recommended). The youth should also include a brief journal entry on the back of the recording sheet, describing what they did with their animal each day.
4. Ask the youth to prepare to share a report with their peers at the next group meeting. Reports should include an oral description on observations along with any potential symptoms of illness. Youth who have a young snake may want to graph growth. The youth could also create a poster or PowerPoint presentation to share their findings.

Sharing, Processing, and Generalizing

Have each youth share his or her report with the group. Follow the lines of thinking developed through the general thoughts, observations, and questions raised by the youth.

If necessary, use more targeted questions as prompts to get to particular points:

1. What are some advantages of keeping a daily health journal for your snake? Were there any challenges? Please explain.
2. Did your snake present any symptoms of concern? If so, what were they, and what did you do? Please explain.
3. What similarities, if any, were there between your snake and others' snakes? What differences, if any, were there? Please explain.

Concept and Term Discovery/Introduction

Volunteers need to ensure that the concept of **health care monitoring** has been introduced or discovered by the youth.

- **Note:** The goal is to have the youth develop concepts through their exploration and define terms using their own words.

References

- Root, B., and P. Hollander. 1995. Care sheet for snakes. Animal Allsorts Web site, <http://www.reptileallsorts.com/sngeneral-cs.htm>.

Animal Health Journal

ANIMAL BACKGROUND INFORMATION SHEET

Date: _____ Youth's name: _____

Animal's name: _____ Species: _____

Breed: _____ Date of birth or age of animal: _____

Gender (male, female, or unknown/fixed or intact): _____ Has this animal been bred? _____

If yes, how many times? _____ Date of last breeding? _____

Health history: Is this animal on any medications? _____ If yes, please list. _____

Does this animal have current vaccinations? _____

Does this animal have any allergies? _____ If yes, please list. _____

Has this animal had any major illnesses or surgeries? _____ If yes, describe. _____

Date of last veterinary checkup: _____ Date of last shed: _____

Environment: Please describe the housing for this animal (indoor/outdoor, with other animals/alone, size of enclosure).

Diet: Please describe the diet and the feeding schedule for this animal. Describe how water is provided (bowl, automatic waterer, etc.)

ANIMAL HEALTH DAILY RECORDING SHEET

Date: _____ Time: _____

Animal name: _____

MEASUREMENTS

Length : _____ Girth : _____

Heart rate: _____ Respiration (breathing) rate: _____

OBSERVATIONS

Behavior: _____

Activity level: _____

Appetite: _____

Body condition: _____

Body position and movement: _____

Skin and scales: _____

Eyes: _____

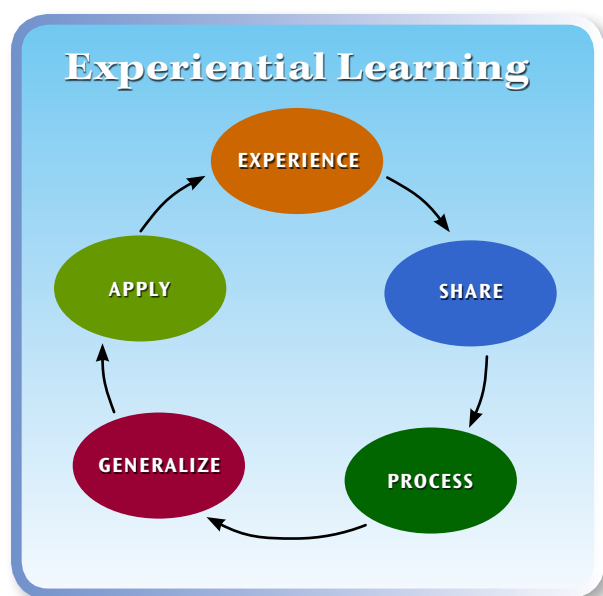
Nose: _____

Body waste: _____

Other: _____

APPENDIX

The activities in this curriculum are designed around inquiry and experiential learning. Inquiry is a learner-centered approach in which individuals are problem solvers investigating questions through active engagement, observing and manipulating objects and phenomena, and acquiring or discovering knowledge. Experiential learning (EL) is a foundational educational strategy used in 4-H. In it, the learner has an experience phase of engagement in an activity, a reflection phase in which observations and reactions are shared and discussed, and an application phase in which new knowledge and skills are applied to a real-life setting. In 4-H, an EL model that uses a 5-step learning cycle is most commonly used. These five steps—Exploration, Sharing, Processing, Generalizing, and Application—are part of a recurring process that helps build learner understanding over time.



For more information on inquiry, EL and the 5-step learning cycle, please visit the University of California's Science, Technology, Environmental Literacy Workgroup's Experiential Learning Web site, <http://www.experientiallearning.ucdavis.edu/default.shtml>.

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