

Phx Zoo

ELEPHANTS TEACHER Activity Packet: EXPLORING COMPLEX COMMUNICATIONS

Activities in this Packet

This activity packet is designed to help students form a deeper understanding of the complex nature of the elephants. Ideally, a class will participate in all of the activities outlined in the packet, however, choose the activities which best meet your students' needs and interest.

Standards

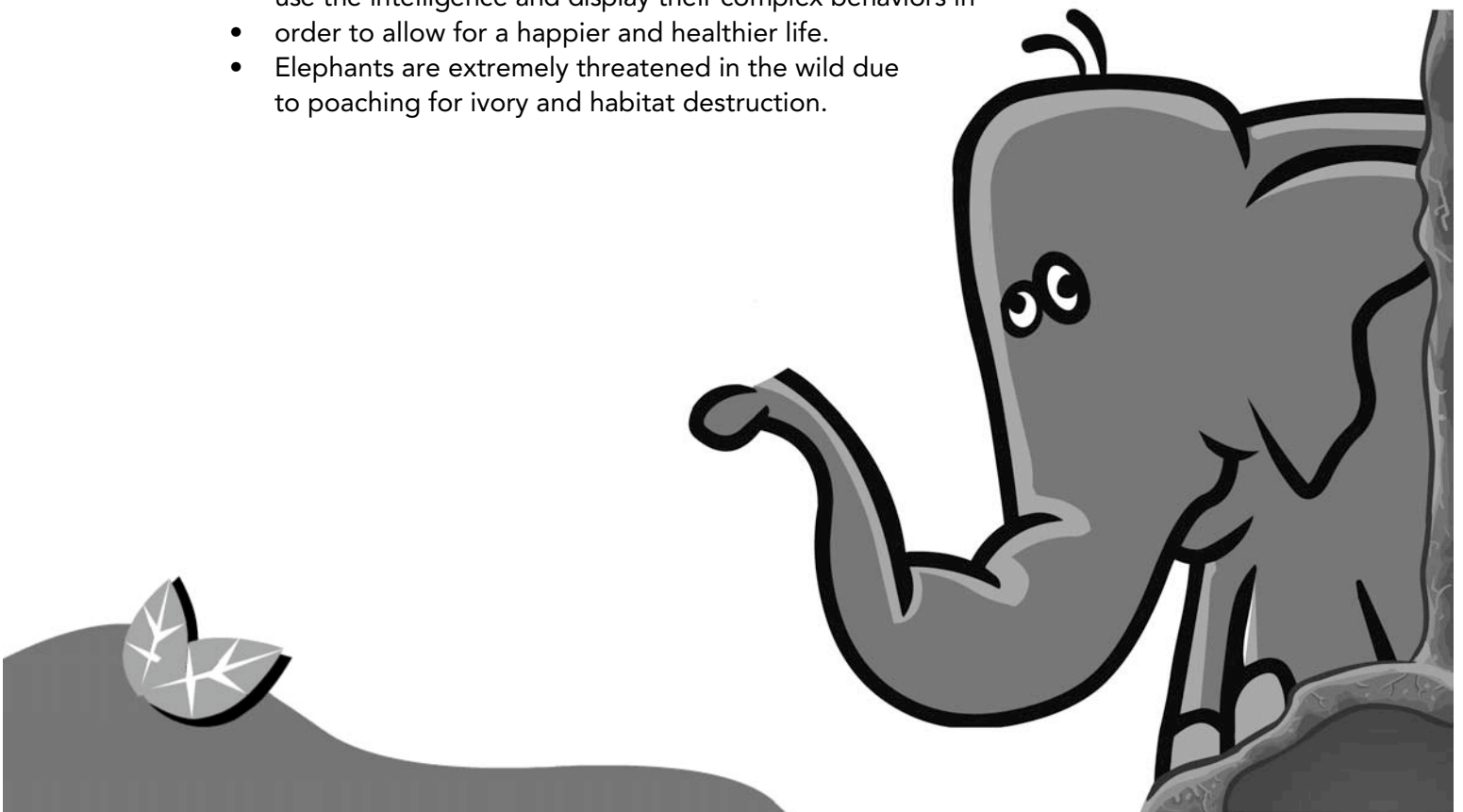
This activity packet is most appropriate for grades 2 and up. The following academic standards can be met by using the materials provided.

SC-S1C1-01, 02; SC-S1C2-02, 03; SC-S4C4-01, 02; SC03-S5C3-03, 04

Learning Objectives

By completing these activities the students will learn...

- Elephants have a large brain capacity relative to their body size, which leads to intelligent and complex behavior and long-term memory.
- Elephants are very social animals living in matriarchal and related herds.
- Elephants rely heavily on communication strategies in their daily lives.
- The Phoenix Zoo's elephant herd is made up of un-related females, which makes it difficult for the elephants to get a long.
- Zoos work to provide many opportunities for elephants to use the intelligence and display their complex behaviors in order to allow for a happier and healthier life.
- Elephants are extremely threatened in the wild due to poaching for ivory and habitat destruction.



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BACKGROUND INFORMATION

Elephants have one of the largest brain sizes in relationship to body size of land mammals (primates being an obvious exception). Large brain capacity allows for an extremely complex and intelligent animal. Elephants have become famous for, among other things, their long-term memory. The saying is most likely true, "an elephant never forgets". One way to explore the depth of their complexity is to examine the multiple communication strategies of individual elephants with their environment and their herd.

Families

We can't talk about elephant communication without emphasizing the social relationships of elephants. The extremely close-knit herds that elephants form helps us to understand how communication came to play such an intense role in their life experience.

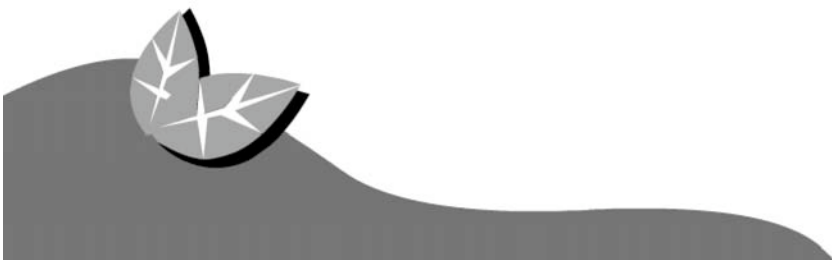
An elephant family is led by a matriarch, with the matriarch being the oldest and most experienced of the herd. The matriarchal society consists of her female offspring and their young. In some cases it may include one of the matriarch's sisters and her offspring as well. It is this close contact and relationship allows the rest of the elephant to acquire knowledge to be used when needed.

A basic family unit contains six to twelve members. Males as they grow older and approach puberty gradually become more independent from the family group. This involves primarily spending more time on the outskirts of the group. Eventually, the males leave the family and join with other males of different ages in a band of bulls.

The herd is a very important part of an elephant's life. Individuals work together to raise the young, help each other find food and other necessities, protect each other and provide the social company that elephants so greatly need. A female elephant separated from her herd may suffer greatly if she is not reunited. It is also very difficult for older elephants to accept new comers that are not related.

The Trunk

The trunk is an essential tool for an elephant. If an elephant's trunk becomes damaged it is very likely that the animal will not survive. The trunk, which is made up of almost 100,000 muscle units, also contains enough nerve endings to make it the most sensitive part of the elephant's body. Along with its ability to use the trunk for obtaining food and water as well as moving objects, the elephant's trunk is also the main tactile and olfactory organ. Elephants use their trunk to smell, move, touch, and manipulate objects around them in order to make sense of their surroundings.



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The trunk also serves a function in verbal communication with other elephants. If an elephant charges with its trunk stretched out it is bluffing and trying to frighten away the other elephant. Since the trunk is such a sensitive organ, if the elephant really wants to fight, it will tuck its trunk in before it charges. Elephants also use the trunks to wrestle with each other, which is a form of fun play. This form of communication reinforces social bonds between them.

Elephants also use their trunk to create the familiar trumpeting sound. This sound is usually a greeting or excited sound. Elephants will trumpet when initiating play as well as when greeting other elephants.

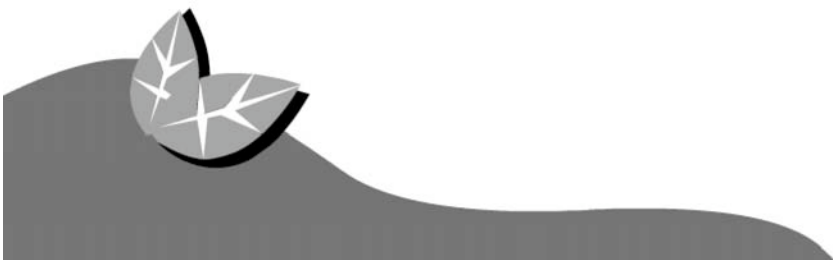
Emotions

There has long been a debate over whether animals can experience conscious thought and complex emotions. This area is very difficult to study, as emotions are difficult to measure. Anecdotal evidence, however, suggests that elephants do in fact experience some sort of emotions and often will communicate these emotions in a way that we are able to see.

What humans refer to as mourning is a typically observed emotional display in elephants. They have been witnessed to stand hunched with head down over the body of a dead or injured elephant. They will often leave the body and come back the next day to visit. Months later, elephants have been observed to stop and pause for several minutes on the exact same spot that a fellow herd member had died. When they come across elephant bones, they will use their trunk and feet to explore the bones. They have not been observed doing this with other species' bones and it is hypothesized that they are trying to identify a possible lost relative during this exploration.

Along with mourning, elephants have also expressed what we refer to as joy or excitement. When herd members are reunited after a long separation, the elephants participate in a "greeting ceremony". During this greeting the elephants involved will spin around, defecate, and urinate. With their heads held high, and ears flapping they fill the air with a symphony of trumpets, rumbles, screams, and roars.

Elephants also seem to express joy in their playing behavior. Elephants play alone or with others and typically do so by manipulating objects around them. Play is typically initiated by loud trumpeting sounds followed by periods of running, chasing, and throwing around or manipulating objects.



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Ears

Elephant ears serve several purposes from cooling the body to hearing and communication. African elephants will actually use their ears to send signals and threats to other elephants.

The most unique thing about elephant ears, however, is their amazing ability to hear. Elephants have the capability of hearing *6 miles* away and within a *62 square mile* range. They do this by picking up extremely low frequency sounds generated by other elephants.

This long distance communication allows for distress signals to be heard from far away for separated herds to reunite, and for males to find receptive females for breeding. This infrasound ability can be noticed by the sudden reaction of elephants to lift their head from drinking, bathing or eating, and act in a peculiar fashion. This may indicate that they have heard something that has warned them about some danger or could just be a female sending out estrus calls. Infrasound takes social communication to new levels within the natural animal kingdom.

Humans without the aid of special acoustical equipment cannot hear infrasound. For this reason it took many years of elephant research to understand just how deep their communication strategies went.



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Pre-Visit Activities

Communicating Without Words

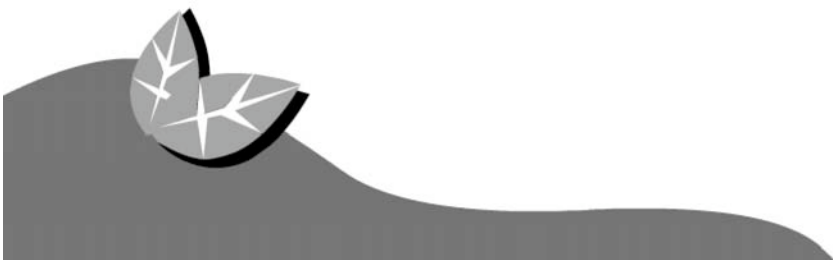
This activity challenges students to consider how animals communicate without the use of words. In groups the students devise their own communication methods. The only rule, they are not allowed to use any spoken language developed by humans.

Materials

Various items available in the classroom or schoolyard

Procedure

1. Hold a class brainstorming session about the various ways that humans use to communicate with each other (verbal, physical).
2. Ask, "How can animals express things to one and another without words?"
3. Divide students into pairs or small groups.
4. Challenge each group to come up with a way to communicate that doesn't use any written or spoken language. They have to use their bodies and the classroom environment to create their communication techniques. Vocalizing is okay as long as it isn't using words.
5. Once they have come up with their means to communicate, each student should choose something to communicate to the rest of the group and see if the others can understand what they are saying.
6. Come back together as a class and discuss the fact that animals have adapted to use their bodies and their environments to communicate.
7. Communication is a very important thing for social animals, such as elephants.
8. Have students consider how elephants communicate and go over what scientists have discovered that elephants do.



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Tactile Experience

This activity allows students to explore tactile sensitivity of various areas on their body and leads into a discussion about how the number of nerve endings concentrated in an area determines the sensitivity. This discussion can be related to the sensitivity of an elephant's trunk and how vital the trunk is for communication with the elephant's environment.

Materials

Several small pebbles for each group of students

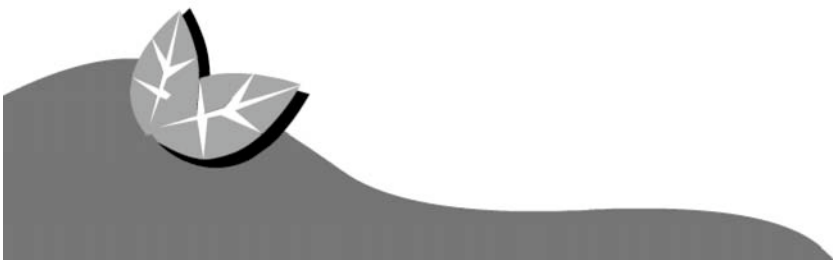
One blindfold per group of students

Paper

Pencils

Procedure

1. Divide students into pairs or small groups.
2. Students will take turns being blindfolded.
3. The students that are not blindfolded place several pebbles down on the table (the blindfolded student should not know how many pebbles there are).
4. The blindfolded student needs to determine how many pebbles are on the table by touching the pebbles with various parts of their body. Body parts can be nose, elbow, knee, back of hand, ear, toes, fingers, etc.
5. The other students in the group should keep track of what body part was used and how many pebbles were guessed for each guess the blindfolded student makes. The students should not indicate whether the guesses are correct or not.
6. After each student has had a chance to do the experiment hold a class discussion about the results. What did the students learn from this activity? Were there body parts that consistently gave accurate results across the class? Why was it difficult to count the number of pebbles with some body parts?
7. Follow up with a discussion about the number of nerve endings and how that relates to tactile sensitivity. Ask the students to consider what are the most sensitive part of an elephant's body and how does the elephant communicate with its surroundings.



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Communicating With Sound

This activity challenges students to experiment with producing sounds of various pitch and volume. The experiments are followed by a discussion about how the elephant is able to produce the many sounds it can.

Materials

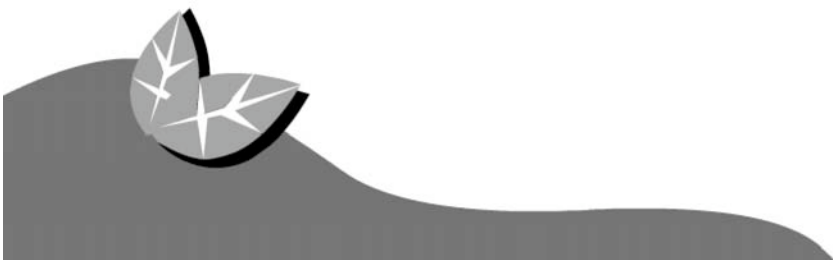
Various sized rubber bands
Various sized tubes
Various sized containers
Any materials that make noise
Masking tape

Additional Background Information

An elephant's vocal apparatus is designed in such a way that it is able to produce a large range of sounds at different frequencies and volumes. Consider the elephant's body like a musical instrument; the longer and looser the string the lower the pitch, the larger the resonating chamber the louder the sound can be. The large body structure acts as a large resonating chamber. The trunk adds length to the chamber and the elephant also has a pouch near the base of its tongue that adds additional space for resonance. The vocal cords and hyoid (the main structures that produce sound) are extremely flexible allowing the elephant to tighten for higher sounds and loosen for lower sounds. Elephants can also manipulate the pitch of a sound by moving the head and mouth in different ways.

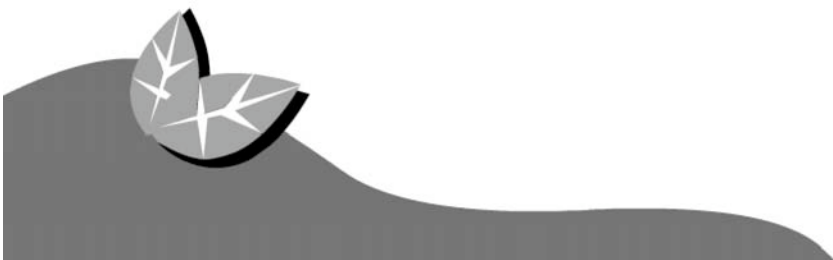
Procedure

1. Divide the students into small groups and pass out supplies. Each group should have a variety of materials.
2. Explain to the students that all of these materials can be used for making sound. Ask the students to experiment with the materials to see what kinds of sounds they can produce. Think about making loud sounds, soft sounds, high sounds, low sounds. Allow at least 20 minutes for the students to experiment with the materials.
3. After you feel the students have had enough time to experiment with the materials challenge them to create a sound machine. You can make it simple or complex depending on the skill level of the students. Simple machines would produce either low sound only or high sound only. More complex sound machines may be able to produce high and low sounds and change volume.
4. Allow time for the students to share their machines with the rest of the class.
5. Encourage group discussion about improvements or changes that can be made to the machines.



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6. After the presentations help the students to summarize what components were necessary to produce the various sounds. Tie this in to elephants by explaining how the elephant's body has these many components.



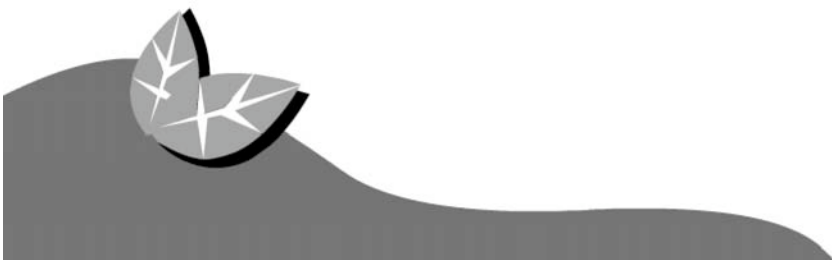
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DURING YOUR VISIT TO THE ZOO

- Before you come, make sure to have a discussion about the social relationships of elephants and how they communicate.
- Ask the students to watch the elephant on exhibit and consider ways that the elephant may use the communication techniques that they learned about. How have the keepers created an environment for the elephant to explore with its trunk?
- Ask the students what is missing in this exhibit. (Another elephant)
- Explain the situation with the Zoo elephants. We have three adult elephants that are not related. Because they are not related they are having difficulty getting along. The Zoo is hoping that by providing them opportunities to use their complex behaviors, they elephants will keep themselves busy and be less interested in fighting.
- Is there any evidence that the elephants are still communicating with each other even though they are not on exhibit together?
- While you are there, take some time to go over the conservation signage with the students as well as allow them to see the tusks and skull that are at the exhibit.

AFTER YOUR ZOO VISIT

Hold a class discussion regarding the complexity of the elephants and their relationship to their environment. How do the students think that elephants might affect their environment? Go over the threats that elephants face in the wild, in zoos, and in the circus.



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INTERNET RESOURCES

Savanna Elephant Vocalization Project – This website compiles research on elephant communication conducted by the Amboseli Elephant Research Project in Kenya.
<http://www.elephantvoices.org>

The Elephant Information Repository is an excellent source for a wide variety of elephant information. <http://elephant.elehost.com>

PBS has a good site with information about elephants.
<http://www.pbs.org/wnet/nature/elephants>

The African Elephant Conservation Trust is a good source for elephant conservation information. <http://www.elephanttrust.org>

