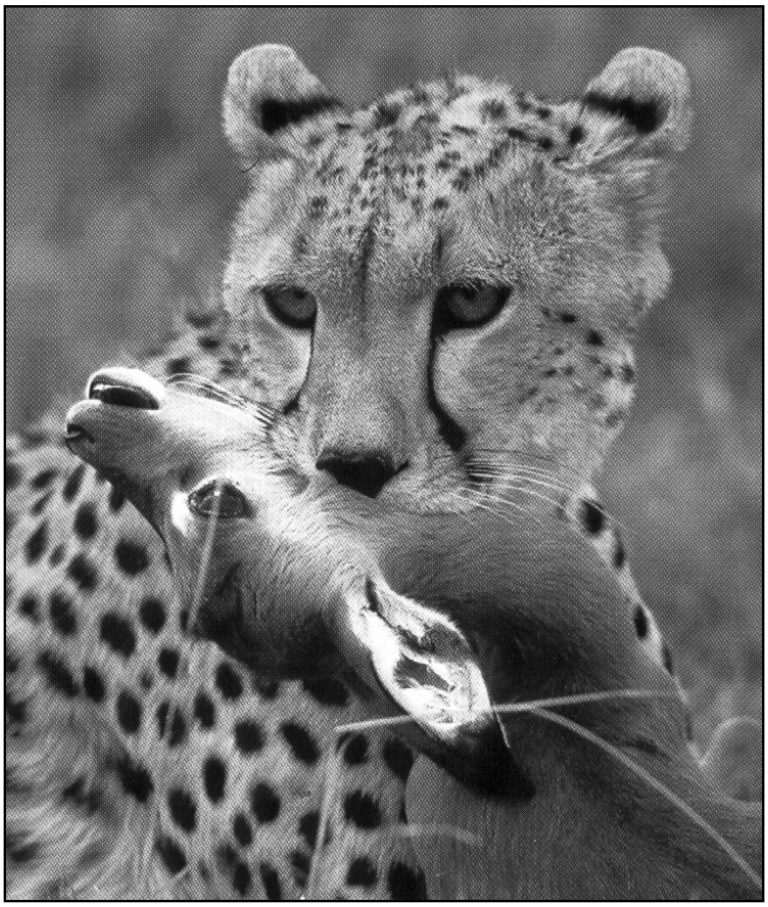
Ecology



CHEETAH
CONSERVATION FUND

HABITATS I

SUBJECT AREAS:
Sciences

DURATION/TIME:
Activity 1: 20 min
Activity 2: 25 min

RECOMMENDED PREPARATION:
Introduction:
Find rotten log
(for a habitat example)

Activity 2:
Read the 'background' sheet on habitats and have flashcards prepared and cut out

MATERIALS NEEDED:
Introduction:
Rotten log

Activity 2:
Animal flashcards

LOCATION:
Classroom

KEY WORDS TO REVIEW:
Habitat
Need
Want
Neighbourhood
Conflict

OBJECTIVE:

Learners will become familiar with factors influencing an organism's habitat and will apply their knowledge to themselves and other living organisms to draw comparisons.

LESSON ACTIVITIES:

INTRODUCTION:
Use a rotten log as a habitat example

ACTIVITY 1:
Brainstorm activity on what learners need in their home. Next, explain the difference between need and want and identify the four common 'needs.' Also discuss classification of a habitat.

ACTIVITY 2:
Learners will list animals in a village and identify the needs of the animals. Learners will, lastly, have a discussion on a cheetah's needs and whether that leads to conflicts.

Learning Outcomes

The learners will become familiar with the factors that influence an organism's habitat, including food, water, shelter, and space. They will then apply their knowledge to themselves and other living organisms to draw comparisons.

Teaching the Lesson

Introduction – classification of a habitat

Bring in a rotten log from the school yard and start a discussion as to whether the log has the requirements to be classified as a habitat. This is just an introduction that habitats can be varying sizes as well as different depending on the life phase of a particular species.

Assessment

1	2	3	4
Learner was unable to associate the rotten log with the requirements for a habitat	Learner could only partially predict that the rotten log was a habitat	Learner achieved the assessment standard using previous knowledge to logically describe why the rotten log can be called a habitat	Learner exceeded expectations showing increased understanding of habitat requirements

Activity 1 –need vs. want

Introduce the terminology of habitat where an animal lives. With learner input draw up a list of all the things they need within their home (a home is bigger than a house, it includes where they live and the things they need to survive such as food, water, and fuel sources). Allow them to write anything that comes to mind such as TV, toys, water, bed, etc. Learners are encouraged to think about things they do or need to use every single day. Discuss the difference between a need (water) and a want (coca cola) and, using two columns on the board labelled "need" and "want," place all the previous suggestions under the correct heading with the learners' input. This will lead you into the four common needs: food, water, shelter and space.

Then have the learners write up a list of the animals in their village or neighbourhood (bird, goat, dog, insect, etc). Have them identify what they need to survive and where in the village or neighbourhood the animals live.

Hand out the animal flashcards (names of animals on pieces of paper) to groups of learners. Learners will place the cards together on a blank sheet of paper according to habitat similarities. Label the blank sheet with titles indicating the habitats:

- in the house
- tree
- wetland
- open field

Answer Key – Possible answers. Answers will differ depending on animals you chose for the flashcards

Bird	- Tree	Frog	- Wetland
Scorpion	- Open field	Dog	- House
Cat	- House	Monkey	- Tree
Tortoise	- Open Field	Mouse	- House, open field
Lizard	- Open Field	Beetle	- Tree, Open Field

-OR-

If you do not make flashcards, the learners could just write on a separate sheet of paper, in columns labelled with the different habitats, the names of the animals found on the habitat sheet under the appropriate heading.

Lastly have the learners identify what a cheetah needs in order to survive in its habitat. Discuss the differences and similarities between the learner's environment and the cheetah's. This will emphasize that all living things have the same requirements. Discuss whether this would lead into conflict/competition between species if they all have similar needs.

What is a habitat?

All living things need a home, or habitat in which to live. A habitat is the environments, or place, in which the animal lives throughout its life. These range from mountain peaks to ocean bottoms, forests to deserts. Each animal is especially adapted to live in certain habitats. People also have habitats; this is bigger than just the house in which we live. It includes the entire environment that we come in contact with. Where we go to school, shops or on holiday, it is all still our habitat.

What do animals need from their habitat?

A habitat provides the four basic needs that all animals share: food, water, shelter and space. Food and water supply us with the energy we need to live. Shelter protects from the weather and enemies. All animals need space in which to find their food, water and shelter. If there is not enough space for the living things within a habitat, there will not be enough resources for those animals to survive. Due to their speed, cheetah need to live in open spaces, such as grassland, savannahs, woodlands, bushlands, etc, where they have the space for a high speed sprint without risk of running into obstacles. They prefer to live in areas with low populations of competing predator species such as lion, leopard, baboon, hyena, etc. This generally means that they live outside of protected areas where the populations of other predator species are usually high.

HABITATS II

SUBJECT AREAS:
Sciences

DURATION/TIME:
Activity 1: 15 min
Activity 2: 35 min
Reflection: 15 min

RECOMMENDED PREPARATION:
Activity 2:
Review the cat fact sheets in the Reference section, photocopy one set of the habitat picture pages, photocopy the 'habitat watch' worksheet for each learner

MATERIALS NEEDED:
The cat fact sheets in the Reference section, copies of the habitat picture pages and the 'habitat watch' worksheet.

LOCATION:
Classroom

KEY WORDS TO REVIEW:
Savannah
Desert
Wetland
Rainforest
City
Cultivated land
Habitat
Preferred

OBJECTIVE:

Learners will further investigate the factors that influence an animal's habitat and learners will predict the best habitat for each animal.

LESSON ACTIVITIES:

ACTIVITY 1:
Habitat hoop game and a discussion on what will happen if one element in the habitat is removed.

ACTIVITY 2:
Discuss habitats, review the 'cat facts' and do the 'habitat watch' worksheet.

REFLECTION QUESTIONS:
Hold a discussion on outlined points pertaining to habitats

Learning Outcomes

This activity will further investigate the factors that influence an animal's habitat. It also uses the learner's background knowledge on the major cat species to predict the best habitat for each.

Teaching the Lesson

Review the information within the Habitats I activity.

Activity 1 – habitat hoop (adapted from the project wild activity "Habitat lap sit")

Get the learners into a circle, front to back, and go around naming the learners by a habitat necessity: space, water, shelter and food. Tighten the circle until the learners are close enough together that they can sit on each other's knees. Remove one learner and see what happens to the circle. Remove all the waters and see what happens to the circle. This shows that while all four elements are present there is a balanced environment; a slight decrease in one of the elements results in only a little disturbance, while removing one of the elements results in the collapse of the environment / habitat. The learners can be led in a class discussion to achieve this conclusion on their own.

Activity 2 – habitat watch

The region or area that an animal lives in is called its habitat. A variety of different habitats are shown in this lesson. (Copy the 3 habitat picture pages and share with the class.) Each of these habitats will support a variety of plants and animals. The number and kind of plants and animals that each one supports depends on several factors.

A habitat can contain various amounts of food, water, shelter and open spaces. Since different animals have different needs for each of these factors, each habitat will usually have different animals found in them. Sometimes the same animal will be able to live in different habitats if all of its needs are met.

In addition to the animal's needs for these factors, its specific abilities and body type may influence what habitat it lives in.

Habitat Requirements Table

Instructions: After studying the provided pictures of five different habitat types, ask the learners to decide whether each habitat has LOW, MEDIUM, or HIGH levels of each of the habitat factors. Draw this table on the chalkboard for learners to copy into workbook or use attached learner worksheet.

Habitat Factors	Savannah	Rain Forest	Wetlands	City	Cultivated Lands	Desert
Food						
Water						
Shelter						
Space						

Animal Requirements Table

Instructions: Review the 'cat facts' provided in the Reference section to determine the requirements each of the animals below have for their habitat. After completing the Habitat Requirements table above, ask the learners to determine the preferred habitat of each cat species. Special factors such as specific abilities and body type may also influence an animal's habitat preference. Draw this table on the chalkboard for learners to copy into workbook or use attached learner worksheet.

Animal	Food	Water	Shelter	Space	Special Factors	Optimum Habitat
Cheetah						
Tiger						
Lion						
Domestic Cat						
Human						

Worksheet – habitat watch

Name: _____ Date: _____

Habitat Requirements Table

Instructions: After studying the provided pictures of five different habitat types, decide whether each habitat has LOW, MEDIUM, or HIGH levels of each of the habitat factors.

Habitat Factors	Savannah	Rain Forest	Wetlands	City	Cultivated Lands	Desert
Food						
Water						
Shelter						
Space						

Animal Requirements Table

Instructions: Review the 'cat facts' provided by your teacher to determine the requirements each of the animals below have for their habitat. After completing the Habitat Requirements table above, determine the preferred habitat of each cat species. Special factors such as specific abilities and body type may also influence an animal's habitat preference.

Animal	Food	Water	Shelter	Space	Special Factors	Optimum Habitat
Cheetah						
Tiger						
Lion						
Domestic						
Cat						
Human						

Answer Key to habitat watch worksheet

Habitat Requirements Table

Habitat Factors	Savannah	Rainforest	Wetlands	City	Cultivated Lands	Desert
Food	*High*	*High*	*Medium*	*Low*	*Medium*	*Low*
Water	*Medium*	*High*	*High*	*Medium*	*High*	*Low*
Shelter	*Low*	*High*	*Medium*	*High*	*Medium*	*Low*
Space	*High*	*Low*	*Medium*	*Low*	*High*	*High*

Animal Requirements Table

Animal	Food	Water	Shelter	Space	Special Factors	Optimum Habitat
Cheetah	*High*	*Low*	*Medium*	*High*	*Fast, small mouth, solitary hunter*	*Savannah*
Tiger	*High*	*Medium*	*High*	*Low*	*Large, powerful, solitary, camouflage*	*Rainforest*
Lion	*High*	*Medium*	*Medium*	*High*	*Group hunter, powerful, large mouth*	*Savannah*
Domestic Cat	*Low*	*Low*	*Medium*	*Low*	*Depends on humans*	*City / Cultivated Land*
Human	*Medium*	*Medium*	*High*	*Low*	*Modifies habitat*	*Various*

Reflection Questions:

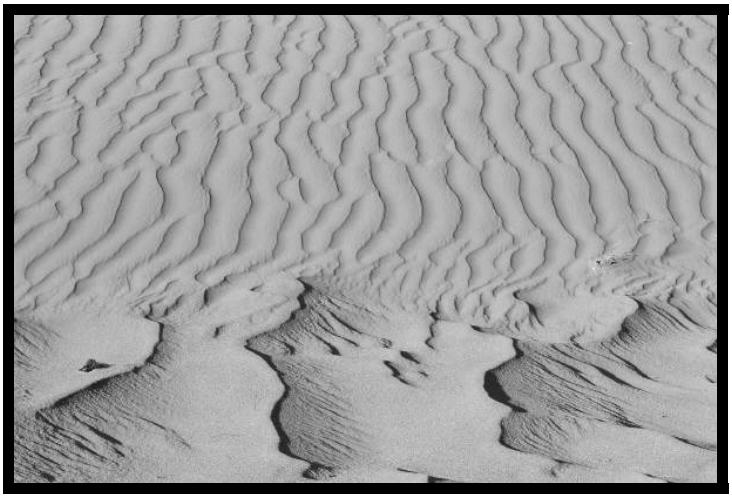
1. Which habitat has the HIGHEST levels of habitat factors? Which one has the LOWEST levels of habitat factors?
2. Which habitat will probably support the most animals? Which habitat will probably support the fewest animals? Why?
3. What other factors (besides those listed in the table) may be important in an animal being present in a particular habitat?
4. What ability do humans have that allows them to take advantage of more than one habitat type?
5. Explain why the cheetah is sometimes out competed by the lion for habitat space.

   Background information for question 5:

   The cheetah is a non-aggressive cat and avoids confrontation. Their mobility is crucial to their survival and confrontations with other predators could cause injury and jeopardize their survival. With this in mind, cheetahs will back down when confronted by a lion, leopard or pack of hyenas. The cheetah often loses its prey or territory to lions and leopards.

Habitat Picture Page 1:

Savannah



Desert

Habitat Picture Page 2:

Wetland

Rainforest

Habitat Picture Page 3:

City

Cultivated Land

ANIMAL BEHAVIOURS

SUBJECT AREAS:
Sciences

DURATION/TIME:
Activity 1: 10 min
Activity 2: 30 min
Research Project: 1 week

RECOMMENDED PREPARATION:
Activity 1:
Review background information provided.

Activity 2:
Make 40 'prey' cards to use in the outdoor activity and mark out the 20x20 meter outdoor area needed.

MATERIALS NEEDED:
Activity 2:
Prey cards

LOCATION:
Classroom &
Outdoor

KEY WORDS TO REVIEW:
Predator
Prey
Behaviour
Instinct
Cub
Survival
Strangle
'Pride' of lions

OBJECTIVE:

Learners will learn the behaviour of animals while using cheetahs as an example

LESSON ACTIVITIES:

ACTIVITY 1:
The class will take part in 'lion encounter,' a classroom activity, and will then hold a discussion.

ACTIVITY 2:
Outdoors the class will take part in a predator and prey activity and then discuss the activity.

RESEARCH PROJECT:
Collect data to compare social interactions between the cheetah and other animals

Learning Outcomes

This activity is designed as an introduction to animal behaviours using the cheetah as a focus. Classroom and outdoor activities introduce the topic of behaviour to the learners while the activity ends with a research project comparing the interactions of cheetahs and other animals sharing their environment.

Teaching the Lesson

Review the 'hunting development of cub' background information located at the end of this activity.

Activity 1 – lion encounter (classroom activity)

Select a number of volunteers from the class. Take the smallest volunteer separately and group the rest together. Ask the class to imagine that the front of the classroom is a savannah and the group represents a pride of lions and the individual is a cheetah. As a lone cheetah what would happen if the cheetah should try to pass through the lion's territory. Lead this into a discussion of how and why a cheetah must learn to interact with other predators to ensure its survival in the wild, using background information in this lesson.

Activity 2 – outdoor activity

Using paper, create a number of cards as follows to represent various prey items: (this representation can be through various colour paper, cut-out shapes or merely the name of the prey item written down on the piece of paper).

Make five cards per prey item

Prey items:

- zebra
- springbok
- snake
- grass
- mouse
- flower
- hare
- kudu

Divide the class into groups, which represent the following predators: give each individual a piece of paper, depicting by shape or writing, which of the following predators the individual learner represents.

- Insect
- Cheetah
- Lion
- Bird

Take the group outside where you spread the prey items over an area of 20 x 20 meters. Have the class line up at one side of the area and at the count of three, traverse the area searching for appropriate prey items for the predator they represent. Once all prey items have been picked up initiate a discussion of what was picked up and why.

- The insect should have grass and flowers
- The bird could have flowers if a nectar feeder or a snake and mouse if it's a bird of prey (possibly the hare if the learner has selected to be a bigger bird of prey)
- The cheetah should have selected the springbok and hare (possibly also the mouse).
- The lion should have a selection of kudu, zebra, springbok and hare.

Follow this with a discussion of how the cheetah hunts and what this means in terms of the mother having to teach the young. Review the hunting behaviour of a cheetah using the background information provided.

Teacher's Worksheet for Research Project – it is tough in the wild

Focus:
To compare the social interactions and relationships between the cheetah and other animals sharing its environment.

Question choices for research topic:
- How does a mother teach her cubs to avoid other predators and why would this be necessary?
- What survival strategies does a cub need in order to survive in the wild?
- How does a cheetah cub learn to hunt?

Data should be submitted in the form of a portfolio (this may include pictures and charts). This activity can be done as an individual or as a group.

After the portfolio has been put together the topic should be presented to the rest of the class and a discussion initiated as to the social interactions in the wild. The teacher can inform the learners as to any additional information provided in the Teacher's Guide, not presented by the learners.

Resources:
- Library
- Internet
- Background Information from resource
- Magazines
- Nature Videos
- Zoo or organisation working with lions or cheetahs

Pre-preparation:
The teacher should first have the facts about this research and that requires him/her to make use of resources to get information. The teacher should be able to inform the learner exactly where to find the information.

Assessment:

Research Assessment Statements	Yes	No
Learner completed assignment within time limit		
Learner gave title and author		
Learner gathered information from a variety of sources		
Learner used information relevant to the topic		
Presentation was neat and well laid out		
Learner gave references correctly		

Background – hunting development of cubs

Chasing prey may be instinctive, but cubs must learn how to bring prey down, how to direct a bite at the throat, and how to hold the victim until it stops kicking, all from watching adults.

Cubs learn the stranglehold from watching their mother kill and practice it through play by biting napes of siblings. They sometimes stop eating to imitate stranglehold on dead prey.

Mother cheetah uses every opportunity to teach offspring how to hunt by:

- Releasing stranglehold of prey not yet dead and letting cubs finish it off.
- Bringing small live animals (fawns, hares, etc.) back to cubs as young as 4 months old to kill.

Cubs begin accompanying mother on hunts from 3 to 4 months. She conceals them when prey is spotted and induces them through vocalizations to remain hidden. If hunt is successful, she calls them to the kill.

Occasionally, cubs will alert the prey by standing up or moving forward too soon. Cubs start taking a more active role in the hunt from 6 to 7 months and will sometimes follow mother during chase, not staying behind to be called. While mother is strangling prey, they may help by holding the animal down with paws or with a bite to the flank, or will start eating immediately.

Cubs will attempt catching and killing small animals on their own from 7 months with little success. They may occasionally catch and kill hares they have flushed out.

By 12 to 14 months, cubs are capable of killing prey themselves. At 15 months, cubs are as big as or bigger than mother, and often take initiative in the hunt though they may still need assistance from mother with the actual kill. By 16 to 18 months, cubs are almost fully grown and can usually survive on their own.

Mistakes made by cubs learning to hunt on their own include:

- Not being properly concealed from prey.
- Not watching prey closely enough.
- Stalking animals too large for them.

During this time period the mother will also be teaching the cubs to avoid other predators in the area such as lion, leopard, baboon etc. Due to their delicate build for running, cheetah are very vulnerable to injury in a fight and so will prefer to avoid confrontation with a larger predator.

FOOD CHAINS

SUBJECT AREAS:
Sciences
Health
Arts

DURATION/TIME:
Activity 1: 30 minutes
Activity 2: 20 min
Activity 3: 30 min

RECOMMENDED PREPARATION:
Review background information

Activity 1 & 2:
Copy and cut out items on the 'food chain picture page' for individual learners or small groups

Activity 3:
Remind learners to bring cans. Have magazines/ pictures for learners to use and prepare paint (and other art materials) for activity

MATERIALS NEEDED:
Activity 1:
Copies and images cut out of the 'food chain picture page.'

Activity 3:
Soda cans or tin cans
Paint
Paint brushes
Water (to rinse brushes)
Magazines/pictures
Scissors
Glue or tape

LOCATION:
Classroom

KEY WORDS TO REVIEW:
Producer
Consumer
Primary & Secondary
Herbivore
Carnivore
Food pyramid/web/chain
Ecosystem

OBJECTIVE:

Learners will study the difference between a food web, chain and pyramid.

LESSON ACTIVITIES:

ACTIVITY 1:
Lead a discussion explaining the food chain, web and pyramid and how animals depend on one another in an ecosystem. Use the background page. Then, learners will construct a food pyramid by using the pictures provided in the 'food chain picture page.'

ACTIVITY 2:
Learners use pictures from the 'food chain picture page' to form a food web and chain. Small groups will present to the class.

ACTIVITY 3:
Learners will take part in an arts activity and use cans and photos to create a food pyramid of their own. Groups will present their pyramids to the class.

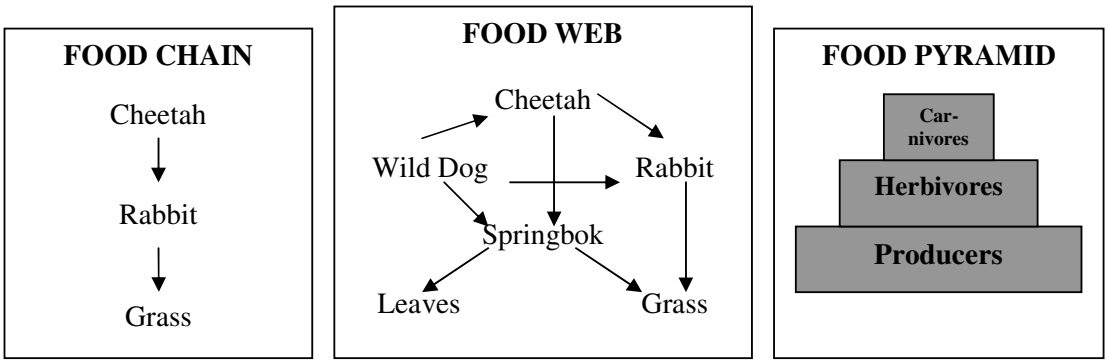
Learning Outcomes

In this activity learners study food chains, webs, and pyramids in relation to the cheetah. Learners use this information to make their own food pyramid in Activity 3.

Teaching the Lesson

Activity 1 – discussion & food pyramid

Review the food chain background information provided, then explain the concepts to learners using the diagrams below.



(Arrows indicate what organism preys on another organism. If you want to show the flow of energy through the system reverse the direction of the arrows)

Using the 'Food Chain Picture Page,' cut out the pictures.

Paste the pictures on separate pages under the appropriate headings of Producer, Primary Consumer/Herbivore, and Secondary Consumer/Carnivore.
-OR-
Hand out the 'food chain picture page' to each group of learners and have learners write down the headings on a sheet of paper, filling the names of the animals shown on the picture page under the appropriate heading. The learners hand in the picture page after the activity, allowing you to reuse them for the next group.

Activity 2 – food chain

Use the 'Food Chain Picture Page' handout. Divide the class into three groups. Each group must use the pictures on this page (either cut out pictures or just the names of pictures) to form a food chain and food web. Each group is then given an opportunity to present to the class explaining why they used the pictures they did. (Alternatively they can just write the names of the organism down in a diagram as above, allowing you to reuse the picture page.)

Activity 3 – assemble a food pyramid

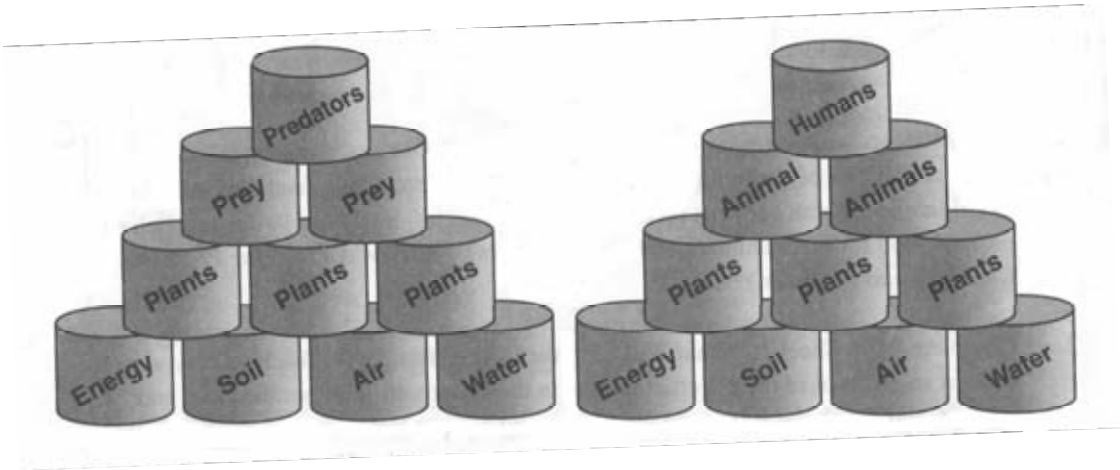
Have each learner bring in an empty soda can or tin can.

Have learners also bring pictures from magazines of plants, antelope, dogs, cats, etc (i.e. examples of producers, herbivores and predators) prior to the lesson.
-OR-
Hand out the 'Food Chain Picture Page' for the learners to cut out and use.

Break the class into groups of six learners with one 'Food Chain Picture Page' and six cans per group. Briefly explain the concepts of food pyramids to the learners. Then ask them to assemble a food pyramid of their own using the cans and pictures. Each pyramid should have a base of three cans each with a producer, the second level should consist of two cans with herbivores and one can with a carnivore on top. Let each group present their food pyramid to the class, describing the kinds of organisms that are a part of their food pyramid and the ways they depend on each other for energy. Groups should use the words: producers, herbivores, carnivores; and understand the energy flow through the pyramid. As an entire class, construct one giant pyramid from each groups' pyramids. Discuss the importance of maintaining balance in habitat. If one can is removed from the pyramid the whole system weakens or collapses. Stress the importance of each individual animal to the natural world.

Assessment

1	2	3	4
Learner did not show understanding of information in the building of their pyramid	Learner was mostly correct in their classifications showing some lack of recall of information discussed	Learner could correctly recall information necessary to build the pyramid, correctly classifying the animals	Learner showed a deeper understanding of the pyramid built. The pyramid was built accurately with correct classifications



FOOD CHAIN PICTURE PAGE

Cats and the Energy Cycle:

The speed of a cheetah and the strength of a lion aid them in catching their prey. Big cats are predators and play an important role in the energy cycle, fitting in with the overall balance of life. Every animal needs to get its energy from somewhere; food chains illustrate where a plant or animal gets its energy from within its habitat. A single food chain does not show all the sources of energy for an organism, merely examples. A food web, which is more complicated, takes into account all sources of energy between organisms within a given habitat. Therefore one can say that it is a compilation of all the food chains within a habitat.

How does Energy Cycle work?

FOOD WEB & FOOD CHAIN:
The sun is the source of energy within a food chain or web. Plants, one of the few organisms on earth that can transfer the sun's energy to make their own food, are called **producers**. The producers support all other life on earth, whether directly or indirectly. **Herbivores** (primary consumers) are the next step in the energy cycle; they consume only plants in order to get their energy. Herbivores include giraffe, antelope, many rodents, sheep, goats and cattle and are especially adapted to gathering, grinding and digesting plants. Some concentrate on only parts of the plants such as leaves, seeds, bark and / or roots. The next step in the energy cycle is the **carnivores** (secondary consumers). Carnivores are those animals that eat only other animals in order to get energy and include cats, dogs, birds of prey, sharks and some snake species. **Omnivores** are designed to obtain energy from a variety of sources, both animal and plant. Some examples of omnivores are pigs, porcupine and badgers. When plants and animals die, the energy still contained within their bodies is fed on by scavengers, beginning the process of decomposition. Other organisms known as **decomposers** (insects, fungi, and bacteria) recycle dead organisms back into nutrients and soil. The energy cycle then begins anew as the plants use the nutrients and soil to grow. Thus the food web is the cycle of energy through a habitat.

FOOD PYRAMID:
While food chains and food webs depict energy interrelationships, food pyramids show the relative amounts of producers, herbivores and carnivores within a habitat. Plants are the most numerous organisms; they have a permanent source of energy in the sun. Producers collectively weigh the most and hold the most energy, thereby forming the base of the food pyramid. Herbivores form the next level on the food pyramid as they obtain their energy directly from the producers. Due to the fact that energy is lost at each step of the pyramid, there will always be less herbivores than producers and less carnivores (the top step of the pyramid) than herbivores. Energy is lost at each step as some is not consumed, some is not digested and some is used to carry out bodily processes.

Why are these relationships (food webs and pyramids) so important?

Food webs and pyramids stress the important role of every creature by illustrating the interdependencies which exist in nature. Remove a part of the web of pyramid and the balance of nature will break. Each component depends on the other in the cycle of energy.

CHEETAH HUNT

SUBJECT AREAS:
Mathematics
Sciences
Agriculture

DURATION/TIME:
Activity 1: 10 minutes
Activity 2: 40 minutes

RECOMMENDED PREPARATION:
Activity 2:
Prepare and label 200 'prey' (use cups or blocks). Prepare outside area for game.

MATERIALS NEEDED:
Activity 2:
200 'prey'
Blindfold

LOCATION:
Outdoors (game)

KEY WORDS TO REVIEW:
Carrying capacity
Factor
Prey
Hunt
Shelter

OBJECTIVE:

Learners will discover limiting factors and carrying capacity by participating in a discussion and game.

LESSON ACTIVITIES:

ACTIVITY 1:
Discussion on carrying capacity, limiting factors and population.

ACTIVITY 2:
Game rules and discussion, outdoor game 'cheetah hunt' and questions relating to game.

Learning Outcomes

In this activity learners discover limiting factors and carrying capacity using a game in which they all play cheetahs competing in the savannah.

Teaching the Lesson

Activity 1 – discussion

It is possible for each of the over 6 billion people on Earth to fit in a country the size of Namibia. Discuss with the learners whether or not we would all survive in that much space. What else would we need? Review with them the four factors that affect an animal's habitat (food, water, shelter, and space).

The limiting factor is the factor which is in the shortest supply. For example, a cheetah can have excess space, food, and shelter, but if water is in short supply, it still will not be able to survive. This maximum number of animals that can survive in an environment is the carrying capacity. As long as the limiting factor increases, the carrying capacity can increase as well. But as soon as the limiting factor decreases, the carrying capacity must decrease as well.

This activity will demonstrate carrying capacity by using food as the limiting factor. The food is divided into different cheetah prey animals, each counting as a certain amount of energy. Each animal has a certain amount of energy it requires to survive, and those who do not meet that requirement will die.

Activity 2 – outdoor game 'cheetah hunt'

Before the activity begins, prepare 200 'prey.' Small, reusable cups are useful because they are easy to pickup, but even small blocks of wood will work. Label with a G, R, P, D, or S according to the chart below:

Prey animal	Population	kg of prey
Guinea Fowl (G)	100	1
Rabbit (R)	50	2
Porcupine (P)	30	7.5
Duiker (D)	19	20
Springbok (S)	1	75

You will also need a blindfold for one of the 'cheetahs.'

Procedure:

1. Begin by setting up the outside game area. Evenly spread the cups (prey) throughout the field.
2. Discuss with learners that they will be playing a game which demonstrates how many cheetahs can live in an area.

   Here are the rules of the game:
   - Each person will represent a cheetah
   - Together, you are a population of cheetahs in a defined habitat
   - You need to find enough food to survive for 1 month (50 kg)
   - Each cheetah must find a shelter where they can keep their prey
   - Cheetahs stalk their prey and only use their incredible speed when their prey runs. Your prey will not be running away, so you can't run either!
   - A cheetah can only take one prey at a time and take it back to its shelter
   - Cheetahs cannot fight over prey because they can get injured
   - Do not damage the prey! Be careful!
   - When all of the prey has been picked up, we are done. Stay at your shelter.

3. Ask for three volunteers. One volunteer will be injured and must hop on one leg the entire time. One is blind because of an unfortunate encounter with a porcupine, so cannot see. Give them a blindfold to use. The last is a mother with two cubs. Each needs an extra 25kg of food to survive so she needs 100kg for her family to survive.
4. Send the learners to their shelter. Review that each needs 50kg to survive. There are five different prey animals and each one is worth so many kg of food. Review the prey and kg of each prey.
5. Begin the game! When the learners are finished, have them add up their kg's and meet up.
6. Ask each learner to tell how many kg's of prey they caught. Keep track of the number as you go. Ask the three volunteers to go last. When they are finished, tell them how many survived out of how many there were originally.
7. Ask the learners what the limiting factor to cheetah survival was in this case. (Food). Then ask what the carrying capacity of this habitat is for cheetahs. This is the number that survived. Discuss why so many died. Also, how did the three volunteers do? Is it easy for a mother cheetah to get enough food for both her and her cubs?
8. Discuss what would happen to the cheetah population if a virus killed off the rabbit population. Conversely, what would happen to the rabbit population if hunters lowered the cheetah population? (It's all interrelated!)
9. There are just over 6 billion people in the world today. If they stood side by side they could all fit in Namibia. Would we all survive? How does this relate to carrying capacity?

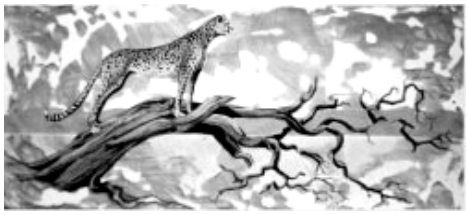
Now, using the descriptions on the following page, describe how a real cheetah would hunt its prey. How is it different than other large cats?

Cheetah Hunt

To achieve a successful hunt, a sequence of behaviors occurs. If the sequence is interrupted, the hunt will be abandoned. If it is successful, the cheetah may not have to hunt again for several days.

Visual Contact

The cheetah climbs termite mounds or trees as vantage points to locate potential prey.



Approaching Prey

The cheetah may either select or stalk prey from a hidden position or approach the prey at a walk or slow run.

Chase

The cheetah bursts into full speed after its prey. If the chase is unsuccessful, the cheetah will need to rest before another hunt is attempted.

Trip

Running at full speed the cheetah uses its front foot and dewclaw to strike at the hind legs of its prey, tripping and knocking it down

Killing Prey

Prey is killed by suffocation when the cheetah takes hold of the throat, closing off the windpipe.

Rest

The cheetah will sometimes be too exhausted to eat after a high speed chase. It may rest for up to 30 minutes before hunting or eating again.

Feeding

Cheetahs often drag their kills to a shaded area and begin eating the hindquarters of the carcass.

PREDATOR – PREY RELATIONSHIPS

SUBJECT AREAS:
Mathematics
Sciences
Agriculture

DURATION/TIME:
Activity 1: 10 min
Activity 2: 30 min
Activity 3: 20 minutes

RECOMMENDED PREPARATION:
Activity 1:
Review the sheet 'a place for predators' in the Reference section for the discussion.

Activity 2:
Photocopy and cut out cheetahs and gazelles for groups

MATERIALS NEEDED:
Activity 2:
All materials listed are needed **per group** of learners:
- Photocopy of one large cheetah
- Photocopy of 250 gazelles (3 copies of gazelle page)
- A 60cm square section of table top
- Masking tape or coloured sello tape
- Data table
- Graph paper

LOCATION:
Classroom

KEY WORDS TO REVIEW:
Predator
Prey
Population
Generation

OBJECTIVE:

Learners will simulate the interactions between predators (cheetahs) and prey (gazelles) to discuss and understand population of species.

LESSON ACTIVITIES:

ACTIVITY 1:
Discussion on predator-prey relationships and preparation for the 'cheetah vs. gazelles' game.

ACTIVITY 2:
Predator and prey relations are discovered by playing the 'cheetah vs. gazelles' game.

ACTIVITY 3:
Graphing activity with information from data table in Activity 2 and discussion.

Teaching the Lesson

The purpose of this activity is to simulate the interactions between cheetahs and gazelles in order to understand what happens to the population of both species.

Materials:

Note the materials needed on previous page. Cheetah and gazelle images can be found in this lesson to be copied.

Activity 1 – cheetahs vs. gazelles game preparation

Begin by discussing what is a predator and prey and what the relationships are between the two. (Use the sheet 'a place for predators' in the Reference section to aid in discussion.)

Divide the class up into groups of 3-4. Each group needs the above materials. Cut-outs of the cheetahs and gazelles are provided. Before they begin, learners should create a data table that keeps track of the generation, cheetah population, and gazelle population.

A sample data table is below.

	GENERATIONS																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	26	17	18	19	20	**21**	**22**	**23**	**24**	**25**
Cheetah Population																									
Gazelle Population																									

Activity 2 – cheetahs vs. gazelles game

Begin by discussing the rules of the game:

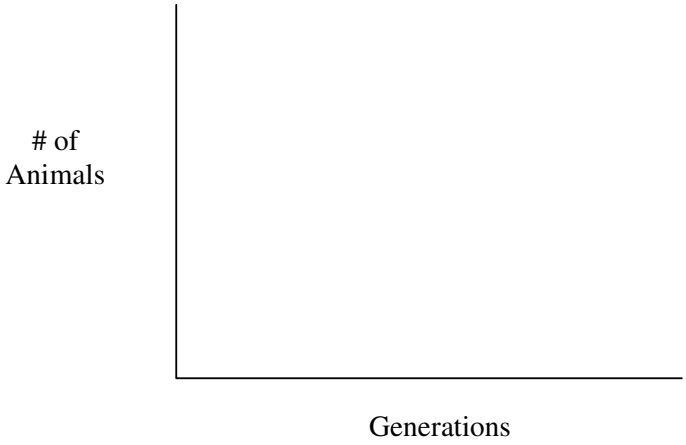
1. Begin with 3 gazelles and 1 cheetah.
2. A cheetah needs to catch 3 gazelles to survive.
3. If the only cheetah dies, another will take its place.
4. If all gazelles die, 3 more will take their place.
5. A cheetah needs to catch 3 gazelles at one time to reproduce.
6. The gazelle population doubles after each generation.
7. If a gazelle is caught, it must be removed.

Activity Procedure:

1. Mark off your valley with a 60cm x 60cm square of masking tape.
2. Distribute 3 gazelles in a valley.
3. Toss the cheetah once to catch a gazelle.
4. Complete the data table for generation #1.
5. Double the gazelles left and disperse them in the meadow.
6. For each generation, toss each cheetah and remove caught gazelles.
7. Simulate 20 generations, recording data at each generation. Guess the last 5 generations.

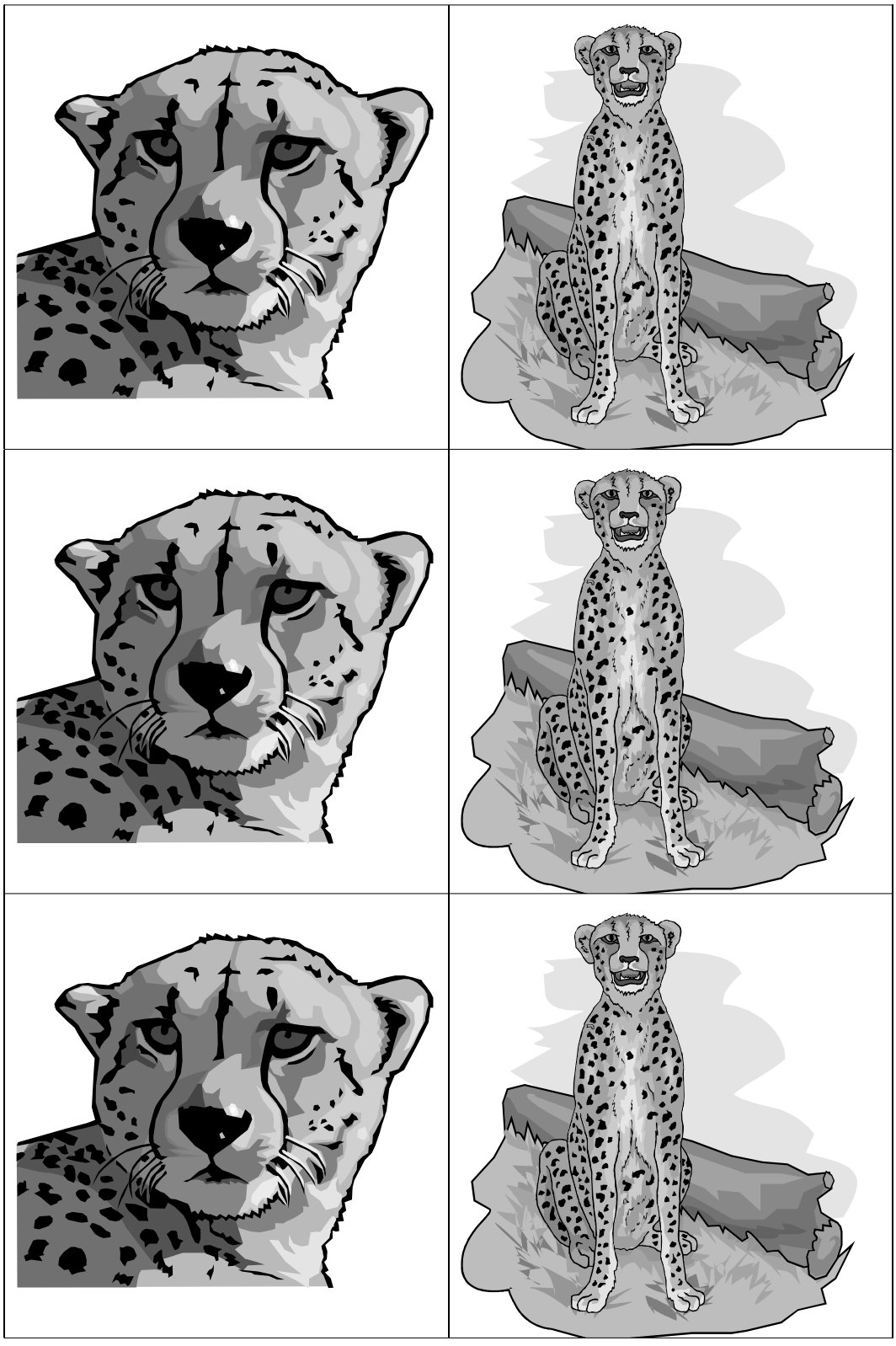
Activity 3 – cheetahs vs. gazelles graph & discussion

Graph the data for 25 generations. Place both the gazelle and cheetah data on the same group (in different colours). Label the vertical axis "Number of Animals" and the horizontal axis "Generations."

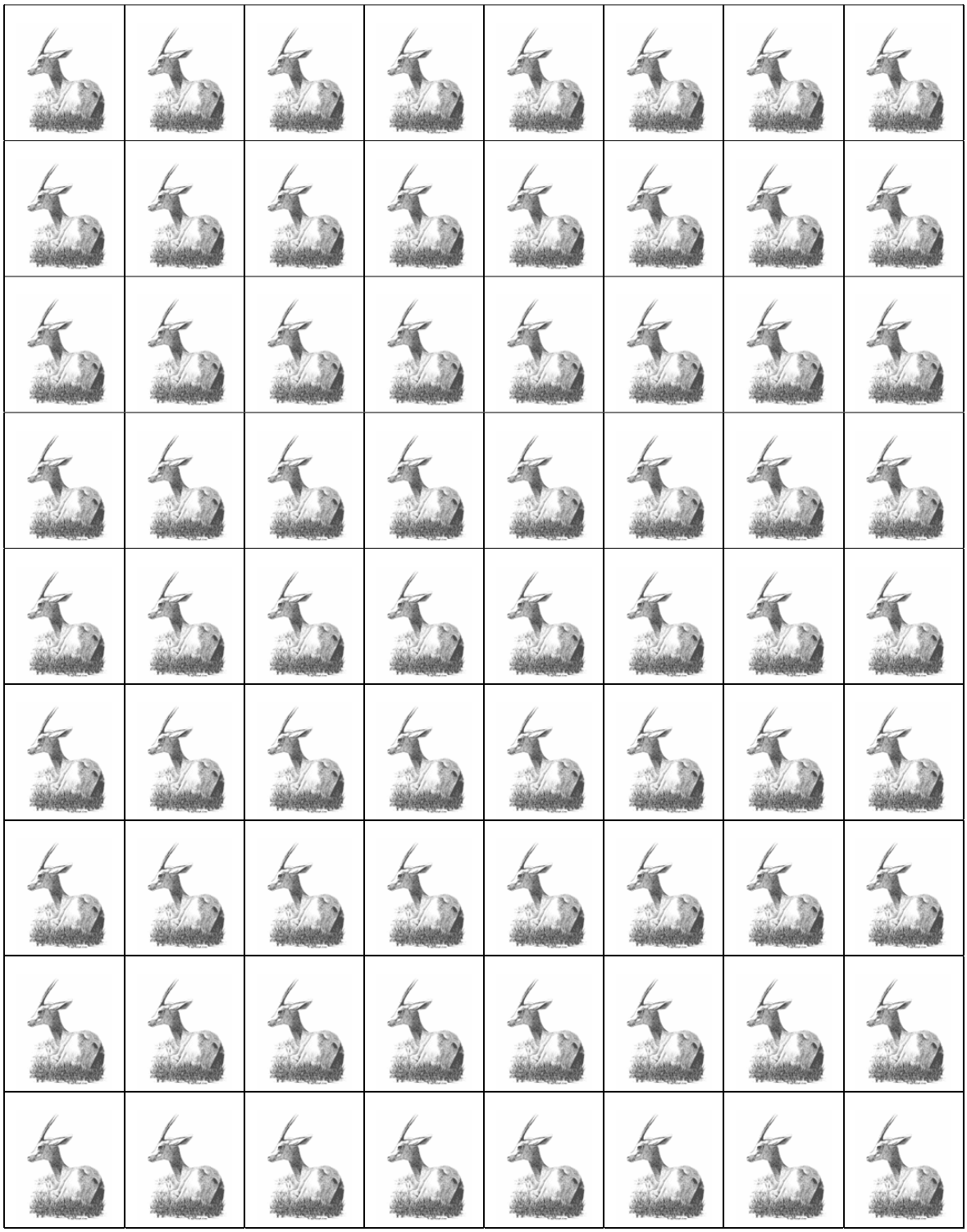


When the groups have finished and the graphs are complete, here are possible discussion topics:

- What shape do both the cheetah and gazelle population graphs have?
- Which graph peaks first, the cheetah or the gazelle? Why?
- If another predator is introduced to this game in addition to the cheetah, what do you predict would happen to both graphs?
- If the cheetah were removed from this game, what would happen to the gazelle population? What do you predict would happen if this occurred in real life?



(large cheetahs to use in cheetah vs. gazelles game)



(Gazelles to use in cheetah vs. gazelles game)

POPULATION CHANGE

SUBJECT AREAS:
Mathematics
Sciences
English

DURATION/TIME:
Activity 1: 40 min
Activity 2: 30 min
Activity3: 20 min

RECOMMENDED PREPARATION:
Activity 1:
Read the background 'threats to survival' sheet and prepare procedures for the game.

Activity 2:
Read the 'cheetahs and farmers' sheet in the Reference section

MATERIALS NEEDED:
Activity 1 & 2:
Graph paper

LOCATION:
Classroom

KEY WORDS TO REVIEW:
Population
Community

OBJECTIVE:

Learners will look at the factors that influence populations. Learners will evaluate populations using maths, English and science skills.

LESSON ACTIVITIES:

ACTIVITY 1:
Learners will play the 'cheetah challenge' game and discuss ecosystems and habitat. Learners will complete a graph activity and a writing activity.

ACTIVITY 2:
Learners will play the same 'cheetah challenge' game with the addition of the farmer.

ACTIVITY 3:
There are prompts for writing activities, based on the 'cheetah challenge' games, for learners to complete

Learning Outcomes

In this activity learners will look at which factors influence a population, including food, shelter, and space. They will play a game which simulates a population of cheetahs competing for food, shelter, and space. The data will then be graphed.

Teaching the Lesson

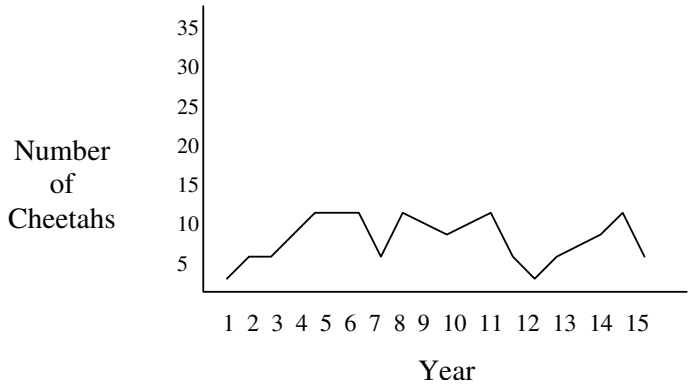
Introduce vocabulary:
Population: all the people in a country or region; number of animals in a region
Community: any group living in the same area or having interests in common

Activity 1 – 'cheetah challenge' game with graphing activity

Procedure

1. Ask the learners to count off in fours. Have all the "ones" go to one side of the activity area and the rest to the other side. Learners with these numbers 'become' the cheetah or habitat components listed below.
   Ones – Cheetahs
   Twos – Food
   Threes – Shelter
   Fours – Space
2. The "ones" become cheetahs. Ask the learners what a cheetah or any animal needs to survive - food, water, shelter and space. For the purpose of this activity, assume that the cheetahs have enough water to drink. The "ones" need to find food, shelter and space. If a cheetah (the "ones") wants to find food they clamp their paws over their stomachs. If the cheetah is looking for shelter, it puts its paws over its head. If it is looking for space, it crosses its paws across its chest (like hugging itself). A cheetah can choose to look for one of its needs during each round and can change what it is looking for in the next round, if it survives. The cheetah can not change its sign when it sees what is available during that round.
3. The twos, threes, and fours are food, shelter and space - components of a habitat. At the beginning of each round, each learner is allowed to choose which component he or she will be during that round. The learners depict which component they are in the same way the cheetahs show what they are looking for; that is, hands on stomach for food, etc.
4. The activity starts with all players lined up on each side of the activity area (cheetah on one side, habitat components on the other side) and with their backs facing the learners along the other side of the area.

5. Begin the first round by asking the learners to make their signs - each cheetah deciding what it is looking for, each habitat component deciding what it is. Give the learners a few moments to put their hands in place. (The two lines of learners normally will display a lot of variety in signs. As the activity proceeds, sometimes the learners will confer with each other and all will make the same sign. That's okay, and you may encourage it. For example, all learners in the habitat might decide to be shelter. This could represent a drought year with no food or water.) Note: Switching symbols in the middle of a round can be avoided by telling the learners if they are caught cheating they will not participate.
6. When the learners are ready, say: "Cheetah Challenge!" Each cheetah and each habitat component turn to face the opposite group, continuing to hold their sign clearly.
7. When the cheetahs see the habitat component they need, they run to it. Each cheetah must hold the sign of what it is looking for until getting to the learner in the habitat with the same sign. Each cheetah that reaches its necessary habitat component takes the "food," "shelter," or "space" back to the cheetah side of the activity area.
8. "Capturing" a habitat component represents the cheetah successfully meeting its needs and successfully reproducing as a result. Any cheetah that fails to find its food, shelter, or space, dies and becomes part of the habitat. Note: When more than one cheetah reaches a habitat component, the learner who arrives first survives. Habitat components stay in place until a cheetah chooses them. If no cheetah needs a particular habitat component during a round, the habitat component just stays where it is in the habitat. That habitat component can, however, change which component it is from round to round.
9. Record the number of cheetah at the beginning of the activity and at the end of each round. Continue the activity for approximately 15 rounds. If possible, have a learner or two assist you in recording the numbers.
10. After each round, ask the learners to observe what is happening to the cheetah population. Why did it increase?
11. At the end of 15 rounds, use an overhead projector, flip chart or chalkboard, and post the data recorded during the activity. The number of cheetah at the beginning of the activity and at the end of each round represents the number of cheetahs in a series of years. That is, the beginning of the activity is year one; each round is an additional year. Cheetah can be posted by fives for convenience. For example:



Graphing:
Have the learner record the posted data in the form of a graph. The learners will see this as a visual reminder of what they experienced during the activity: the cheetah population fluctuated over a period of years. This process is natural as long as the factors that limit the population do not become excessive, to the point where animals cannot successfully reproduce.

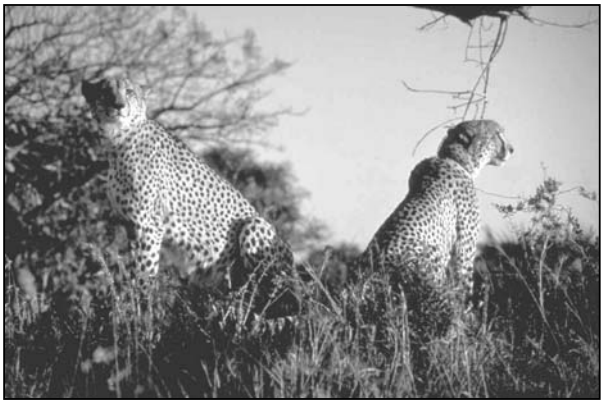
Writing:
With the graph, have the learners write a brief paragraph regarding what was happening with the cheetah population with thoughts on how habitat components are affecting the population numbers. (e.g.: is the population stable- does it fluctuate within acceptable levels; does it crash and why; what would happen if one of the four components was totally removed from the system, etc.)

Extension:
Try to record numbers for all four of the habitat components as well as cheetah numbers on each round and graph the results with a discussion on what you see.

Assessment

Checklist for Graph:

Assessment statements	Yes	No
Graph has a heading		
Both axes are labelled		
Axis labels are correct (number of cheetahs vs. years)		
Axes are divided into relevant intervals		
Data is plotted accurately		
The graph is neat and legible		



Activity 2 – 'cheetah challenge' game incorporating farmer

This is a continuation of Activity 1: Use the data from that lesson or rerun the learners through the exercise and continue with the following steps. Also, use the 'cheetahs and farmers' sheet found in the Reference section as background.

12. Once you have completed a few rounds and observed the changes in the cheetah population, it is time to introduce the trapper / farmer. The trapper starts in his home, which is a designated area off to the side of the activity area. The trapper must skip or hop. This reduces the possibility of violent collisions between cheetah and trapper. Trappers can only tag a cheetah when they are going towards the habitat and are between the habitat and cheetah lines. Once a cheetah is tagged, the trapper escorts the cheetah back to the trapper's home. The caught cheetah is now another trapper. If a trapper fails to tag a cheetah during a round, the trapper becomes habitat.
13. After a few rounds with the trapper, ask the learners what happened to the cheetah population. Did it increase? Decrease? Why?
14. Have the learners add this data onto their graphs from Activity 1.
15. The learners will again see this visual reminder of what they experienced during the activity: the cheetah population fluctuated over a period of years. This process is natural as long as the factors that limit the population do not become excessive, to the point where animals cannot successfully reproduce.

Activity 3 – writing activity using 'cheetah challenge' games

Ask the learners to summarize some of the things they learned from this activity in an essay. You can give them the following questions/topics as a guideline:

- Would the trapper be a natural factor?

(ANSWER: *No. Farmers / trappers tend to remove too much from a system resulting in an imbalance.)*

- The wildlife populations will tend to peak, decline and rebuild; as long as there is good habitat and sufficient numbers of animals to reproduce successfully. How might the trapper affect this trend?

(ANSWER: *The trapper will disturb this trend by removing too much so that reproduction will not be successful enough to rebuild the population.)*

- What is realistic and unrealistic about this simulation?

(ANSWER: *Cheetahs that don't survive DO become recycled as nutrients but it is not instantaneous. Cheetahs need ALL habitat components to survive. Poor habitat usually results in weakened individuals that succumb to disease, not instant death.)*

- What do animals need to survive? And why?

(ANSWER: Food, water, space, shelter)

- How do these components influence carrying capacity?

(ANSWER: *If any of these components are absent or there is an insufficient amount it will decrease the number of animals that can live in that habitat.*

- What are some of the "limiting factors" that affect the survival of animals?

(ANSWER: *Food, disease, water, space, shelter, increases in predation, etc.)*

- How do factors limiting carrying capacity affect health, numbers and distribution of animals?

(ANSWER: *Animals will be unhealthy, numbers will decrease, animals will move to other areas which could offer better chances of survival.)*

- How do these factors affect competition within species?

(ANSWER: *Competition will increase if there is insufficient food, water, space, or shelter.)*

- Are wildlife populations static, or do they tend to fluctuate as part of an overall "balance" or ecological systems involved in the process of constant change?

(ANSWER: *Wildlife populations tend to change all the time in response to changes in the environment, such as varying food availability, water availability, etc.)*

- How does the trapper affect this "balance" of nature?

(ANSWER: *Trappers can disturb this by taking too much out of the system.)*

Background – threats to survival

The cheetah is facing many threats to its survival, including the high death rate of cubs, loss of habitat, a reduction in its prey base, conflict with livestock farming and a reduced ability to survive in parks and reserves due to the presence of larger predators.

The cheetah's ideal habitat is open grassland and the cheetahs occupy quite large territories. Man wants this land for livestock farming, leading to an obvious conflict resulting in the cheetahs' survival being in doubt as an increasing amount of land is converted for human use. Furthermore, as a predator, the cheetah is seen as a threat to livestock and is generally trapped and shot by farmers under the perception that the cheetah is having an excessive economic impact. In some instances large corporate companies eliminate the wild herbivores to make space for livestock. This removes the cheetah's natural prey, resulting in starvation for many.

If the farmer employs effective livestock management practices, they suffer little or no livestock loss to cheetahs due to their hunting behaviour. The cheetah is not generally a livestock predator due to the fact that it relies on speed and does not have the weight for an ambush attack. Livestock does not run, therefore the cheetah is not stimulated to chase and kill. However, if desperate, the cheetah has been known to go for the easier kill, such as goats and sheep. This is generally when the cheetah is old, ill, injured or has no other alternative prey available. The problem has been a lack of education; farmers do not understand the nature of the cheetah and have been blaming it for livestock kills due to the fact that it is a day hunter and therefore always seen.

In the past, our solution to conservation issues has been to put animals in a protected area such as game parks and nature reserves. This, however, is not an ideal situation for a cheetah due to the presence of larger predators such as lion, leopard, hyena, etc. These predators will kill cheetah adults and cubs since they are seen as competition; they will also steal their kills. If a cheetah loses too many kills they will starve to death. As a result of losing too many cubs as well as an increase in loss of kills, cheetah numbers are decreasing in game parks and nature reserves. This means that most of our cheetahs live outside of protected areas, mostly on livestock farms, where the farmer is the threat. Through education, it is possible to bring about a sharing of land between farmers and cheetahs and thereby ensure the survival of this species.