Behave Yourself!

Concept Statement: Animals display innate and learned behaviors. Professionals who work with animals use these behaviors to provide stimulating and safe environments for them.
**List of Materials Needed:**

**Exploration A:**
Each of the following is required per group:
- 1 mouse, rat or hamster (housed in proper home cage with bedding, food, water, wheel, and chew toy)
- Y-maze or T-maze
- Treats (Honey Nut Cheerios, cheese and/ or peanut butter)
- Small holding container with wire mesh cover
- Stop watch
- Gloves

**Exploration B:**
Each of the following is required per group:
- 1 dissecting microscope
- 4 hydra in spring water, each in a small (4” or smaller) Petri dish
- 1 dropper of brine shrimp
- 1 dropper of spring water
- 1 dropper of glutathione
- 1 dropper of tyrosine
- 1 stop watch
- Spring water

**Exploration C:**
- Field trip permission form per student
- Transportation to and from local zoo

**Activity Time Frame:**
This activity may take one full day (8 hours)

**Environmental Setting:**
This activity will be conducted in a typical classroom and the local zoo. Oklahoma City Zoo education director 405-425-0288.

**PASS Standards:**
Science Processes and Inquiry: Biology

Process Standard 1: Observe and Measure
1. Identify qualitative and quantitative changes in organisms before, during, and after an event.
2. Use appropriate tools when measuring.

Process Standard 3: Experiment
1. Evaluate the design of a biology laboratory investigation.
2. Identify independent and dependent variables and controls in the experiment.
3. Use mathematics to show relationships within a given set of observations.
4. Identify a hypothesis for a given problem in biology investigations.
5. Recognize potential hazards and practice safety procedures in all biology activities.

Process Standard 4: Interpret and Communicate
1. Select appropriate predications based on previously observed patterns of evidence.
2. Report Data in an appropriate manner.
3. Interpret data tables.
4. Accept or reject hypotheses when given results of a biological investigation.
5. Evaluate experimental data to draw the most logical conclusion.
6. Prepare a written report describing the sequence, results, and interpretation of a biological investigation.

Process Standard 5: Model
1. Interpret a biological model which explains a given set of observations.
2. Select predications based on models.
3. Compare a given model to the living world.

Process Standard 6: Inquiry
1. Formulate a testable hypothesis and design an appropriate experiment relating to the living world.
2. Design and conduct a biological investigation in which variable are identified and controlled.
3. Use a variety of technologies, such as and tools, microscopes, measuring instruments, and computers to collect, analyze, and display data.
4. Inquiries should lead to the formulation of explanations or models. In answering questions students should engage in discussions and arguments that encourage the revision of their explanations, leading to further inquiry.

Content Standard: Biology
Standard 3: Biological Diversity
2. Biological adaptations include changes in structures, behaviors, or physiology, which may enhance or limit the survival and reproductive success in a particular environment.

Standard 4: Interdependence of Organisms
2. Organisms both cooperate and compete in ecosystems

Standard 6: The behavior of Organisms
1. Specialized cells enable organisms to monitor what is going on in the world around them.
2. Responses to external stimuli can result from interactions with the organisms own species and others as well as environmental changes.

Lesson Objectives:
• Design and carry out scientific process through experimentation.
• Design and carry out ethogram to describe animal behavior.
• Objectively observe animal behavior.
• Describe the relationship between innate and learned behavior.
• Describe the relationship between natural and captive behavior.
• Describe the relationship of observed behavior and zoological engineering of habitats.

Vocabulary Terms:
Behavior: actions or reactions of an object or organism, usually in relation to the environment
Innate behavior: responses to stimuli which are influenced by genes and are performed spontaneously the first time the stimulus is encountered.
   Instinct – hunting, nesting, nursing
   Reflex - startle reaction, moving away from hot object
Taxes - movement towards or away from a stimulus
Learned behavior: behavior that develops as a result of experience
Classical conditioning: A basic form of learning in which a neutral event (unconditioned stimulus, US) initially incapable of evoking certain responses acquires the ability to do so through repeated pairing with other stimuli that are able to elicit such responses. This type of conditioning does not involve any voluntary choices by the animal; the response or reaction is reflexive (e.g., blinking or salivating) and not dependent on operant learning.
Operant conditioning: A type of learning in which behavior is determined by its consequences. (Strengthened if followed by reinforcement [positive or negative] and diminished if followed by
punishment). The animal “operates” on the environment, leading to a desired outcome; the animal’s behavior is instrumental in acquiring the desired outcome.

**Ethology:** study of an organism's behaviors in an ecosystem

**Ethogram:** A complete list of all the different kinds of behaviors an animal species can exhibit.

**Dependent variable:** the variable that may change as a result of a change in the independent variable

**Independent variable:** A variable whose values are independent of changes in the values of other variables, independent variable.

**Control variable:** A control variable is any factor that remains unchanged and strongly influences values; also, a factor held constant to test the relative impact of an independent variable.

**Control group:** a group within an experiment treated identical to the experimental group, but without the independent variable. This group is used to help determine if the dependent variable is actually being changed due to the independent variable.

**Resources:**
- [http://www.petco.com/Content/ArticleList/Article/35/20/830/Can-I-Teach-My-Hamster-To-Do-Tricks.aspx](http://www.petco.com/Content/ArticleList/Article/35/20/830/Can-I-Teach-My-Hamster-To-Do-Tricks.aspx)
- [http://www.cavyrescue.co.uk/rat-article16.shtml](http://www.cavyrescue.co.uk/rat-article16.shtml)
- [http://www.theagilerat.com/?id=30](http://www.theagilerat.com/?id=30)
- Mice and Rats: [http://www.afrma.org/rindex.htm](http://www.afrma.org/rindex.htm)
- [http://www.wikihow.com/Take-Care-of-Mice](http://www.wikihow.com/Take-Care-of-Mice)
- [http://www.wikihow.com/Care-for-a-Pet-Rat](http://www.wikihow.com/Care-for-a-Pet-Rat)
- Hamster: [http://www.wikihow.com/Care-for-a-Hamster](http://www.wikihow.com/Care-for-a-Hamster)
- [http://www.hsus.org/pets/pet_care/rabbit_horse_and_other_pet_care/how_to_care_for_hamsters.html](http://www.hsus.org/pets/pet_care/rabbit_horse_and_other_pet_care/how_to_care_for_hamsters.html)
- [http://www.hamsterhideout.com/allabthams.html](http://www.hamsterhideout.com/allabthams.html)

**Background Knowledge:**

**The Hydra**

Hydra feeding behavior: Hydra do not have an organized brain, rather a layer of nerves called a nerve net throughout their body. Because they do no have a brain to drive a desire to eat, their feeding behavior is based on simple mechanical and chemical activation. Potential food rub against specialized triggered cells on tentacles called cnidocysts (stinging cells). Once the trigger is tripped, a nematocysts burst out of the cell compartment and wraps its barbed coil around the food. See the picture below.
Once the potential food is punctured, it releases chemicals into the water. Hydra nerve system detects chemicals in food using typical specialized chemical receptor cells (lock and key system).

In the case of this experiment, the brine shrimp release glutathione which “fit” into receptor proteins on tentacle nerve cells. This causes an automatic response to stretch out tentacles, open the mouth and push the tentacles into the mouth. Brine shrimp also release other chemicals, but only glutathione fit into tentacles receptor proteins. Brine shrimp also release a chemical called tyrosine which “fits” into receptor proteins inside the gastrovascular cavity (GVC). Once inside the GVC the tyrosine triggers the hydra to crunch its body, breaking up the food into smaller pieces. These smaller pieces are then taken into other specialized cells within the GVC and digested again. Other specialized cells then transport the nutrients throughout the body.

(Pictures for the Hydra section provided by University of Oklahoma Zoology Department and are for reference purposes only.)

The Mammal

Animal Care-reference the following websites for care of your specific animal:
Mice and Rats: http://www.afirma.org/rmindex.htm
http://www.wikihow.com/Take-Care-of-Mice
http://www.wikihow.com/Care-for-a-Pet-Rat
Hamster: http://www.wikihow.com/Care-for-a-Hamster
http://www.hsus.org/pets/pet_care/rabbit_horse_and_other_pet_care/how_to_care_for_hamsters.html
http://www.hamsterhideout.com/allabthams.html

In general, all animals need a clean, stimulating environment, be provided fresh food and water and be handled daily. In addition, be sure to make yourself aware of signs of illness and have a vet in mind prior to obtaining any animal.
This lesson should only be taught if you have intention of keeping your animals as pets or have an appropriate, safe place for them after your lesson is complete. No animal should be given to a student of any age unless the student and parent have been educated on its proper care.

Animal handling-Students need to be directed in the proper care of vertebrate animals in accordance to federal, state, and local laws. The following links may aid in this discussion:


It is important to hand train young animals (weanling to early adolescent) prior to using them for classroom demonstrations. You may find older animals difficult handle and train. If your animal seems prone to bite, start with thick gloves. Gently handle your animals daily by holding them with both hands, letting them walk from hand to hand and petting their backs. Although hand trained hamsters, mice and rats are not prone to biting, they will if not handled correctly or if they smell food on you. Mice and dwarf hamsters are very quick. With mice, you may begin by picking them up quickly by the base of tail (NOT the tip) and gently placing them in your hand. Rats are best picked up gently by midsection supporting their hind legs with the other hand. Hamsters can be scooped into your cupped hands. Do not squeeze as restraint causes fear. All animals need to be acclimated to their home cage and handled daily for at least a week (more is better) prior to introduction in the classroom.

Animal training-Hamsters, mice, and rats are all capable of learning “tricks” with rats being the easiest and hamsters being the most difficult to train. Working with your animal helps provide a more stimulating environment. If done properly (with the animal’s well being at highest priority) it can be very rewarding and educational for your students. Below are some resources to help you train your animal. Mice can learn in the same manner as rats and hamsters. It is important to always stay calm with your animal and be patient. Some animals may take longer than others to learn a new trick. Treats are the best way to reinforce a behavior. Punishment should never be used.

http://www.petco.com/Content/ArticleList/Article/35/20/830/Can-I-Teach-My-Hamster-To-Do-Tricks.aspx
http://www.cavyrescue.co.uk/rat-article16.shtml
http://www.theagilerat.com/?id=30

Activity Procedures:
- Students will participate in a classical conditioning learning activity.
- Students will observe videos of various types of learning.
- Students will perform experiments displaying innate and learned behaviors from various animals.
- Students will observe how innate and learned behaviors are used in a zoo setting to provide stimulating and safe environments for the animals.
- Students will use a webquest to determine natural behaviors for a selected animal.
- Students will develop an ethogram based on their webquest.
- Students will use their ethogram to observe their selected animal in a zoo (captive) setting.
- Students will compare their observations with natural behaviors of their animal.
- OPTION: Students will design a diorama of an animal habitat which would provide the animal with a safe AND stimulating environment based on their research and observations.

Technology Component:
A computer with internet connection and MS Excel will be used for the ethogram part of this lesson.

WebQuest: The webquest for this lesson involves students researching innate and potential learned behaviors of a chosen animal, researching ethogram, and designing an ethogram based on their research. The resulting ethogram will be used for the authentic assessment.
**Engineering Application:** Reference is made throughout exploration C to zoological engineers. Although this term is not widely used, it describes professionals who research and design solutions to problems with animals in the wild or captivity using the tools of science, mathematics, and technology.

**Assessment Tools:** Assessment involves the students using the ethogram developed during the webquest to observe a live animal’s behavior in a zoo setting and answering questions regarding their observations. There is also a brief written assessment of student’s knowledge of innate verses learned. Alternatively, you may have students design a diorama of an animal habitat which would provide the animal with a safe AND stimulating environment based on their research and observations.

**Examples of Purchasing Resources:** For hydra, brine shrimp, microscopes, petri dishes, etc.
www.carolina.com
www.flinnsci.com
www.wardsci.com

**T-Maze diagram:**

Each T-maze can be constructed from a piece of 28 by 16 inch plexiglass 1/16 inch thick. The plexiglass can be cut with a table saw or by scoring the surface with a plexiglass knife and breaking it. Many home improvement stores will also cut it for a fee. You will also need a 2 ¼ inch hole saw to cut the maze entrances.

The following pieces will be required for construction:

A: 3X 24” by 4”
B: 4X 4” by 3 7/8”
C: 2X 4” by 2”
D: 3X 4” by 4”
Packing Tape
Hole Saw dia. 2 ¼ “

Assembly of Start Box:

Use Parts D as the top, left and right sides, with Parts B as the front and back. There is no bottom piece. Cut a hole 2 ¼ “ wide in the center of the front piece. Packing Tape can be used for assembly.
Assembly of Maze Box:

Use Parts A as the top, front and back. Use Parts B as the left and right and Parts C as supports for the bottom. Packing tape can be used for assembly. Draw two lines approximately 3 inches from the hole to designate the left and right arms (marked by the slotted lines in the diagram)

Total Assembly:
Behave Yourself!

INTRODUCTION (variable time)

Watch the videos provided by your teacher. Below is a list of examples:
Fish (1:00) http://youtube.com/watch?v=4ewPCADX4eA
Dog, water, stairs (3:47) http://youtube.com/watch?v=LwfrFm5wAuY
40 dog tricks (9:29) http://youtube.com/watch?v=e7QrBwANSDs&feature=related
Pig tricks (2:50) http://youtube.com/watch?v=aLmWz1kvhZg
Pocahontas show: (4:11) http://www.youtube.com/watch?v=ULuoy99_QZU&feature=related
Cat yawning: (0:04) http://youtube.com/watch?v=LQ5m75qZlyk
Hippo yawning: (2:03) http://youtube.com/watch?v=UwgpfVYtsNk&feature=related
Charlie bit me: (0:56) http://youtube.com/watch?v=_OBlgSz8sSM
Freezing Frogs (3:47) http://youtube.com/watch?v=uRx_cj826Mo
Several videos: http://www.momo-p.com/index-e.html

Take notice of what is happening in each. Think about how each animal is performing each task. Did the animal learn the task or did they just know. Why do people teach animals certain things? Today we are going to explore the answer to these questions.

EXPLORATION A (45 minutes for Tasks I and II, 15 minutes for Task III)

Watch the demonstration of behavior. Show students any “tricks” you trained your animal. Suggestions are in the cover sheets. How is the animal able to perform these behaviors? Are they born with these behaviors? This exploration will investigate these questions.

Materials:
Each group will need the following...
• 1 mouse, rat or hamster (housed in proper home cage with bedding, food, water, wheel, and chew toy)
• Y-maze or T-maze Instructions for making your own y-maze are in the cover sheet
• Treats (Honey Nut Cheerios, cheese and/ or peanut butter)
• Small holding container with wire mesh cover
• Stop watch
• Gloves

Procedures:

Task I: Natural Behavior
1. Watch the demonstration on how to handle the live animal. See cover sheet for instructions on this. It is vital that these instructions are followed for the safety of the animal and yourself. Gloves must be worn to handle the animals. Rats need to have no food for 24 hours and mice and hamsters need to have no food for 12 hours prior to experiment. This is to ensure the animals are motivated to retrieve food. Food deprivation for longer than this is not appropriate for this experiment.
2. Determine if your animal prefers left or right. (Make sure your area is quiet).
   a. Gently place your animal in the holding container with lid.
   b. Set the timer for 30 seconds.
   c. After the 30 seconds gently place your animal in the start box of the maze.
   d. Count to 10 and open the maze door by sliding the “T” so the doorway matches up.
   e. Record which side the animal crosses first (whole body must cross the marker on maze to be counted). Start over if no choice is made within 1 minute.
   f. Gently place the animal back in the holding container.
   g. Repeat “b” through “f” 6 times, wiping the floor between each trial.
Task II: Training
4. Now we will try to train your animal to go a certain direction. If your animal preferred a certain direction, choose the opposite direction.
5. Repeat steps “a” through “d” only this time place a small piece of food just past the marker on the correct side. Do this 4 times allowing your animal to finish eating before removing it. Use the checklist below to keep track of your progress. If your animal makes an “incorrect” choice or takes longer than 60 seconds, remove it immediately and start over.
6. Repeat step 5 eight more times, but this time place the food at the far end of the maze.
7. Place your animal back into the home cage for a resting period.
8. Do you think your animal will learn to go down the chosen arm without a food reward? Why or why not? Student answers will vary depending on their opinion. Possible answer may include that the animal is only going toward the smell of the food or that yes, the animal has learned.
10. We will now go on to EXPLORATION B (page 3) and test your animal later.

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<th>Trial</th>
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</table>

Total right _____  Total left _____

3. Which side, if any, did your animal prefer? __________________

Task III: Testing
11. AFTER EXPLORATION B: Now let’s see if your animal will go down your chosen arm…
12. Repeat steps “a” through “g” with NO food and record your animal’s chosen arm. If your animal takes longer than 60 seconds to make a choice, remove it and start over.

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<th>Trial</th>
<th>Right or Left</th>
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Total right _____  Total left _____

Be sure to provide normal food amounts after the experiment is over. In actuality it takes time for memory of learning to “consolidate” or become part of permanent memory for later recall. Repetition of training strengthens any preferences. To demonstrate true learning, it would be best to perform step 12 the next
day. If time does not allow this, animals should still show some short term preference although may tire easily and not make choices at all. If animals do not make choices relatively quickly, they may need a longer break.

CONCEPT DEVELOPMENT – A (10 minutes)

1. Which side, if any, did your animal prefer? __________________
2. Do you think your animal learned to prefer this direction or is it born with this preference? Explain. If the animal preferred the trained side even without food, students should conclude that the animal has learned.
3. Based on this experiment, what kind of behavior can animals display? Give evidence for your answer. Animals display learned behavior. Students should describe how their animal showed learning and compare this to learning in other animals.

EXPLORATION B (60 to 75 minutes)

You may want to show a video or images of a hydra before students observe so they have an idea of what to look for (example video: http://www.youtube.com/watch?v=Kukv0AtIVdU).

Materials:
Each of the following is required per group:
- 1 dissecting microscope
- 4 hydra in spring water, each in a small (4” or smaller) Petri dish
- 1 dropper of brine shrimp
- 1 dropper of spring water
- 1 dropper of glutathione
- 1 dropper of tyrosine
- Spring water
- 1 stop watch
Procedures:

**Task I: Natural Behavior**
1. Observe a hydra for 2 minutes. Check off the hydra’s behavior in 15 second intervals on the data sheet below. Use the chart below as a guide.

**Example of Hydra Behavior**

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Description of Behavior</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moving around</td>
<td>Moving entire body from one location to another</td>
<td></td>
</tr>
<tr>
<td>Waving tentacles</td>
<td>Body is stationary, but tentacles are moving around</td>
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<tr>
<td>Tentacles to mouth</td>
<td>Tentacles are being moved toward and possible into the mouth</td>
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<tr>
<td>Open mouth</td>
<td>Mouth is opening</td>
<td>Can only be observed if looking down on animal</td>
</tr>
<tr>
<td>Crunch midsection</td>
<td>Middle of body is shrinking in size</td>
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</tr>
<tr>
<td>Stretch midsection</td>
<td>Middle of body is elongating (getting longer)</td>
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<tr>
<td>Tentacle stretch</td>
<td>Stretching tentacles out away from body</td>
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</table>

**Hydra Observation Data Sheet (1)**

<table>
<thead>
<tr>
<th></th>
<th>Moving Around</th>
<th>Waving tentacles</th>
<th>Tentacle stretch</th>
<th>Tentacles to mouth</th>
<th>Open mouth</th>
<th>Crunch Midsection</th>
<th>Stretch Midsection</th>
<th>Other: write it down</th>
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</table>

Do you notice any consistent behavior? *Students should only notice very few behaviors. Hydra do not typically move around since they are sessile (attached directly by its base; immobile) animals.*
Task II: Feeding Behavior
1. Now we are going to feed one of the hydra. Place one dropper of brine shrimp next to the hydra. Be careful not to place it directly on top of the hydra.
2. Observe hydra for 5 minutes recording behavior in 15 second intervals on the data sheet below.

Hydra Observation Data Chart (2)

<table>
<thead>
<tr>
<th>Time Interval</th>
<th>Moving Around</th>
<th>Waving Tentacles</th>
<th>Tentacle Stretch</th>
<th>Tentacles to Mouth</th>
<th>Open Mouth</th>
<th>Crunch Midsection</th>
<th>Stretch Midsection</th>
<th>Other: write it down</th>
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</table>

3. Do you notice any specific behavior?

*Students should notice tentacles stretching out and moving first, then tentacles “grabbing” shrimp, then moving it to their mouth, opening mouth, pushing shrimp into midsection (gastrovascular cavity), and finally the midsection crunching. See cover sheet for specifics on how hydra capture prey.*

4. Compare the natural behavior chart to feeding behavior chart. What behaviors are more prominent in feeding verses natural?

*Moving tentacles to mouth, opening mouth, and crunching the midsection are all feeding behaviors in hydra and should be noted.*

5. Would you consider these feeding behaviors? Why or why not?

*Since the behaviors in feeding are typically not seen in hydra at rest (nor during other functions), these behaviors would be considered feeding behaviors.*
Task III: Chemical Reaction – Let’s try an experiment using the scientific method…

1. **Observation:** Brine shrimp contain the chemicals glutathione and tyrosine.
2. **Question:** Would hydra try to “eat” if just a chemical found in brine shrimp were in the water?
3. **Hypothesis:** Make up your own hypothesis (based on your knowledge of science, what would you guess).

   *Answers will vary depending on student’s thoughts.*

4. **Experimental Design:**

   **Dependent variable:** We are looking for “eating” behavior. What type of behavior did you observe during feeding?

   *The feeding behaviors from question #6*

   **Independent variable:** What could cause this behavior?

   *Glutathione, tyrosine*

   **Control Group:** Treated just like the experiment, but without the independent variable.

   *Use spring water instead of chemical. This will take away affects of fluid being added.*

   **Control (Standardized) variables:** Those things you can control which could affect the experiment.

   *Room temperature, lighting, type of hydra, amount of fluid, time of observation, etc.*

5. **Procedure:** What steps will you take to perform the experiment?

   *Add one drop of chemical or spring water next to (not on top of) the hydra. Record behavior for a full 2 min. recording every 15 seconds. Use a different hydra for each condition (spring water, glutathione, and tyrosine). Someone needs to be the timer while someone else needs to record behavior.*

6. **Teacher approval to start experiment ____________

7. **Results… Write in each box which condition (spring water (S), glutathione (G), and tyrosine (T)) was seen.**

   **Hydra Observation Data Sheet (3)**

<table>
<thead>
<tr>
<th>Time</th>
<th>Moving Around</th>
<th>Waving tentacles</th>
<th>Tentacle stretch</th>
<th>Tentacles to mouth</th>
<th>Open mouth</th>
<th>Crunch Midsection</th>
<th>Stretch Midsection</th>
<th>Other: write it down</th>
</tr>
</thead>
<tbody>
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<td>0:00 – 0:15</td>
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</table>

8. **What is your conclusion? Did you accept or reject your hypothesis?**

   *Depends on results and hypothesis stated.*
CONCEPT DEVELOPMENT – B (15 minutes)

Answer questions using complete sentences.

1. Which behaviors, if any, did you notice with spring water?
   *This should have had only an initial behavior of tentacles waving due to the fluid being added.*

2. Which behaviors, if any, did you notice with glutathione?
   *This should have only resulted in an initial tentacle wave, then the tentacle stretch & moving towards the mouth, mouth opening. No midsection crunching should have been observed.*

3. Which behaviors, if any did you notice with tyrosine?
   *Tyrosine should have only evoked a crunching response in the midsection after an initial waving of tentacles.*

4. Were any of these behaviors feeding behaviors described in Task II?
   *Discuss with the students that glutathione is a chemical ligand which matches receptors on the tentacles. This reaction makes the animal stretch tentacles, open the mouth and move tentacles to the mouth. Tyrosine on the other hand is a chemical ligand which matches the receptors only inside the “stomach” midsection. This reaction causes “crunching” of the midsection which aids in initial digestion of food. Make it a point to stress how these “feeding behaviors” happen even if no food is there (just the chemicals create the behavior).*

5. Do you think hydra learned feeding behavior or was born with this ability? Explain.
   *They were born with it. It is simply a chemical reaction involving no thought or memory process, which is required for learning.*

6. What type of behavior is it called when an animal is born with that behavior?
   *This is called innate behavior.*

7. Hydra are animals. Based on the hydra experiment, what type of behavior can animals display? Give evidence of your answer.
   *Animals can display innate behavior. Hydras displayed innate feeding behavior through the use of chemical reaction. Discuss with students that hydra only have a nerve net and no real “brain” for thought or memory process.*

TYING IT TOGETHER...

Based on your experiments in these lessons, what types of behaviors do animals display?

_____ Animals displays innate and learned behaviors. ________________________________
Web-Quest: Animal Behavior

INTRODUCTION

We have learned animals display a wide array of behaviors, some present at birth, others develop later in life. We can learn much from simply observing these animals; determining which behaviors are learned and unlearned can tell us how these animals live out their lives.

TASK (20 to 40 minutes)

Your task will be to select an animal from the list below and research it using the World Wide Web. Here are some links to get you started, but you may use any reputable website.

- Behavioral Advisory Group: www.ethograms.org
- San Diego Zoo: www.sandiegozoo.org
- Encarta Online Encyclopedia: http://encarta.msn.com
- Animal Planet: www.animalplanet.com
- Primate Info Net: http://pin.primate.wisc.edu
- Academic Info: www.academicinfo.net/zoo.html

Animals to choose from: grizzly bear, river otter, African wild dog, chimpanzee, flamingo, meercat, bat, white tailed deer These animals will vary based on the time of day and time of year you visit the zoo.

Research your animal's average behavior and determine whether the behaviors are learned or unlearned. You will also need to research the preferred method of recording animal behavior: the ethogram. The list of hydra behaviors in Exploration B is an ethogram.

You will prepare an ethogram of expected behaviors and a data sheet to record those behaviors then use this data sheet to do live observations of your animal in a zoo setting.

Through this webquest you will accomplish the following:

- Research websites about your chosen animal
- Analyze the information to differentiate between learned and unlearned behaviors.
- Create an ethogram for later use with an accompanying data sheet.

PROCESS

Step 1: Researching your animal

1. What is your chosen animal?
   Students may choose from a list you provide. You will need to check with the zoo prior to this activity to determine which animals will be active during your planned visit.

2. What is the animal's normal habitat?
   All of the following questions will depend on the chosen animal. Students will need to be specific for their animal.

3. What is the animal's social life like?
4. What are its eating habits?

5. Are there any other habits that make the animal unique?

6. Which behaviors do you think are innate?

7. Which behaviors do you think are learned?

**Step 2: Developing your ethogram**

1. What is an ethogram?

*Behaviors of interest of a particular animal are listed along with descriptions. Descriptions may describe the behavior itself, or may describe what may result due to that behavior.*

2. What are the necessary components of an ethogram?
   a) A word or couple of words to label the behavior
   b) A brief description of the behavior
   c) Any notes regarding the behavior (when or where observed)

3. Based on your findings in step 1, develop your ethogram below (list only 8):

<table>
<thead>
<tr>
<th>Name of Behavior</th>
<th>Description of Behavior</th>
<th>Notes</th>
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4. Develop a data sheet for doing a 20 minute observation. Here you will need to determine what time intervals you will record behavior. 2-5 min intervals are typical for a 20 minute observation. Below is just an example. Behaviors will vary.

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<thead>
<tr>
<th></th>
<th>Jump</th>
<th>Run</th>
<th>Groom</th>
<th>Sleep</th>
<th>Eat</th>
<th>Invasive</th>
<th>Defense</th>
<th>Sneak</th>
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EXPLORATION C

Materials
- Field trip permission form per student
- Transportation to and from local zoo

Introduction
Scientist have put a tremendous amount of time, effort and money to determine normal innate behaviors and learned behaviors in a large number of species. Why do you think learning about animal behavior is so important? This exploration will explore the answer to this.

Individuals who solve problems dealing with animals using science, math, and technology may be considered zoological engineers. More commonly they are known as biologist or zoologist. Today we are going to watch zoological engineers in action.

Procedure
1. Travel to our local zoo.
2. Watch a demonstration of how information about behavior is used by zoological engineers at the zoo. We have set up for our zoo to first demonstrate a clicker training with the students, then review a PowerPoint describing why training is used in the zoo (husbandry, medical procedures, enrichment, safety, etc.) and how learning about behavior plays a part in this. We have also set up for the students to watch videos of actual animal training session and a demonstration of a trained animal. Check with your local zoo for their willingness to provide such an experience. It is also advisable if you meet with zoo professionals to review the questions in concept development C beforehand so students will know what to listen and look for.
CONCEPT DEVELOPMENT – C

1. Name AT LEAST 3 behaviors animals are trained to do at the zoo and which animal(s) they train to do the behavior. Answers will depend on what the zoo educators discuss.

2. What innate behaviors, if any, do trainers depend on to teach a certain behavior. Name AT LEAST 2 and write the specific animal(s). Again, answers will depend on what the zoo educators discuss.

3. Would zoo trainers be able to train their animals without prior knowledge of normal innate behaviors, limitations and capabilities of animal learning? Explain. No, zoo trainers need to understand the animals’ limitations and capabilities for successful training to occur. For example, some animals are more aggressive when approached from behind while others may be more aggressive if approached head on. It would also be very frustrating for both the trainer and the animal to try training a behavior they are not capable of doing. It would be equally frustrating for the animal to be trained well below its capabilities for enrichment.

4. Other than human entertainment, name AT LEAST 4 reasons why zoo trainers train their animals. Husbandry, medical procedures, safety of human, safety of animal, enrichment

5. People who work with animals use __innate____ and ___learned________ behaviors of animals to provide _stimulating (enriching) _ and ___safe________ environments for the animals.

CONCEPT APPLICATION

1. List other behaviors an animal may have that are innate behaviors. Remember, innate behaviors are ones that an animal is born with. Also list why you think this behavior is innate and how it may be used to help professionals who work with the animal. Answers will vary and need to correctly depict the type of learning.

A. Innate behavior: Animal:

Why:

Used by professionals?

B. Innate behavior: Animal:

Why:

Used by professionals?

C. Innate behavior: Animal:

Why:

Used by professionals?
2. Now list behaviors an animal may have that is learned.
   A. Learned behavior: Animal:

      Why:

      Used by professionals?

   B. Learned behavior: Animal:

      Why:

      Used by professionals?

   C. Learned behavior: Animal:

      Why:

      Used by professionals?
AUTHENTIC ASSESSMENT
Now it is your turn to be a zoological engineer. You have already researched innate and learned behaviors typical of a chosen animal, much like a scientist initially would. You have been hired to develop a habitat that will provide the animal a stimulating and safe environment based on behavioral observations. You have developed a way to document behavior observations of the animal (the ethogram from the webquest). Now use your data sheet to observe your chosen animal for 20 minutes documenting behaviors you observe. Keep note of any behaviors observed not listed on your ethogram as well. Answers to the following questions should demonstrate the students understanding of innate verses learned behaviors, how to use an ethogram, and how understanding animal behavior is important. Answers will vary depending on the student’s chosen animal and what is observed on that day.
OPTION: It may be interesting to have students develop a diorama of a habitat they would design based on their observations. The diorama would demonstrate understanding of the animal’s natural behavior and an enriching environment.

1. What, if any, behaviors did you observe NOT listed on your ethogram?

2. Which of these behaviors do you think are innate? Why do you think this?

3. Which of these behaviors do you think are learned? Why do you think this?

4. If what you observed was different from behaviors on your ethogram, explain why you think this is.

5. Do you think 20 minutes was long enough to get an accurate picture of your animal’s true normal behavior? Why or why not.

6. List and/or draw how you might set up an environment for your animal.
INTRODUCTION
Watch the videos provided by your teacher. Take notice of what is happening in each. Think about how each animal is performing each task. Did the animal learn the task or did they just know. Why do people teach animals certain things? Today we are going to explore the answer to these questions.

EXPLORATION A
Watch the demonstration of behavior. How is the animal able to perform these behaviors? Are they born with these behaviors? This exploration will investigate these questions.

Materials
Each group will need the following…
• 1 mouse, rat or hamster (housed in proper home cage with bedding, food, water, wheel, and chew toy)
• Y-maze or T-maze
• Treats (Honey Nut Cheerios, cheese and/or peanut butter)
• Small holding container with wire mesh cover
• Stop watch
• Gloves

Procedures:

Task I: Natural Behavior

1. Watch the demonstration on how to handle the live animal. It is vital that these instructions are followed for the safety of the animal and yourself. Gloves must be worn to handle the animals.
2. Determine if your animal prefers left or right. (Make sure your area is quiet).
   a. Gently place your animal in the holding container with lid.
   b. Set the timer for 30 seconds.
   c. After the 30 seconds gently place your animal in the start box of the maze.
   d. Count to 10 and open the maze door by sliding the “T” so the doorway matches up.
   e. Record which side the animal crosses first (whole body must cross the marker on maze to be counted). Start over if no choice within 1 minute.
   f. Gently place the animal back in the holding container.
   g. Repeat “b” through “f” 6 times wiping the floor between each trial.

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<thead>
<tr>
<th>Trial</th>
<th>Right or Left</th>
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Total right _____ Total left _____

3. Which side, if any, did your animal prefer? ______________
Task II: Training

4. Now we will try to train your animal to go a certain direction. If your animal preferred a certain direction, choose the opposite direction.
5. Repeat steps “a” through “d” only this time place a small piece of food just past the marker on the correct side. Do this 4 times allowing your animal to finish eating before removing it. Use the checklist below to keep track of your progress. If your animal makes an “incorrect” choice or takes longer than 60 seconds, remove it immediately and start over.
6. Repeat step 5 eight more times, but this time place the food at the far end of the maze.
7. Place your animal back into the home cage for a resting period.
8. Do you think your animal will learn to go down the chosen arm without a food reward? Why or why not?

9. We will now go on to EXPLORATION B (page 3) and test your animal later.

<table>
<thead>
<tr>
<th>Checklist</th>
<th>Set 1</th>
<th>Set 2</th>
<th>Set 3</th>
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</thead>
<tbody>
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<td>1</td>
<td>5</td>
<td>9</td>
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<tr>
<td>2</td>
<td>6</td>
<td>10</td>
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<td>7</td>
<td>11</td>
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<td>4</td>
<td>8</td>
<td>12</td>
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</tbody>
</table>

Task III: Testing

10. AFTER EXPLORATION B: Now let’s see if your animal will go down your chosen arm…
11. Repeat steps “a” through “g” with NO food and record your animal’s chosen arm. If your animal takes longer than 60 seconds to make a choice, remove it and start over.

<table>
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<tr>
<th>Trial</th>
<th>Right or Left</th>
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</tbody>
</table>

Total right _____ Total left _____

CONCEPT DEVELOPMENT - A

1. Which side, if any did your animal prefer? __________________
2. Do you think your animal learned to prefer this direction or is it born with this preference? Explain.

3. Based on this experiment, what kind of behavior can animals display? Give evidence for your answer.
EXPLORATION B

Materials:
Each of the following is required per group:
- 1 dissecting microscope
- 4 hydra in spring water, each in a small (4” or smaller) Petri dish
- 1 dropper of brine shrimp
- 1 dropper of spring water
- 1 dropper of glutathione
- 1 dropper of tyrosine
- Spring water
- 1 stop watch

Procedures:

Task I: Natural Behavior

1. Observe a hydra for 2 minutes. Check off the hydra’s behavior in 15 second intervals on the data sheet below. Use the chart below as a guide.

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Description of Behavior</th>
<th>Notes</th>
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<tbody>
<tr>
<td>Moving around</td>
<td>Moving entire body from one location to another</td>
<td></td>
</tr>
<tr>
<td>Waving tentacles</td>
<td>Body is stationary, but tentacles are moving around</td>
<td></td>
</tr>
<tr>
<td>Tentacles to mouth</td>
<td>Tentacles are being moved toward and possible into the mouth</td>
<td></td>
</tr>
<tr>
<td>Open mouth</td>
<td>Mouth is opening</td>
<td>Can only be observed if looking down on animal</td>
</tr>
<tr>
<td>Crunch midsection</td>
<td>Middle of body is shrinking in size</td>
<td></td>
</tr>
<tr>
<td>Stretch midsection</td>
<td>Middle of body is elongating (getting longer)</td>
<td></td>
</tr>
<tr>
<td>Tentacle stretch</td>
<td>Stretching tentacles out away from body</td>
<td></td>
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</tbody>
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<table>
<thead>
<tr>
<th></th>
<th>Moving Around</th>
<th>Waving tentacles</th>
<th>Tentacle stretch</th>
<th>Tentacles to mouth</th>
<th>Open mouth</th>
<th>Crunch Midsection</th>
<th>Stretch Midsection</th>
<th>Other: write it down</th>
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Do you notice any consistent behavior?
Task II: Feeding Behavior

1. Now we are going to feed one of the hydra. Place one dropper of brine shrimp next to the hydra. Be careful not to place it directly on top of the hydra.

2. Observe hydra for 5 minutes recording behavior in 15 second intervals on the chart below.

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<th>Time Range</th>
<th>Moving Around</th>
<th>Waving Tentacles</th>
<th>Tentacle Stretch</th>
<th>Tentacles to Mouth</th>
<th>Open Mouth</th>
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3. Do you notice any specific behavior?

4. Compare the natural behavior chart to feeding behavior chart. What behaviors are more prominent in feeding verses natural?

5. Would you consider these feeding behaviors? Why or why not?
**Task III: Chemical Reaction** – Let’s try an experiment using the scientific method…

1. **Observation:** Brine shrimp contain the chemicals glutathione and tyrosine.
2. **Question:** Would hydra try to “eat” if just a chemical found in brine shrimp were in the water?
3. **Hypothesis:** Make up your own hypothesis (based on your knowledge of science, what would you guess).

4. **Experimental Design:**
   - **Dependent variable:** We are looking for “eating” behavior. What type of behavior did you observe during feeding?
   - **Independent variable:** What could cause this behavior?

5. **Control Group:** Treated just like the experiment, but without the independent variable.

6. **Control (Standardized) variables:** Those things you can control which could affect the experiment.

**Procedure:** What steps will you take to perform the experiment?

5. **Teacher approval to start experiment ____________
6. Results… **Write in each box which condition (spring water (S), glutathione (G), and tyrosine (T)) was seen.**

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<th>Time</th>
<th>Moving Around</th>
<th>Waving Tentacles</th>
<th>Tentacle Stretch</th>
<th>Tentacles to Mouth</th>
<th>Open Mouth</th>
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7. What is your conclusion? Did you accept or reject your hypothesis?
CONCEPT DEVELOPMENT - B

Answer questions using complete sentences.

1. Which behaviors, if any, did you notice with spring water?

2. Which behaviors, if any, did you notice with glutathione?

3. Which behaviors, if any did you notice with tyrosine?

4. Were any of these behaviors feeding behaviors described in Task II?

5. Do you think hydra learned feeding behavior or was born with this ability? Explain.

6. What type of behavior is it called when an animal is born with that behavior?

7. Hydra are animals. Based on the hydra experiment, what type of behavior can animals display? Give evidence of your answer.

TYING IT TOGETHER...

Based on your experiments in these lessons, what types of behaviors do animals display?
INTRODUCTION
We have learned animals display a wide array of behaviors, some present at birth, others develop later in life. We can learn much from simply observing these animals; determining which behaviors are learned and unlearned can tell us how these animals live out their lives.

TASK
Your task will be to select an animal from the list below and research it using the World Wide Web. Here are some links to get you started, but you may use any reputable website.

• Behavioral Advisory Group: www.ethograms.org
• San Diego Zoo: www.sandiegozoo.org
• Encarta Online Encyclopedia: http://encarta.msn.com
• Animal Planet: www.animalplanet.com
• Primate Info Net: http://pin.primate.wisc.edu
• Academic Info: www.academicinfo.net/zoo.html

Animals to choose from: grizzly bear, river otter, African wild dog, chimpanzee, flamingo, meercat, bat, white tailed deer

Research your animal’s average behavior and determine whether the behaviors are learned or unlearned. You will also need to research the preferred method of recording animal behavior: the ethogram. The list of hydra behaviors in Exploration B is an ethogram

You will prepare an ethogram of expected behaviors and a data sheet to record those behaviors then use this data sheet to do live observations of your animal in a zoo setting.

Through this webquest you will accomplish the following:

• Research websites about your chosen animal
• Analyze the information to differentiate between learned and unlearned behaviors.
• Create an ethogram for later use with an accompanying data sheet.

PROCESS

Step 1: Researching your animal

1. What is your chosen animal?

2. What is the animal’s normal habitat?

3. What is the animal’s early life like?

4. What is the animal’s social life like?
5. What are its eating habits?

6. Are there any other habits that make the animal unique?

7. Which behaviors do you think are innate?

8. Which behaviors do you think are learned?

Step 2: Developing your ethogram

1. What is an ethogram?

2. What are the necessary components of an ethogram?
   1) 
   2) 
   3) 

3. Based on your finding in step 1, develop your ethogram below (list only 8 behaviors):

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<th>Name of Behavior</th>
<th>Description of Behavior</th>
<th>Notes</th>
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4. Develop a data sheet for doing a 20 minute observation.

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**EXPLORATION C**

**Materials**
- Field trip permission form per student
- Transportation to and from local zoo

**Introduction**
Scientist have put a tremendous amount of time, effort and money to determine normal innate behaviors and learned behaviors in a large number of species. Why do you think learning about animal behavior is so important? This exploration will explore the answer to this.

Individuals who solve problems dealing with animals using science, math, and technology may be considered zoological engineers. More commonly they are known at biologist or zoologist. Today we are going to watch zoological engineers in action.

**Procedure**
1. Travel to our local zoo.
2. Watch a demonstration of how information about behavior is used by zoological engineers at the zoo.
CONCEPT DEVELOPMENT – C

1. Name AT LEAST 3 behaviors animals are trained to do at the zoo and which animal(s) they train to do the behavior.

2. What innate behaviors, if any, do trainers depend on to teach a certain behavior. Name AT LEAST 2 and write the specific animal(s).

3. Would zoo trainers be able to train their animals without prior knowledge of normal innate behaviors, limitations and capabilities of animal learning? Explain.

4. Other than human entertainment, name AT LEAST 4 reasons why zoo trainers train their animals.

5. People who work with animals use ___________ and ___________ behaviors of animals to provide _________________ and _________________ environments for the animals.
CONCEPT APPLICATION

1. List other behaviors an animal may have that are innate behaviors. Remember, innate behaviors are ones that an animal is born with. Also list why you think this behavior is innate and how it may be used to help professionals who work with the animal.
   A. Innate behavior: Animal:
      Why:
      Used by professionals?
   B. Innate behavior: Animal:
      Why:
      Used by professionals?
   C. Innate behavior: Animal:
      Why:
      Used by professionals?

2. Now list behaviors an animal may have that is learned.
   A. Learned behavior: Animal:
      Why:
      Used by professionals?
   B. Learned behavior: Animal:
      Why:
      Used by professionals?
   C. Learned behavior: Animal:
      Why:
      Used by professionals?
AUTHENTIC ASSESSMENT

Now it is your turn to be a zoological engineer. You have already researched innate and learned behaviors typical of a chosen animal, much like a scientist initially would. You have been hired to develop a habitat that will provide the animal a stimulating and safe environment based on behavioral observations. You have developed a way to document behavior observations of the animal (the ethogram from the webquest). Now use your data sheet to observe your chosen animal for 20 minutes documenting behaviors you observe. Keep note of any behaviors observed not listed on your ethogram as well.

1. What, if any, behaviors did you observe NOT listed on your ethogram?

2. Which of these behaviors do you think are innate? Why do you think this?

3. Which of these behaviors do you think are learned? Why do you think this?

4. If what you observed was different from behaviors on your ethogram, explain why you think this is.

5. Do you think 20 minutes was long enough to get an accurate picture of your animal’s true normal behavior? Why or why not.

6. List and/or draw how you might set up an environment for your animal.