Section 4 — Ape Behavior

OVERVIEW

Ape behavior is advanced and complex. Social strategies differ, from the semi-solitary orangutans, to chimpanzees living in loose groups of up to 100 individuals. One commonality is the bond between mother and infant. Ape diets are primarily based on fruits and plants, with insects and small vertebrates often supplementing. Locomotion patterns differ: the African great apes are known for knuckle-walking, while the Asian apes spend more time in the trees. The gibbons are brachiators, and the orangutans, with their massive bodies, are slow, suspensory climbers. Communication is important to ape societies, and vocalizations, facial expressions, gestures, and body language are all essential. With enhanced cognitive capacity, apes have been identified as tool users both in the wild and in captivity.

Ape behavior is distinctly advanced and complex. While there are some general trends, behavior is an area where many of the differences among the apes can be found.

Social Strategies

The apes tend towards different social strategies. This may relate to food availability, habitat structure, or other factors. One commonality between all species of apes is the bond between mother and infant. This bond is strong, with great maternal investment, and lasts long through the slow maturation period.

Fusion-fission

Bonobos and chimpanzees follow the fusion-fission social pattern. In this social arrangement, there is a large, loose group associated with each other in a given territory. As a whole congregation, bonobo groups sharing a territory usually total up to 20 individuals, while a whole chimp congregation sharing a territory can total up to 100. However, the group rarely congregates as a whole. Instead, daily activities occur in smaller, family bands and groups, or sometimes individually. These smaller groups may interact with each other throughout the day. Such division is a mechanism to deal with competition for resources

The larger group as a whole is dominated by a hierarchy. For chimpanzees, males are dominant over females, and each sex has its own hierarchy. Bonobos, on the other hand, have females at the core of their hierarchy, and male-female bonds are also important to bonobos. In both species, females tend to leave the **natal group** in order to increase mating opportunities.

Chimpanzee violence has been documented in wild populations. The males in particular have been known to fiercely protect and even patrol their territory, and to stage invasions into neighboring groups, or to attack within their own group. This level of aggression is less common in bonobos. Some researchers believe the frequent sexual activity across all lines of hierarchy and gender in bonobo groups works to bond the group and relieve tension in volatile situations. Chimps and bonobos both use mutual grooming and group feeding as a social lubricant as well.

Polygyny

Polygyny is a form of polygamy in which there is one male and many females (compare to **polyandry**—polygamy in which there is one female and two or more males). Gorillas practice polygyny as their major social structure. One male, known as the silverback, is the dominant head of the hierarchy. He lives with a harem of females and their offspring. The silverback is the main protector of the group, and often remains socially aloof from the females and juveniles. In return for the protection he provides, the female gorillas are receptive to him for sex. The silverback may have subordinate males living under his hierarchy, known as **blackbacks**. However, many males will leave their natal group after maturing and join a bachelor group of other males that exists on the periphery of the natal groups.

Bonded pair

Gibbons and siamangs generally live in monogamous, bonded male-female pairs with offspring. The family units are usually close, and mutual grooming is used for bonding. As part of the closeness of the family unit, the male plays an important role in rearing offspring. When juveniles mature, they leave the family group to pursue mating opportunities. These animals are highly territorial and both the male and female will duet with a song display to mark their territory.

Semi-solitary

The orangutan is a semi-solitary species. Adult females live in small social groups with dependent offspring, while independent adolescents and adult males live solitarily, with occasional social interaction. The semi-solitary nature of orangutans appears to be contrary to the general social nature of primates. This discrepancy may be explained by research that suggests that the large body size of orangutans requires a high caloric diet. It would be difficult to maintain this diet living in social groups in their habitat, as there would be high **intraspecific** competition for limited food (fruit is both dispersed spatially and in time because of fruiting seasons).

Figure 13. Apes – Social Strategies.



Male and female siamang pair perfroming a song display



Beyond Apes: Looking at Other Primates

The Callitrichids (tamarins and marmosets) of the New World Monkeys are the only known non-human primates to practice cooperative **polyandry**. Cooperative polyandry is a social structure in which two or more males mate with a single female during a breeding season, and the males collaborate to raise offspring. This practice is uncommon because it implies **altruism**, in that one of the males is helping to raise offspring that is not his. With the involvement of two males helping to raise offspring (callitrichids generally give birth to twins, meaning there is a high demand for parental assistance), rearing becomes manageable. The father and mother gain from this relationship by receiving help in offspring rearing, and the other male gains by having sexual access to the female. Researchers believe once there is an older sibling in the family group that can assist with offspring rearing, the father no longer needs to tolerate an additional male in the group.

Diets

Apes tend towards generalized diets, with many depending on fruit or plant materials, and supplementing with available alternatives.

Bonobos - primarily frugivorous, supplement with plant leaves, insects, honey, and opportunistically feed on small vertebrates (not known to hunt like chimpanzees)

Chimpanzees – primarily frugivorous, supplement with insects, bird eggs, honey, small and medium vertebrates (including other primates)

Gibbons - mainly leaves and fruits, some insects, bird eggs, small vertebrates

Gorillas – mainly plant materials (mountain gorilla is most folivorous of gorilla species), also fruits, termites, ants

Orangutans - primarily frugivorous, plant material also essential to diet

Hunting by Chimpanzees

Hunting and meat eating by chimpanzees were first documented in the 1960s by Jane Goodall working in Gombe National Park, Tanzania (East Africa). Since then, the hunting behavior of chimpanzees has been confirmed in nearly all chimpanzee populations that have been studied in Africa. It is estimated that a chimpanzee population may consume several hundred kilograms of meat in a year.

Hunting can occur individually or as a group effort. Though the majority of hunters are male, females and juveniles have been observed to hunt as well. The culture of hunting differs among chimpanzee populations. In Gombe, most hunting is carried out alone, and group hunting is not typically cooperative (a band of hunters will separate to go after individual targets once prey is identified). The chimpanzees of Taï National Park, Cote d'Ivoire (West Africa) however, mainly hunt in cooperative bands. When prey is identified, often in the form of some mammals, including the red colobus monkey, the band acts together to block the prey's escape, and to capture it.

Researchers suggest that in addition to providing protein-rich food sources, chimpanzees may hunt for social reasons. Males can leverage meat for sexual receptiveness from females. Meat can also be shared with allies along lines that reflect, and thus strengthen, the male hierarchy.

Locomotion

Knuckle-walking is a distinct form of quadrupedalism seen in the African great apes. The weight of the arms is put on the knuckles, in this form of quadrupedalism. Orangutans do not knuckle walk, but instead put the weight of the body on their fists when they move quadrupedally. When moving arboreally, the massive orangutans cannot brachiate as freely as the lighter gibbons. Instead, orangutans exhibit suspensory climbing, a slow, deliberate type of climbing in which both hands and both feet are used to move safely through the trees. Gibbons spend most of their time in the trees swinging hand over hand, making them truer brachiators than any other ape. When gibbons are on the ground, their long arms necessitate a bipedal stance with their arms held up in the air balancing over their heads.



RVAN Hawk

Table 5. Primary Locomotion Patterns of Apes

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Species	Primary Locomotion Patterns
Bonobo	Knuckle-walking
Chimpanzee	Knuckle-walking
Gibbons	Brachiation, bipedal walk
Gorilla	Knuckle-walking
Orangutans	Fist-walking, suspensory climbing

Gorilla knuckle-walking

Communication

Living in socially complex arrangements, communication is important to maintaining social dynamics, from sharing information to expressing emotion. Apes can vocalize to communicate. The gibbon song advertises a claim to territory. Chimpanzees have a wide range of distinct groups of vocal calls that can be used in communication, like a submissive pant-grunt, or a fearful pant-scream.

Apes also communicate using touch, space and body language. Mutual grooming communicates trust. Closing distance between individuals invites intimacy. A bowed head communicates deference.

Facial expressions can relate emotion for apes. Just like humans smile, laugh, furrow our brows, or frown, apes manipulate their faces to display emotion as well. A chimp showing all of his teeth in a wide grin may be fearful, and a gorilla with an open mouth, covering all her teeth with her lips, may be happy.

Figure 15: Ape Faces



Michael Jacob • Courtesy St. Louis Zoo

Chimpanzee



Gorilla



Gorilla

Apes may also use gestures to communicate, displaying requests or calling for attention through manipulating the hand into a meaningful symbol. Chimpanzee mothers, for example, may gesture with their hands to beckon a juvenile. This gestural language is possible because of the relative dexterity in the ape hand. Researchers have extended this to teaching captive apes symbolic languages, including American Sign Language. Washoe, the first captive chimpanzee to successfully learn and use ASL, later taught the language to her adopted chimp son, Loulis. Captive gorillas, bonobos and orangutans have also successfully learned to use symbolic languages.

Tool Use

A tool is an object that can be manipulated to complete a task. There are two distinct types of tools: naturefacts and artifacts. Naturefacts are tools that are made by using naturally occurring material without any alteration. A chimp that picks up a stick and scratches its back with it is using a naturefact. An artifact, on the other hand, has been altered in some way to facilitate the task. This alteration can vary: material might be reduced, reshaped, combined with other parts, or perhaps replicated. For example, a chimp selects a stick for fishing termites out of a mound, then strips the leaves off the stick and chews on the stick to reduce the size, making the tool better fitted for the hole. All great apes have displayed tool use in captivity. With recent research documentation in 2005 of the first observations of wild gorilla tool use, it is believed all great apes display tool use in the wild as well.

The culture of tool use

Chimpanzees and bonobos are especially known for their tool craft in the wild, although it can take time for individuals to learn proper technique. Juveniles will learn from adults, observing and practicing, often taking more than a year to master cracking nuts with stones, for example. The particular use and creation of tools can differ from population to population, and the variations in tool use, along with variations in social behavior (including hunting patterns discussed above), have been said by some researchers to reflect a difference in culture among wild chimpanzee populations. Culture is defined here as a set of behavioral traits that are passed on through learning.

Chimpanzee culture variation across long-term study sites in West and East Africa

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Hammering nuts (stone hammer on stone anvil)	•	0	Ø	•	0	0
Fishing for termites	0	0	Ø	0	0	
Rain dance (slow display at start of rain)	0		•	•		
Hand clasp (arms overhead)	0		0	•		0

= customary behavior: occurs in all or most able-bodied members of at least on demographic (e.g. adult females)

= habitual behavior: has been observed to occur repeatedly in several individuals; evidence of social transmission

 \bigcirc = not possible: absence of the behavior is due to local ecological features

O = absent: not recorded and no apparent ecological explanation

*Adapted from Caldecott and Miles, 2005



4.1: How do I develop an ethogram for the subject of an observational study? (**s**,**w**)



Materials: Per student: watch, pen, paper

Objective: The student will be able to practice and refine behavioral research methods in order to design a tool that satisfies his or her individual research needs.

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Procedure:

- Review with students the purpose of an ethogram in behavioral research. Be sure to emphasize that:
 - I. An ethogram is a tool used by ethologists, scientists who study animal behavior.
 - 2. An ethogram is a catalogue of observable behaviors typical of an individual or species
 - 3. Behaviors in an ethogram should be described with objectivity—that is, the basic ethogram should not offer interpretations of behavior. For example, "inactive" is preferred over "resting," and "within 2 meters" is preferred over "close."
- Assign students the task of developing an ethogram. The following are excellent options for observational opportunities on which students can base an ethogram:
 - I. Pets at home or at school; other accessible animals (e.g. at a park)
 - 2. Videos depicting primate behavior (with sound off to mute narration)
 - 3. Primates at the zoo
 - 4. Teachers or classmates at school; friend or family member at home
- Students will practice developing an ethogram using basic behavioral research methods (see sample on the following page):
 - I.Discretely perform five to 10 minutes of ad libitum (or ad lib) observation. Record all behavior that is visible and may seem relevant to you. This is a preliminary method for developing a catalogue of possible behaviors. The student can record this information in narrative form, list form, or any other method he or she deems appropriate. Information about the observed individual should be recorded, as well as any identifiable and potentially relevant variables, including time of day, weather, location, etc.
 - 2. Repeat step one at a time/place when and where most of the variables can be replicated. This replication will be an approximation, and variation is acceptable.
 - 3. Assess your ad lib data. Create a list of possible behaviors, as supported by your ad lib data. Judge the relative frequency and importance of these observed behaviors. Pick five to seven behaviors that best encompass your subject's behavior under a given set of variables. Be sure to name these behaviors objectively.
 - 4. Final ethogram: List these five to seven behaviors, and provide a brief description of them. This description should be complete, so that any other observer who uses your ethogram will be able to use it with ease and clarity.

Assessment Criteria: The student is able to follow procedure, develop objective terms and term definitions, integrate, assess, and rank data, and define variables. The student designs a unique tool that can be understood and used by others.

Extensions

- Develop a behavioral research question about your subject based on one of the variables you have identified. How would you conduct this research? How would you use the ethogram in the research?
- Exchange ethograms with a partner. If possible, observe your partner's subject, using your partner's ethogram. Determine whether the definitions and categories are useful. Can you make any suggestions to improve it?

Skills used in this activity

- Practicing behavioral research methodology
- Collecting observational data
- Designing a unique scientific tool
- Practicing the creation and use of empirical definitions

Sample: Developing an Ethogram

First Observation

photo of Melati Requested from Ryan Hawk

Subject: Melati, adult female orangutan
Date: April 6, 2005
Time: 11:00am-11:10am
Location: Outdoor enclosure, orangutan exhibit, Woodland Park Zoo
Weather: Warm and sunny

- 11:00 Melati is sitting in a hammock at the top of a tree. She has some burlap with her, and she is sitting on it. She isn't moving or doing anything.
- 11:03 Melati left the hammock, and is climbing down the tree. She is carrying the burlap in her foot.
- 11:06 She is walking to the back of the enclosure, dragging the burlap.
- I I:08 Melati went through the indoor enclosure door and I can no longer see her. She is not visible.

11:10 Not visible

Second Observation

Subject: Melati, adult female orangutan
Date: April 6, 2005
Time: 1:00pm-1:10pm
Location: Outdoor enclosure, orangutan exhibit, Woodland Park Zoo
Weather: Warm and sunny

- 1:00 Melati is back in the same hammock at the top of a tree. I cannot be sure, but I think she has the burlap with her. She is inactive.
- 1:02 Melati just picked up the burlap and adjusted it.
- 1:05 Melati is using her mouth to pick at her fingers. Maybe she is grooming herself.
- 1:07 A keeper just called for Melati. It looks like he has some oranges. She is starting to get out of the hammock and climb down the tree.
- 1:10 Melati ate the orange from the keeper. She is walking away, taking the peel with her.

Possible behaviors:



Interacting with keeper



Final Ethogram

Using object: an object is being used for comfort, as a tool, as a covering, etc. This includes the hammocks and the burlap.

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Eating: individual ingests food, chewing and swallowing

Walking: individual travels on the ground from one location to another using the limbs

Climbing: individual climbs up or down a single apparatus (including trees and fences) without switching to another

Inactive: individual is idle for 10 seconds or more

Not visible: individual is out of sight to observer

Other: individual is exhibiting a behavior not identified in the ethogram

4.2: What is the percent of time a focal ape subject exhibits selected behaviors? (M, S)



Materials: Per student: one copy of the observation worksheet for his or her chosen ape species (included: "Siamang Observations," "Gorilla Observations," and "Orangutan Observations"), blank paper (optional), pencil, clipboard. Per chaperone: Woodland Park Zoo map, stopwatch.

Objective: The student will be able to identify and classify behaviors through observation. The student will be able to collect observational data using inclusive 1-0 data sampling, in order to determine the frequency of observed behaviors for his or her subject. The student will be able to translate his or her data into graph form.

Procedure:

- Allow students to choose an ape species (siamang, gorilla, or orangutan) to observe at Woodland Park Zoo. Each student should receive one copy of the appropriate observation worksheet for his or her chosen subject.
- Break students into chaperoned groups (one chaperone per six students is required at Woodland Park Zoo), and have students go with their chaperones to their chosen exhibit.
- You may review the procedure as a group before splitting, or have the chaperones review the procedure after splitting off to the appropriate exhibits.

AT THE ZOO:

- Students should first quietly observe all visible subjects. They may take ad lib observational notes on blank paper if desired. This initial observation should be timed to last for five minutes. After observations, students should select five behaviors defined in the worksheet ethograms. These behaviors can be behaviors they have observed or suspect they may observe.
- Students should now choose a **focal subject**—one individual to be observed.All recorded observations in the next section should reflect the behavior of only the focal subject.
- Students should fill the five selected behaviors into the observation data collection chart. The last two rows under the behavior column must be reserved for "Not visible" and "Other." Discuss the importance of including these for an inclusive study.
- Now students are going to collect observational data using 1-0 sampling. The chaperone should set the stopwatch for ten minutes, and be prepared to call out 1-minute intervals to students. At each minute interval, the student should record a score of 1 or 0 for each behavior, according to the behavior of his or her focal subject at the mark. A subject may exhibit more than one behavior at a time, and all exhibited behaviors should be marked with a "1" for that interval. Any behavior not observed at the mark should be recorded with "0." For more data, you may repeat this activity for another 10 minutes after a break (in this case, each student should have two copies of his or her worksheet).

BACK IN CLASS:

- Students should review their data in order to determine the frequency of behavior for their subject. (This can be done in class or for an at-home assignment.)
- **Frequency** is the measurement of the number of times that a repeated event occurs per unit of time. To calculate the frequency of a behavior, the number of occurrences of the behavior (add up all the "1" scores) within the 10 minute interval are counted, and then divided by the length of the time interval, 10.

f =Total # of behavior occurrences within total time interval time interval

- This will create a fraction that can be converted to a percentage by dividing the numerator by the denominator, then moving the decimal point two places to the right.
- Students can use these percentages to reflect the percent of time a subject spent exhibiting a behavior during the observation period.

· Have students create a pie graph that reflects these percentages. They must title, label, and draw the graph accurately. You may ask students to practice using graphing software, such as Microsoft Excel, in creating this graph.

Alternative: Using the procedure described in Activity 4.1, have students create their own ethograms for the apes at Woodland Park Zoo during a visit. Then, ask students to exchange their ethogram with a partner. Students must now collect data according to the above procedure using their partner's ethogram. This will help to test the strength and clarity of their ethograms.

Assessment Criteria: The student distinguishes among discrete animal behaviors and records accurate data. The student uses the appropriate formula to determine the frequency and total percentage of behaviors, and utilizes this information to develop a complete, clearly labeled pie graph.

Extensions

- What variables may have been a factor during the observation period? Have students develop a list of possible variables (such as weather, time of day, feeding times, crowd level), and brainstorm about the possible effects of these variables.
- Students can develop a research question that can be answered within reason by this type of data collection.
- Have students compare focal subjects within one population. How do frequencies of behaviors differ? Now compare subjects across species. How do behaviors and frequencies differ?



Behavior of Focal Siamang in 10 minute period



- Distinguishing among discrete animal behaviors
- Practicing and assessing data collection methodology
- · Calculating frequency and percentage
- Creating graphs

Siamang Observation

Observe all visible individuals for five minutes. Circle five behaviors defined below that you feel the individuals have exhibited or may exhibit. Fill these behaviors into your observation data chart under the "behaviors" column. In addition to the five behaviors, you should include "Not visible" and "Other" in order to be inclusive: that is, by ncluding these options, there will always be an observation to mark for every interval.

in that interval. For any behavior on your chart the subject is not exhibiting, mark a "0" for that behavior in that interval. Your subject may exhibit more than one behavior at interval. Your chaperone will help you to keep time, announcing every one-minute mark. If your subject is exhibiting a behavior from your chart, mark a "1" for that behavior You will now choose ONE individual siamang subject and observe this subject for up to 10 minutes. You will record ALL behaviors of your individual at every one-minute a time—all should be marked with a "1."

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Ethogram

nactive – the animal is not moving and not exhibiting any discrete behavior

Brachiating – locomoting by swinging

Eating – consuming or manipulating food

Vocalizing – emitting vocal sounds

Grooming – uses digits or lips to inspect and/or manipulate skin or fur of self or another individual

Bipedal locomotion – locomoting upright on hind legs

Not visible – out of sight of observer

Other – any other behavior not described in ethogram

Gorilla Observation

Observe all visible individuals for five minutes. Circle five behaviors defined below that you feel the individuals have exhibited or may exhibit. Fill these behaviors into your observation data chart under the "behaviors" column. In addition to the five behaviors, you should include "Not visible" and "Other" in order to be inclusive: that is, by including these options, there will always be an observation to mark for every interval.

in that interval. For any behavior on your chart the subject is not exhibiting, mark a "0" for that behavior in that interval. Your subject may exhibit more than one behavior at interval. Your chaperone will help you to keep time, announcing every one-minute mark. If your subject is exhibiting a behavior from your chart, mark a "1" for that behavior You will now choose ONE individual gorilla subject and observe this subject for up to 10 minutes. You will record ALL behaviors of your individual at every one-minute a time—all should be marked with a "1."

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Ethogram

Inactive – the animal is not moving and not exhibiting any discrete behavior

Eating – consuming or manipulating food

Grooming – uses digits or lips to inspect and/or manipulate skin or fur of self or another individual

Contact – in physical contact with another individual

Knuckle-walking – locomoting quadrupedally (on all fours), on knuckles

Object contact – touching or using any loose, non-food materials (such as straw)

Display – demonstrating any of the following behaviors: chest beating, throwing, thumping, slamming

Not visible – out of sight of observer

Other – any other behavior not described in ethogram

Orangutan Observation

Observe all visible individuals for five minutes. Circle five behaviors defined below that you feel the individuals have exhibited or may exhibit. Fill these behaviors into your observation data chart under the "behaviors" column. In addition to the five behaviors, you should include "Not visible" and "Other" in order to be inclusive: that is, by ncluding these options, there will always be an observation to mark for every interval

n that interval. For any behavior on your chart the subject is not exhibiting, mark a "0" for that behavior in that interval. Your subject may exhibit more than one behavior at interval. Your chaperone will help you to keep time, announcing every one-minute mark. If your subject is exhibiting a behavior from your chart, mark a "1" for that behavior You will now choose ONE individual orangutan subject and observe this subject for up to 10 minutes. You will record ALL behaviors of your individual at every one-minute a time—all should be marked with a "1."

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Ethogram

nactive – the animal is not moving and not exhibiting any discrete behavior

Climbing – moving up or down a structure using the limbs

Eating – consuming or manipulating food

Grooming – uses digits or lips to inspect and/or manipulate skin or fur of self or another individual

Contact – in physical contact with another individual

Object contact – touching or using any loose, non-food materials (such as burlap blanket)

Walking – locomoting quadrupedally (on all fours)

Not visible – out of sight of observer

Other – any other behavior not described in ethogram

4:3: Interactivity: Ape Relay (С, F, S)



Materials: 20-30 objects (small balls, bananas or other fruit, sticks, leaves, books, etc.); stopwatch.

Objective: The student will be able to practice a form of ape locomotion, in order to demonstrate

and compare ape locomotion to human locomotion.

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Procedure:

- Mark out two end zones on either side of a field or gym (grass is preferable since students will be knuckle-walking on their hands/knuckles and knees).
- At one of the end zone, place all of the objects in a pile.
- The goal is for the students to act collectively to transfer all of the contents of the pile from one end zone to the other.
- During this activity, students can carry any number of objects they want to and can carry the objects any way they can in their hands, balanced on their backs, whatever works.
- For the first round, students take turns walking (but not running) and for the second round students must knuckle-walk (on knees and knuckles hands closed in a loose fist). While knuckle-walking, apes will sometimes fold objects into one arm and walk on only three limbs, or they may grasp an item in their hand and walk on all four.
- At your signal to go, one team member must carry the objects he/she has selected down to the other side of the playing area, put them down, come back to the starting point and tag the next team member. If an object is dropped on the way down the field, the student must pick up the object and return to the starting point to start over. Once the first team member has tagged the next player, that student picks up his/her objects and carries them to the other end of the field. Continue until all the objects have been transferred. (During the bipedal walking part of this activity, since students can carry more when their hands are free, you may not have enough objects for each member of the team so you may want to run this part twice.)
- Time how long it takes the class to finish each of the two rounds and then compare the times for the walking round and the knuckle-walking round.
- Discuss: Which method of locomotion is more efficient for carrying items? How might this activity have been different if humans also had opposable big toes?

Assessment Criteria: The student appropriately demonstrates the distinct form of quadrupedalism known as knuckle-walking, and compares its efficiency to bipedalism for certain activities.

Skills	used in	this	activity
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- Team-building and communication
- Modeling of scientific concepts

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Ryan Hawk

4.4: How can I communicate without using words? (C,S)

Materials: set of flashcards prepared before start of class, each with one word written on one side (provide at least one card per student)

Objective: The student will be able to demonstrate and interpret non-verbal communication in order to experiment with the role of non-verbal communication in human society, as a proxy for primates.

Procedure: Ask students as a class to brainstorm non-verbal ways of communicating. This may include formal non-verbal communicating systems, such as American Sign Language, but can also include indicators such as personal space, eye contact, facial expressions, and gesturing.

- Review the importance of non-verbal communication in primate societies. You may want to emphasize the following points:
 - 1. While primates do vocalize, they can also communicate information through body and facial language. For example, a young gorilla might initiate play by approaching another individual (change in personal space) and making a "play face" expression (mouth open, lips covering all teeth).
 - 2. Apes have also been observed to use gestural language in the wild. A mother chimpanzee may communicate to her young to come to her by gesturing with a backwards, cupped hand.
 - 3. In fact, gestural language is so natural for some apes, that some captive apes have been able to learn and use American Sign Language.
 - 4. Washoe, the first chimpanzee to learn and use ASL, was even able to teach the language to her adopted chimpanzee son, Loulis, who now uses the language fluently today as an adult.
- Before class starts, select any words for the flashcards and fill them out. You may want to increase the challenge level by adding abstract or concept words such as the name of a color, or words like "freedom," or "beginning."
- Students will now challenge themselves to communicate non-verbally. Allow students to pair with a partner. Give each student in the class a flashcard with a word. The student should not show this word to anyone. One at a time, the students must use gestures, facial expressions, and other non-verbal (and non-written!) language to communicate the word to their partners.
- The partners should actively try to guess the word, sharing aloud their guesses until they are correct. Much like the game of Charades, the acting student can silently encourage his or her partner's guesses.
- After correctly guessing the word, the students should switch roles.

Assessment Criteria: The student actively utilizes non-verbal communication to express himself or herself and to interpret his or her partner's communicative efforts.

Extensions

- Let students trade cards among each other, continuing the game with their partners for several rounds.
- Discuss their impressions of the exercise. Was it difficult? How did they choose to represent the more conceptual words? What word types were easiest? Nouns? Verbs? Most difficult?

Word possibilities

- **Easier**: eat, jump, sad, happy, scared, basketball, baseball, bubblegum, tall, flower, book, love, write, dog, birthday
- Harder: blue, freedom, beginning, forever, time, patriotic, money, squid, copy, shelter, dawn, fields, construction, garlic, vast

Skills used in this activity

- Communicating through alternative methods
- Analyzing communication principles
- Collaborating for effective communication
- Comparing communication methods within a taxonomic family

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4.5: Interactivity: Ape Classifieds (s,w)



Materials: Per student: ape fact sheets, or access to research resources including Internet and library; writing materials.

Objective: The student will be able to recognize species-specific behavior, including, but not limited to troop dynamics, mate selection and tool use.

Procedure:

- Allow your students to choose an ape character to embody. They should choose a species, a gender, and an age for their character.
- Ask students to create an ad for their character for an ape classifieds service. The ad can be in search of a roommate, troop
 mate, new home, job position, or, for mature student groups, mating partner. The ad should describe the character, which can
 include physical descriptions as well as behavioral, and outline what the character is looking for with respect to the chosen ad
 category. For example, a sub-adult female chimpanzee may place an ad looking for a babysitting job in which she describes her
 experience helping with her siblings.
- · Allow students to be creative and have fun with the exercise!
- Ask students to share their ads to see if there are any appropriate matches in the classroom.

Assessment Criteria: The student demonstrates an understanding of his or her chosen species' behavior by writing an ad that accurately depicts this behavior.

Example ad:

SFS seeks SMS

SFS (single female siamang) seeks SMS for monogamous relationship. Needed: A serious dater ready to commit and start a small family. I am a mature six year old seeking a mature male, same age. I have been singing alone for too long, and am ready to find that special someone for a duet. I enjoy grooming for long periods of time, and swinging through branches. Would appreciate a partner with a love for same. Strong arms and large throat sac a plus.

Skills used in this activity

- Extracting and synthesizing important information
- Writing to inform an audience
- Modeling of scientific concepts

4.6: What is a tool? (C,S)

Materials: Per student group: copy of "What is a tool?" worksheet, various materials such as assorted twigs, bottle tops, buttons, drinking straws, feathers, paper, roll of tape, rope, ruler, sponge, string, thread, wire. For task stations: copy of each task card, two small bowls, water, rocks or pebbles, tall jar, coin, paper coffee cup with lid, paper, hole puncher.

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Objective: The student will be able to define tool use, and distinguish between naturefacts and artifacts. The student will be able to collaboratively invent and test tools to accomplish a variety of tasks.

Procedure:

- Break students into small groups. Give each group a copy of the accompanying worksheet. Read and discuss the opening text on the worksheet. Have students brainstorm about tools they commonly use. Are these tools naturefacts or artifacts?
- Now divide students among the task stations. Students will collaborate within their groups to invent a tool that can be used to successfully complete each task. They will have to create the tool and test it.
- For each task, students can only use the materials supplied to them. Successful tools must be recorded and described on their worksheet.
- Require students to create at least one artifact—that is, a tool that has been created by altering one or more materials.
- When students have completed all tasks, discuss each group's tool inventions. Compare the tools invented, and examine whether tools were naturefacts or artifacts.

Task Station One: Two small bowls, placed several feet apart. One bowl is filled with water. The other bowl is empty. The task is to transfer the total water content of one bowl to the other, without touching or moving the bowls. **Task Station Two:** Place several rocks or pebbles into a tall jar. Leave lid off. The task is to remove at least one rock from

Task Station Two: Place several rocks or pebbles into a tall jar. Leave lid off. The task is to remove at least one rock from the jar without touching or moving the jar.

Task Station Three: Place a coin on the floor or on a desk surface. The task is to pick up the coin.

Task Station Four: Use a hole-punch to make small bits of paper. Fill a paper cup with these bits of paper. Place the lid on the cup, and peel back the opening on the lid. The task is to remove at least ten bits of paper from the cup without tilting or moving the cup.

Assessment Criteria: The student collaborates with group members to invent an appropriate tool that completes the task under all the restrictions provided. The student correctly distinguishes between naturefacts and artifacts, and can correctly apply these definitions to identify invented tools.

Extensions

- At the zoo, observe for tool use in all animals. Ask students to identify tools as naturefacts or artifacts.
- Invent a task—Ask students to invent their own task for which their partner will invent a tool. Have students switch roles.

Skills used in this activity

- Collaborative inquiry
- Problem solving
- Tool invention
- Distinguishing categories

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Task One:

Task Two:

Transfer the total water content of one bowl to the other, without touching or moving the bowls.

Remove at least one rock from the jar without touching or moving the jar.

Task Three:

Pick up the coin.

Task Four:

Remove at least ten bits of paper from the cup without tilting or moving the cup.

Worksheet: What is a tool?

Chimpanzees and other apes have been observed in the wild and in captivity to create and use tools. A tool is an object that can be manipulated to complete a task. There are two distinct types of tools: naturefacts and artifacts. Naturefacts are tools that are made by using natural occurring material without any alteration. A chimp that picks up a stick and scratches its back with it is using a naturefact. An artifact, on the other hand, has been altered in some way to facilitate the task. This alteration can vary: material might be reduced, reshaped, combined with other parts, or perhaps replicated. For example, a chimp selects a stick for fishing termites out of a mound, then strips the leaves off the stick and chews on the stick to reduce the size, making the tool better fitted for the hole. This type of tool has been altered, and is considered an artifact.

In this exercise, you will attempt to complete several tasks with the use of tools that you will invent. You will be given an assortment of materials to choose from—each material in its unaltered state will be considered a "natural" material. In your groups, construct tools to complete the various tasks using any combination of the materials provided. You will record your successful tools, identifying all parts used to make the tool, how the tool is used, and whether the tool is a naturefact or an artifact. To complete this activity, you must invent at least one artifact that can be used to successfully complete a task.

Tool materials	How is the tool used?	Naturefact?	Artifact?	Draw the tool

Task One

Task Two _

Tool materials	How is the tool used?	Naturefact?	Artifact?	Draw the tool

Worksheet: What is a tool?, contd.

Task Three _____

Tool materials	How is the tool used?	Naturefact?	Artifact?	Draw the tool

Task Four

Tool materials	How is the tool used?	Naturefact?	Artifact?	Draw the tool

Thinking Ahead

In order to begin the process of connecting behavioral phenomena with conservation, discuss the following with your students:

How might the behavior of apes affect their conservation status?

Consider, for example, their delayed maturation, their diets and their social relationships and units.