Introduction to Animal Behavior Observations

Why Study Behavior
Studying an animal’s behavior can provide scientists with valuable information that can aid in conservation efforts. Although complete ethograms are rarely published anymore in behavior literature, they are often used by zoos to describe normal behavior and monitor captive behavior in order to identify illness, and serve as a valuable tool for many lab and field experiments on both model organisms and ecological studies. The study of animal behavior is called ethology. Scientists use ethograms to help with this research.

When scientists conduct animal observations, they rely on specific procedures in order to collect data that is as accurate as possible. Researchers use an ethogram as part of these procedures. Ethograms are a list of all the possible behaviors an animal might exhibit. Using an established ethogram helps ensure the data collected by lots of different scientists is similar enough to be compared. As you can imagine, scientists might use different ethograms for different species to capture the unique behaviors of each. Scientists might also use different ethograms for the same species. These ethograms may be more specialized and focus on types of behavior such as maternal care or social aggression.

There are many different ways to collect data on animal behavior. In interval sampling, observers note what an animal is doing at pre-set, evenly-spaced time intervals. This allows the researcher to get a clear “snapshot” of an animal’s behavior at a precise moment in time. When multiple observations are combined, researchers can begin to draw conclusions about which types of behaviors might be most common for a species, or when certain types of behaviors are most likely to occur. It is important to stress to students that we do not know what an animal is “thinking” ethograms record visible behaviors not intentions or emotions.

What Will I Find in This Guide
1. Be a Penguin Naturalist
   a. A roleplaying activity that allows students to experience ethology and working with an ethogram in the comfort of the classroom. It gives students the opportunity address the challenges of distinguishing and tracking an individual animal, understanding and distinguishing a set of behaviors, as well as collecting, representing and analyzing behavioral data before doing so in a natural setting with possibly unpredictable animals.
2. Isopod Habitat Preference
   a. A lab experiment to emphasize how inferences based on observations of the physiology and the anatomy of animals can be used to predict behavior.
3. Isopod Behavior Unit
   a. Multiple inquiry based lab experiences that allow students to experience setting up a classroom habitat, and then to design, build, and report on their own experiments based off of guiding questions.
4. Stepping Outside
   a. 4 different styles of ethograms that can be used for students to observe the wildlife in your schoolyard.
5. Tracking Behavior
   a. An indoor introduction and an outdoor study of animal tracks in an effort to learn more about animal behavior.
Frequently Asked Questions:

1. **We live in the city. What do we do if there is no wildlife to observe?**
   Even the most urban of areas will have some type of plant or animal life for you to explore. While you may not have acres of pine trees or animals roaming, there is likely a wealth of living things to observe. Ants, spiders, and pigeons are just a few examples of this urban wildlife.

2. **What ages would learn best from these activities?**
   While the activities are written for learners in fourth grade and above, the process of observing animals is relevant to all ages, including adults. Some activities contain a modification suggestion that would make it more appropriate for younger participants.

3. **What do we do when there aren’t any animals to observe?**
   Many animals are active even in extreme weather, but you may have to look a little harder to find them. Another option is to observe household pets or classroom animals such as fish in an aquarium.

4. **Can exploring animals be dangerous?**
   It is unlikely that you will encounter dangerous animals in schoolyards, parks, or other public areas. However, animals may bite someone that gets too close or a bee sting can make a day outside very unpleasant. Remind participants to observe animals without touching, determine a safe distance to keep, and be aware of any participant allergies, especially to bee stings. If you decide to conduct observations in more natural areas, check with rangers or other officials about how to stay safe.

5. **Who can I Contact if I have a question?**
   For more information or additional programs, you are welcome to contact Jennifer Chapman the Education Programs Supervisor at the Austin Nature & Science Center. 512-974-3888 or Jennifer.Chapman@austintexas.gov

6. **How can I get my students involved in more outdoor studies?**
   A wonderful way to get students involved is to start them collecting data that is used by professional scientists. The following links provide information on how to have your class join simple student oriented Citizen Science projects.
   - The lost ladybug project: [http://www.lostladybug.org/](http://www.lostladybug.org/)
   - Bugs in our backyard: [https://www.bugsinourbackyard.org/](https://www.bugsinourbackyard.org/)
   - The Heart Project: [http://beats.robdunnlab.com/](http://beats.robdunnlab.com/)
   - Citizen Sort: [http://citizensort.org/](http://citizensort.org/)
   - School of Ants: [http://www.schoolofants.org/](http://www.schoolofants.org/)
   - Backyard bark beetles: [http://backyardbarkbeetles.org](http://backyardbarkbeetles.org)
   - Scistarter is a great resource to find hundreds of current Citizen Science projects to which your students can contribute.: [http://scistarter.com/](http://scistarter.com/)
Goal: Involve students in a role-play to introduce them to ethology (the study of animal behavior) and to reinforce graphing skills.

Background: Ethology is the study of animal behavior. Naturalists, laboratory scientists, field biologists, comparative psychologists and zoo employees are among the many people using ethology to learn more about individual animals as well as specific populations. At the Nature & Science Center we observe animals’ behavior to learn more about their health, nutritional needs, habits, and social interactions. By role-playing ethologists and penguins, students will capitalize on their desire to learn more about penguin behavior to reinforce data collection and analysis skills.

Materials:
- Stopwatch
- Penguin Behavior Definitions
- Walk Like a Penguin Ethogram

Procedure:
1. Guiding Question: How do scientists collect data on animal behavior?
2. Separate students into pairs.
3. Hand out the Walk Like a Penguin Ethogram and Behavior Definitions
4. Explain to students that they are going to take turns role-playing the ethologist and the penguin.
5. Go over the penguin behaviors with the students. Act out the behaviors with them, so that they do not feel shy when they role-play those penguin behaviors.
6. Explain that the “penguins” will be acting as normal penguins. The ethologists will be observing this behavior and placing a checkmark beside the behavior they see from their penguin at each 20 second interval. They are taking a “snapshot” record of exactly what they observe at the exact moment of observation. Be sure to loudly announce each interval, so that students know when to record each checkmark. The first time you try this activity, your students may need a longer interval period.
7. After each group has participated, create a large graph on the wall. Let the kids transfer their data to that table.
8. **Reflection:** Discuss as a group alternate ways to collect data. Ask students what behaviors they observed. Ask the kids to hypothesize why they saw those behaviors? Would they see these results with real penguins? How could this data help a zookeeper or a field biologist?
# Be a Penguin Ethologist

**Date:**

**Start Time:**

**Penguin Identifier:**

**End Time:**

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Check one box each time you see a behavior listed below</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Swimming" /></td>
<td>Swimming</td>
</tr>
<tr>
<td><img src="image2" alt="Bowling" /></td>
<td>Bowling</td>
</tr>
<tr>
<td><img src="image3" alt="Trumpeting" /></td>
<td>Trumpeting</td>
</tr>
<tr>
<td><img src="image4" alt="Preening" /></td>
<td>Preening</td>
</tr>
<tr>
<td><img src="image5" alt="Shaking dry" /></td>
<td>Shaking dry</td>
</tr>
<tr>
<td><img src="image6" alt="Resting" /></td>
<td>Resting</td>
</tr>
<tr>
<td><img src="image7" alt="Slender Walk" /></td>
<td>Slender Walk</td>
</tr>
<tr>
<td>Behavior</td>
<td>Definition</td>
</tr>
<tr>
<td>---------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Swimming      | **Swimming**  
Penguin floating or propelling itself forward in the water. |
| Bowing        | **Bowing**  
Usually between a male and female penguin. It is a form of appeasement which establishes the pair's bond and also keeps it strong. |
| Trumpeting    | **Trumpeting**  
Reaching upward with the head pointing the beak toward the sky |
| Preening      | **Preening**  
Straightening and conditioning the feathers. This is a comforting behavior often exhibited following a stressful situation. Penguins can be seen preening in various positions both on land and in the water. |
| Shaking dry   | **Shaking Dry**  
On land penguin will shake its whole body to fling water droplets off of feathers. |
| Resting       | **Resting**  
Although penguins spend most of their time standing sometimes they lay down for a rest. Penguins can sleep either standing up or lying down. |
| Slender Walk  | **Slender Walk**  
Used by penguins trying to pass by their neighbors without getting into a fight. This behavior makes the penguin look very tall and thin. |
Pill bug Habitat Preference Observations

Background:
Calpurnia Tate is a strong naturalist because she studies the nature around her. In this lab you will make inferences based on observations of the physiology and the anatomy of pill bugs and integrate that with their behavior in an effort to hypothesize what types of manufactured habitat that the pill bugs will prefer. This lab can also be undertaken with Madagascar Hissing Cockroaches (MHC). As an extension of this lab, ask your students to design their own habitat preference experiment utilizing another species such as crickets, meal worms or small turtles.

Materials:
- Pill bugs
- Paper Towels
- 1 petri-dish per group (if using MHC, you will need plastic shoeboxes)
- Black construction paper
- Magnifying glasses
- Science/Nature Journal
- Watch or Clock
- Graph Sheet
- Hand wash

Syllabus Outline:
Theme: Animal’s physiology and anatomy can be indicators of behavior
Goals:
1) Allow students to recreate an animal behavior lab exercise
2) Demonstrate that due to their physiology and anatomy pill bugs need homes that are dark and wet.

TEKS: §112.16b 1.A; 2.B, C, D, E; 9.A; 10.A
§112.18b 1.A; 2.B, C, D, E; 12.E

Procedure:
1. Guiding Question: How does physiology and anatomy integrate or even dictate animal behavior?

2. Discuss our expectations for student behavior when using live animals in a laboratory experiment. Students should be quiet and gentle with the animals to reduce their stress levels.

3. Students will each receive one petri dish. Ask the students to use permanent marker to draw 2 lines on the bottom of the dish that divide it into 4 equal sections. The students will label each section as shown below.

```
A   B

D   C
```

4. Place one pill bug on each student’s desk.
5. Using their magnifying glasses, each student is to spend at least 10 minutes observing and sketching their pill bug.

6. Depending on the level of your students wither pass out the Behavior Graph or ask them to create on in their notebooks. Also, pass out damp paper towels and dark construction paper. Students should place the damp paper towel in sections B & C. The construction paper should cover sections C & D.

7. Every 1 minute for 15 minutes the students will record which section of the container that the roach occupies.

8. Between the recordings discuss with the students what they are seeing. Ask them why we are observing pill bugs. Talk with the students about ethology (the study of animal behavior) and famous ethologists like Jane Goodall. Jane Goodall dedicated most of her career working with chimpanzees. At the age of 26, Dr. Goodall traveled to East Africa to observe chimpanzees in the wilds of Tanzania. Her continued work with chimpanzees has helped pave the way for new, great science work.

9. **Reflection:** Once the students have completed their graphs, ask them what their data means about Pill Bug preferences and behavior. How did what they observed of the pill bug anatomy affect Pill Bug behavior? Why do we want to know this about the Pill Bugs?

10. Thank the students for their cooperation, and ask them to clean up their areas.
Isopod Behavior Unit

Background Information:
This hands-on Inquiry activity helps students to understand the methods used for scientific analysis using observations like those made by Calpurnia Tate in the novel by Jacqueline Kelly. It uses these observations and quantitative testing to learn more about a living organism.

This activity is designed to get students actively involved in biology. It uses a small creature commonly known as a Pill Bug to get students familiar with the creature, its body characteristics, its behavior, its means of growth, and other features.

This activity lasts nine weeks with reports due on certain dates. The reports can follow the format that a scientific paper would have. Students work together as scientific teams. Laboratory instructions are held to a minimum so the teams are expected to develop and carry out their own ideas as to how some activity is to be done. In many of the activities the team has to decide what needs to be done to meet the requirements of the activity and secondly, carry out whatever procedure they decide upon.

This activity can be very successful because it involves teamwork and everyone participates. Every student is an integral part of the team and each team has several responsibilities:
- to set a suitable home for the isopod colony.
- to observe characteristics of their isopods.
- to run tests on their isopods to determine strength, speed, etc..
- to use data and graphs to draw conclusions about their isopods.
- to write a scientific paper reporting their results.

Theme: Animal’s physiology and anatomy can be indicators of behavior

Goals:
1. Allow students to get actively involved in biology
2. Use scientific methods to investigate biological phenomena.
3. Use laboratory equipment to study isopods.
4. Understand the processes which define life.
5. Understand the relationship between structures and function as they relate to living things.
6. Apply biological principles to situations in daily life.

TEKS: §112.16b 1.A; 2.B, C, D, E; 9.A; 10.A
§112.18b 1.A; 2.B, C, D, E; 12.E

Notes for teacher:
The isopod is a relatively harmless animal and is easy to take care of in the classroom. The isopods need a small container with a substrate composed of humus, dirt, and moisture. A slice of potato works well for food. A piece of chalk can be added and students enjoy trying to determine what the
isopods use it for. Preparation time is determined by how this activity is used. A study of methodology, research and ecosystem interaction could be used as a precursor to the activity. I find that a brief introduction to the characteristics of the organism plus methods of measurement suffice in getting the project started. The project can run approximately nine weeks and several days per week are used for development of tests, building apparatus for testing, accumulation of data and graphing, and reporting the results in a scientific paper. This project can be run concurrently with regular classroom lectures and activities.

Lab Activity 1: Isopod Anatomy & Physiology
Guiding Question: What is an Isopod?
Procedure:
- Observe the activities of your isopods for approximately 15 minutes. Make a record of what they did after placing them in the container. How can you explain their behavior after placing them in the container?
- Now that you have your isopod colony set up, you are to find out as much as you can about these animals. Are they really animals? Consult any references that you can find and determine what kind of organism they really are. Where do they fit in the classification system of living organisms?
- Examine their body from both the ventral and dorsal aspects. What do the terms dorsal and ventral mean? Does it have an anterior and posterior end? What kind of body symmetry does it have? What are the various appendages on the body? What function do the various appendages serve? Does the organism breathe? If so, how does it obtain oxygen? Does it have a mouth?
- Prepare a drawing showing the organism from the dorsal view. This drawing is to be made directly from one of your specimens. A stereomicroscope will help in viewing some of the small structures. Do the same from the ventral view.
- Your first lab will include a complete description of the body form of the isopod. Your drawings will be a part of this report. In this report not only are you to describe the body, but also determine functions of the various parts. You are expected to use the library to obtain additional information about isopods. All references or sources of information must be included in your bibliography at the end of the report.

Lab Activity 2: Isopod Movement
Guiding Question: How do Isopods move and what affects their movement?
Procedure:
- In this activity you are to study the means by which isopods move around. Design a procedure which will determine how fast your isopod moves and also what affects its rate and direction of movement. You are to collect as much data as needed to answer the questions below. Your data is to be presented in tabular form in your report.
- After determining the rate of movement of your isopods, design a procedure along with other members of the class for conducting an isopod race. First, design the race course to be used. The instructor may have some suggestions for this. Second, determine what rules are to be followed, and third, determine who has the fastest isopod. Repeat the race a second time making any modifications in the course and rules that seem to be needed. Do it a third time if you wish.
- Some of the questions that are to be answered in this activity are as follows:
  - How do the isopods move?
  - Do all legs move together?
  - Describe the pattern of leg movement.
  - Does the kind of surface make any difference as to its rate of movement?
Is there any way that you can stimulate it to go faster? Slower?
Does the light or darkness cause it of move faster or slower?
Does it make a difference whether the surface is level or hilly?

Lab Activity 3:
Guiding Question: What are Isopod food preferences?
Procedure:
- In this activity you are to determine what isopods eat. Design and carry out an experiment which tells you something about the food preferences of isopods. This activity should be carried out with other members of the class in order to obtain more data than with yours alone.
- Some of the questions that are to be answered in this exercise are as follows:
  - What foods do isopods eat?
  - How do they take food into the body?
  - Does it make a difference whether it is wet or dry?
  - Do they show a food preference?
  - Should the food be in a light or dark place?

Lab Activity 4:
Guiding Question: How strong are isopods?
Procedure:
- You are to design a procedure which will tell you how strong an isopod is in proportion to its weight. As a part of this activity you are to find out something about the anatomy of the legs and body of an animal without dissecting your organism. You are not to kill your specimen. Refer to various references to get an idea as to how the internal anatomy may possibly appear. The fact that the organism is a member of the Arthropoda should give you an idea of its internal anatomy.
- Finally, along with other members of the class, design and carry out a contest to determine who has the strongest isopod.
- The following are questions which are to be answered by your report.
  - Are the legs all the same? If not, how do they differ?
  - Do the muscles show through its body covering as human muscles do? Explain.
  - Are the legs jointed? If so, how many joints are there?
  - How do the legs secure traction?
  - What kind of surfaces provides the best traction? The poorest traction?
  - What proportion of its body weight can it carry or pull? In order for you to pull or carry the same proportion, how much would you have to weigh?
  - Are there any environmental conditions which seem to affect its strength?

Lab Activity 5:
Guiding Question: How does pollution affect an isopod’s activity?
Procedure:
- In this, the final activity of the series on isopods, you are to determine whether chemicals will affect its activity in any way.
- Design a procedure to expose your isopods to a volatile substance such as airplane glue. Care should be taken to not overexpose your organisms as they may die. Use very short exposure times to begin with. Be sure that you establish the normal pattern of behavior of your isopods before exposing them to the chemical substances.
- The following are questions which you are to answer in your report:
  - How does the substance enter the body of the animal?
  - Does the size of the body make any difference on the effect of the chemical?
  - What is the normal pattern of behavior of the isopod?
  - How is the pattern of behavior altered as a result of its exposure to the chemical?
All data to support your conclusions should be presented in some kind of table or graph.

**Reflection:**
Based on everything that they students have learned regarding Isopod anatomy and physiology, explain how these characteristics indicate behavior. Why is studying the traits and behaviors of Isopods important? How can these studies be used in different species?
Tracking Behavior

Background:
When studying wildlife in a natural setting it is often difficult to get close to the animal being studied. However, naturalists can study the evidence that animals leave behind. One such piece of evidence is their tracks. An animal’s tracks may be clues that help us to understand its behavior and other traits. Analysis of tracks may reveal an animal’s habitat and food preferences. By analyzing the tracks of several animals, you might learn how they share limited resources.

In this activity, students will create their own animal track maps for other groups to interpret. They will then go outside in an attempt to locate and interpret wildlife tracks in their schoolyard or local park. Students can use the data they collect to classify animals according to consumer category, create presence/absence species lists, and interpret habitat requirements of wildlife. Mathematical skills practiced include measurement and data analysis to document and explain evidence about the natural world.

Goals:
1. Raise student awareness of how animal tracks can be indicative of animal behavior
2. Actively involve students in animal behavior studies through the use of animal tracks

Materials:
♦ Foam  ♦ Scissors  ♦ Shallow Pans  ♦ Sand or Flour
♦ Animal track stamps (optional)  ♦ Plaster of Paris  ♦ Glue
♦ Bait such as canned tuna, peanut butter, rolled oats, sunflower seeds  ♦ Clipboard Pencil or pen
♦ Metric ruler or measuring tape  ♦ Map of study site (school or park map)  ♦ Animal Tracks Field Guide

TEKS:
§112.16b 1.A; 2.B, C, D, E; 9.A; 10.A
§112.18b 1.A; 2.B, C, D, E; 12.E

Procedure:
1. Guiding Question: How can Naturalists study the behavior of animals that they are unable to observe?

2. Introduce students to animal tracks found in Central Texas. Discuss how naturalists such as Calpurnia Tate use tracks to study animals and their behavior.

3. Pass out foam sheets and track templates. Ask students to cut out foam in the shape of tracks. Depending on the thickness of foam that you use they may need to glue together 2 or 3 layers to get a deep enough thickness to make a track in the sand.
4. Each student then needs to record in their science journal what behavior they will be replicating with their tracks. They can then use their foam models to create a set of tracks that represent the behavior they have chosen.

5. Students that can then use these homemade tracks to replicate they behavior that they have chosen in the sand or flour. A fun alternative method to make the prints is to have the students glue the tracks to inexpensive flip-flop sandals. The students will then make the prints on a beach or in a sand volleyball court. This can also be done using pre-made animal track stamps.

6. Students will then travel to other students’ or groups’ prints and try to analyze what they are seeing and hypothesize the behavior that is being represented by those tracks. These hypotheses will be recorded in their Nature Journals.

7. Discuss these hypotheses with the class and record how often the hypotheses were correct or close to it. Now ask the students to discuss how they can study the tracks of animals that live in their schoolyard or Local Park.

8. Ask the students to think carefully about where animals are likely to travel, such as along a path or a stream and select one of those areas as a trap site. Some questions you can consider when selecting a trap site are: Might an animal be traveling to or from water? Are there trails through the field or forest an animal might use? Are there sites animals might be especially attracted to, such as school garbage dumpster?

9. Make a track trap with playground sand. Pour sand onto a patch of ground about one meter square and smooth it with your hand or a trowel.

10. Bait the trap or traps: You may use bait at your trap or a scent to lure animals to your track trap. To use just a scent, dip a Q-tip in a strong smelling food, and then stand it up in the middle of your trap. When mammals smell the bait on the Q-tip, they will cross the sand to sniff it, leaving tracks behind.

11. Ask the students to use a map of the study site to label where you placed their track trap, and what kind of bait they used. Leave the trap/traps overnight and return the next day to see if there are tracks.

12. Have the students use their Nature Journal to collect data from your track trap and compare with information in a field guide to mammal tracks to determine what species visited your track trap. Even experienced scientists can have trouble identifying an animal by its tracks. If you are unsure which animal left the track, list all the species it could possibly be. A sample data sheet created by the Smithsonian is attached.

13. Once your outdoor explorations are done, it’s time to analyze the data. Students can graph their data by hand on notepaper or on a large flip chart for the class to see. Ask them to compare results with the results of the other teams. Are there similarities or differences that might be evidence that explains the presence of animals in some locations and not others? Does the data suggest that some animals have special food preferences? Did they find different animals in different habitat types? Did human activity seem to influence the types of animals found in different locations?
14. Reflection: What did the students learn from their outdoor explorations? Did anything surprise them? If they were to do this again, would they change any of the methods?
ANIMAL TRACKS – WHAT DO THEY REVEAL?
Student Worksheet: Animal Track Data

Name(s) _____________________________________________

Location of trap ____________________________________ Date __________

Type of bait used ____________________________________

Step 1: Information on the track trap

1. Describe the location of your track trap. For example: on a path, near the dumpster, whether the ground is wet or dry, sunny or shady, lots of vegetation, near a building or people, etc.

2. How many different individual animals can you distinguish among the tracks?

3. How many different species can you distinguish among the tracks?

4. Draw a picture. Sketch the features located near the track trap. Also include tracks of each individual animal and its direction of travel (north, south, east and west). If possible, measure the stride length (distance between the heel of one foot and the heel of the opposite foot of the same animal) and describe the actions or movements of each animal whose tracks appear in the trap.
Step 2: Characteristics of the tracks

1. Document the characteristics of one animal track (complete one form per species).

<table>
<thead>
<tr>
<th>Length in centimeters:</th>
<th>Width in centimeters:</th>
<th>Depth in centimeters:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of toe imprints</th>
<th>Number of claw imprints</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. How many tracks from this animal did you observe?

3. Draw a sketch of this animal track.

4. Describe any clues that tell you what this animal might have been doing. (Such as running, moving towards or away from food or water, etc.)

3. Use a field guide to animal tracks to investigate which species of animal might have made this track. Write the name of the animal you think might have made the track. If you think there may be more than one alternative, indicate all possibilities and why.
Stepping Outside

Background Information:
Calpurnia Tate, like most naturalists, spent the majority of her time studying nature outside. This activity focuses on how to facilitate your students’ study of animal behavior in the wild. 3 different types of data collection forms (ethograms) are included. Please choose which ethograms fit the needs of your students.

How are field investigations different from controlled laboratory experiments?
Classroom science often overemphasizes experimental investigation in which students actively manipulate variables and control conditions. In studying the natural world, it is difficult to actively manipulate variables and maintain “control” and “experimental” groups, so field investigation scientists look for descriptive, comparative, or correlative trends in naturally occurring events. Many field investigations begin with counts (gathering baseline data). Later, measurements are intentionally taken in different locations (e.g., urban and rural, or where some natural phenomenon has created different plot conditions), because scientists suspect they will find a difference. In contrast, in controlled experiments, scientists begin with a hypothesis about links between variables in a system. Variables of interest are identified, and a “fair test” is designed in which variables are actively manipulated, controlled, and measured in an effort to gather evidence to support or refute a causal relationship.

Goal:
1. Actively involve students in field investigations of animal behavior utilizing an ethogram in which to record data.

Materials:
♦ Clipboard  ♦ Pencil  ♦ Ethograms  ♦ Binoculars (optional)  ♦ Stop Watch

TEKS: §112.16b 1.A; 2.B, C, D, E; 9.A; 10.A
       §112.18b 1.A; 2.B, C, D, E; 12.E

Procedure:
1. Guiding Question: How do we study the behavior of animals in the wild?
2. Take the students out to the schoolyard or Local Park. Ask them to notice which animals they are seeing. Take a casual inventory of what species can be found in this habitat.
3. Work with the students to decide which species that they will be observing. Birds and Squirrels are both highly visible and active animals.
4. Once each student or group has chosen their species, they will need to define the behaviors that they expect to see. Example behaviors include flying, walking, resting, eating, drinking, digging, nesting, leaping, running, feeding young, vocalizing, preening, grooming, swimming, climbing, and defecating. An example of behavior definitions is on page 22. A student definition sheet is located on page 23.
5. Work with your students to design the question that they would like to ask. Example question could be: 1) What kind of behaviors will I observe in Cardinals 2) How many times does a squirrel climb up a tree in 30 minutes 3) Will pigeons spend more time eating or preening.

6. Guide the students in choosing which type of ethogram that will help them to answer a question about their animal.

   a. **Ad Libitum Sampling**: Often abbreviated as *ad lib*, records as much information as possible. It is informal, non-systematic, and often used in field notes. *Ad lib* sampling may sound thorough, but because the observer can never keep track of everything that is going on, the results of these observations will always be biased by the behaviors, individuals, or situations that most attract the observer's attention. It is therefore hard to derive reliable, precise and quantitative information based on these observations. Its main value is in research planning, and in studying rare but fairly obvious behaviors.

   b. **Snapshot Sampling**: An animal’s activities are recorded at pre-selected moments (e.g., every 30 seconds). It is a sample of states (you are unlikely to catch an animal “in the act” of doing a behavior classified as an event), and is used to study the percent of time spent in a certain activity. If the behaviors of all members of a group are surveyed within a short period of time, we call it scan sampling. This provides data on the distribution of behavioral states in a group. Instantaneous or scan sampling is best done with a sample interval as short as possible, and with behaviors that are very easily identified. The behaviors should ideally be relatively long compared to the sample interval. It is an excellent method for collecting a large amount of data on a group of animals.

   c. **All-Occurrences Sampling**: The researcher selects one or a few specific behavioral events and records every occurrence of that (those) behavior(s) within the animal group (every occurrence of grooming, chasing, etc.). This technique is especially useful in determining the rate, frequency, or synchrony of occurrence of specific behaviors.

7. Take the students out to their observation area armed with clipboards, ethograms, pencils, and binoculars. Ask them to record the date, time and weather. Why would these conditions be important?

8. I highly suggest that you announce the timing for any scan sampling. Students will have a difficult time observing, recording, and keeping time.

9. Ask students to analyze their data.

10. **Reflection**: Discuss with students the results of their observations. Did they observe the behaviors they thought they would? What did they learn about their animals? Were they able to answer the question that they created? Would they choose a different observation tool for their next study? Discuss what they thought of being a Naturalist. Was it fun, easy, difficult, boring?

11. **Extension**: Interested students can do research into some of the famous animal behaviorists.

   a. Jane Goodall – Studies Chimpanzees
   b. Diane Fossey – Studied Gorillas
   c. EO Wilson – Studied Ants
   d. Konrad Lorez – Studied Geese
   e. Sophia Yin – Studies dogs
**Example Behavior Definitions:**

<table>
<thead>
<tr>
<th>Behavior Definition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>not visible</strong></td>
<td>animal has moved out of your line of sight</td>
</tr>
<tr>
<td><strong>walking</strong></td>
<td>animal is walking from 1 location to another</td>
</tr>
<tr>
<td><strong>resting</strong></td>
<td>animal is either lying or sleeping in 1 location</td>
</tr>
<tr>
<td><strong>running</strong></td>
<td>animal is running from 1 location to another</td>
</tr>
<tr>
<td><strong>flying</strong></td>
<td>animal is using wings to fly in air from 1 location to another</td>
</tr>
<tr>
<td><strong>standing</strong></td>
<td>animal is on feet and not locomoting</td>
</tr>
<tr>
<td><strong>swimming</strong></td>
<td>animal is in or under water moving from 1 location to another</td>
</tr>
<tr>
<td><strong>climbing</strong></td>
<td>animal is using feet or beak to climb from 1 location to another</td>
</tr>
<tr>
<td><strong>playing by self</strong></td>
<td>animal pounces, throws, jumps throughout exhibit</td>
</tr>
<tr>
<td><strong>playing w/ other</strong></td>
<td>non-aggressive physical contact with others; high activity</td>
</tr>
<tr>
<td><strong>interacting w/ enrichment</strong></td>
<td>animal shows activity regarding enrichment item</td>
</tr>
<tr>
<td><strong>self grooming</strong></td>
<td>preening, licking, or finger combing own coat</td>
</tr>
<tr>
<td><strong>mutual grooming</strong></td>
<td>preening, licking, or finger combing others</td>
</tr>
<tr>
<td><strong>other contact</strong></td>
<td>any contact with another not described by another definition</td>
</tr>
<tr>
<td><strong>aggressive contact</strong></td>
<td>pouncing, biting, clawing, or bumping others</td>
</tr>
<tr>
<td><strong>aggressive stance</strong></td>
<td>staring, pointing, display of teeth, raised horns, etc..</td>
</tr>
<tr>
<td><strong>aggressive movement</strong></td>
<td>lunging at or chasing another</td>
</tr>
<tr>
<td><strong>submitting</strong></td>
<td>walking backward from another, lower head, urinate</td>
</tr>
<tr>
<td><strong>defecating</strong></td>
<td>excreting of fecal material</td>
</tr>
<tr>
<td><strong>foraging</strong></td>
<td>searching for or collecting food</td>
</tr>
<tr>
<td><strong>eating</strong></td>
<td>putting food into mouth and swallowing</td>
</tr>
<tr>
<td><strong>drinking</strong></td>
<td>putting liquid in mouth and swallowing</td>
</tr>
<tr>
<td><strong>food stealing</strong></td>
<td>taking food from another</td>
</tr>
<tr>
<td><strong>nesting</strong></td>
<td>sitting in or building a nest</td>
</tr>
<tr>
<td><strong>vocalizing</strong></td>
<td>creating an auditory call</td>
</tr>
<tr>
<td><strong>other</strong></td>
<td>any behavior not defined</td>
</tr>
<tr>
<td>Behavior</td>
<td>Definition of behavior</td>
</tr>
<tr>
<td>----------</td>
<td>-----------------------</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Ad Libitum Ethogram

Date: ___________________________  Start Time: ___________________________

Weather: ___________________________  End Time: ___________________________

- Student will record all behavior that seems important.

**Description of Animal(s) Being Observed**

<table>
<thead>
<tr>
<th>Time</th>
<th>Description of Behavior Observed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Snapshot Data Ethogram Simple**

Date: ___________________  Start Time: ___________________

Weather: ___________________  End Time: ___________________

Animal Identifier: ___________________________________________

I think my animals will ___________________________________________ the most.

<table>
<thead>
<tr>
<th>Behaviors:</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

My animal actually ___________________________________________ the most.
# Snapshot Data Ethogram Complex

**Observer**

**Time:**

**Weather:**

<table>
<thead>
<tr>
<th>Behavior</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
<th>12</th>
<th>14</th>
<th>16</th>
<th>18</th>
<th>20</th>
<th>22</th>
<th>24</th>
<th>26</th>
<th>28</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>not visible</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>walking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>resting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>running</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>flying</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>standing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>swimming</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>climbing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>playing by self</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>playing w/ other</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>interacting w/ enrichment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>self grooming</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mutual grooming</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>other contact</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>aggressive contact</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>aggressive stance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>aggressive movement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>submitting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>rolling over</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>foraging</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>eating</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>drinking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>food stealing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>nesting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>vocalizing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>other-write in if you can</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
All Occurrence Sampling Ethogram

Date: ___________________________ Start Time: ___________________________

Weather: ___________________________ End Time: ___________________________

- Student will record all occurrences of 1 behavior

Definition of Target Behavior

Record Tally Marks for each time the behavior is seen in 30 minutes.