Pathway: Nature

Lesson 1: African Animals

Pathway: Nature

Topic: African Animals

Prerequisites: None

Next topic: Ecosystems

Cross Curricular Links:

Variation among animals.

Classifying animals into simple groups.

Identifying vertebrates.

Learning outcomes:

Understand there is a large diversity of animals in Africa.

Recognise some of the animals present in Africa.

Know the difference between vertebrates and invertebrates and name the ten major groups.

Pathway aims:

The pathway Nature looks to support the curriculum by providing environmental education about the ecology of Africa. The aims of this program are for children to understand the diversity of life in Africa, ecosystem relationships and conservation.

Lesson Overview: This lesson looks at the simple classification of animals and the biodiversity of life within Africa.

Keywords: Biodiversity, invertebrates, simple classification, vertebrates.

Resources: PowerPoint, pens, post-it notes and field notebooks.

Time	Lesson/activity	Teachers notes
PowerPoint (Slide 1 & 2) *3 minutes*	Go over learning outcomes and hand out the field notebooks—children should write their name on the front cover. Explain why scientists use field notebooks and that the children's field notebooks contain activities to be done in and outside of lessons.	
PowerPoint (Slide 3) *4 minutes*	**Ask the children:** **How many animals are in the world?** *Answer: scientists have identified and named over 76,400 animals but there are many animals yet to be discovered.* **How many animals are identified in Africa?** *Answer: there are 8,590 animals identified in Africa.* **Ask the children why we have not found all the animals in the world?** *Example answers: some places are hard to access (e.g. sea or rainforest), some animals are hard to find (e.g. very small or come out at night), some animals may look very similar to each other and some animal groups are better studied than others.* **Ask the children how long they think it would take to find all the organisms in the world?** *Answer: 1200 years.*	As these questions are being discussed the children should write the answers on page 6 of their field notebooks. <u>Advanced Level Questions:</u> **What is an organism:** *Any life form including animals, plants or fungi.* **How many organisms are in the world?** *Scientists have identified over 116,000 organisms- however, it is thought that this is only 14% of all organisms on Earth and there are actually between 2—100 million (recent estimates of 8.7 million).*
PowerPoint (Slide 4) *5 minutes*	We need to group animals as there is so many of them. Explain the difference between vertebrates and invertebrates. Go through the five major groups of vertebrates (birds, mammals, amphibians, reptiles and fish) and explain the differences between the groups. Go through the five major groups of invertebrates (slugs, snails, spiders, worms and insects) and explain the differences between the groups. (*e.g. spiders have eight legs and two body parts whereas insects have 6 legs and two body parts*).	As this slide is being discussed the children should write the answers on pages 8 and 9 of their field notebooks. *Vertebrate – animal with a backbone.* *Invertebrate – animal without a backbone.*

Time	Lesson/activity	Teachers notes
PowerPoint (Slide 5) *8 minutes*	Ask the children to complete one of the boxes in the picture-perfect activity—page 10 in the field notebooks. Hand out post-it notes. Get the children to write on the post-it note which animal they drew and the major group it belongs to. Stick it onto the table on the PowerPoint (if you have no post-it notes this can be done through hands up). **Are there more vertebrates? Which major group is the most represented? Discuss why this is.**	
PowerPoint (Slide 6 & 7) *4 minutes*	Talk further about the group mammals—definition of a mammal is on the PowerPoint. There are many different mammals in Africa. **How many mammals can the children think of?** **Ask the children if they recognise the animals in the photos?** They can write the answer on page 12 of their field notebooks. Better images are on slide 7. *Answer: Top— African wild dog, hippopotamus, elephant, buffalo; Bottom—antelope, baboon, vervet monkey, lion.* **Ask the children which of these animals are part of the big 5?** *Answer: lion, elephant and buffalo.* *The other animals in the big 5 not included here are—rhinoceros and leopard.*	**If the class does not know what a species is, explain it now.** *A species is a group of organisms that can freely interbreed to produce fertile organisms.*
PowerPoint (Slide 8, 9 and 10) *5 minutes*	Explain what biodiversity is and go through the simple ecology terms on the board. On slides 9 and 10 further explain how to measure habitat biodiversity using species richness and species evenness.	Children should write the answers on pages 14 and 15 of their field notebooks.
PowerPoint (Slide 11) *16 minutes*	Explain how to measure biodiversity using a quadrat. If you have time during the lesson you can show the children how to use a quadrat (if you do not have quadrats at your school then pages 16-17 in the field notebooks tells you how to make one). On page 19 make the children collect their own data using quadrats. Once they have done this, they can use pages 20 and 21 to estimate the number of flowers present.	*Explanation on how to use a quadrat on pages 16-21 of the field notebooks.*

Pathway: Nature

Lesson 2: Ecosystems

Pathway: Nature

Topic: Ecosystems

Prerequisites: African Animals

Next topic: Conservation

Cross Curricular Links:

Understand the components of a ecosystems.

Categorise animals by their diet.

Be able to create a food chain or food web.

Understand the aesthetic value of nature.

Learning outcomes:

Understand the meaning and components of ecosystems.

Categories animals by their diet.

Be able to create a food chain or food web.

Understand what ecosystem services are and provide examples.

Pathway aims:

The pathway Nature looks to support the curriculum by providing environmental education about the ecology of Africa. The aims of this program are for children to understand the diversity of life in Africa, ecosystem relationships and conservation.

Lesson Overview: This lesson looks at relationships within an ecosystem; how biotic and abiotic factors interact, food chains and how ecosystems benefit humans.

Keywords: Abiotic factors, biotic factors, ecosystems, ecosystem services and food chains/webs.

Resources: PowerPoint, pens and the field notebooks.

Time	Lesson/activity	Teachers notes
PowerPoint (Slide 1 & 2) *3 minutes*	Introduce the topic ecosystems, go through the learning outcomes and hand out the field notebooks.	
PowerPoint (Slide 3) *4 minutes*	Explain what an ecosystem is and that ecosystems are made up of a range of habitats—recap on ecology definitions. Ecosystems can be small (e.g. a pond) or very large (e.g. a rainforest). Discuss abiotic and biotic factors. **There are several images on the board. Ask the class which are biotic factors and which are abiotic factors.** *Answers: biotic—grass and insects. Abiotic—soil, sunlight and water.* **Think about an ecosystem in your country. Can the children name abiotic and biotic factors in the ecosystem near you?**	*An ecosystem is a community of interacting organisms and their environment.* *Biotic factor: a living thing that affects other organisms.* *Abiotic factor: a non-living thing that affects other organisms.* The children should fill in page 22 of their field notebooks during this slide.
PowerPoint (Slide 4) *3 minutes*	Talk about the three different types of ecosystem interactions: interactions with the environment (e.g photosynthesis and respiration), feeding (e.g. food chains) and competition (e.g. mates). These interactions can directly impact a species (e.g. humans eating fruit from a tree) or indirectly impact a species (e.g. bees pollinating flowers which allow crops to grow in which humans eat). Today you will further look at feeding relationships.	Further explanation is on page 23 of the field notebooks.
PowerPoint (Slide 5 & 6) *8 minutes*	Explain how to categorise animals depending on their diet (herbivore, omnivore, carnivore, and detritivore). Ask for African examples of these categorisations. **Tell the children to do pages 24 and 25 of the field notebooks.**	*Detritivore is an animal that eats dead organic matter.*
PowerPoint (Slides 7, 8 & 9) *7 minutes*	Teach the children about food chains (including what producers/consumers are and how energy moves along a food chain) using the example on slide 7. **On slide 8 have the children fill in pages 26-28 of their field notebooks.**	*Primary producers: an organism (such as a plant) that can make its own food using sunlight through a process called photosynthesis.*

Time	Lesson/activity	Teachers notes
PowerPoint (Slide 9)		*A consumer: an organism that eats organic material.*
PowerPoint (Slide 10) *10 minutes*	Introduce food webs. The animals in the food web are zebras, grasshoppers, giraffes, vervet monkeys, African wild dogs, lions and leopards. Show the children there are multiple food chains within a food web (there are seven food chains in this example). Look at how the change in abundance of one organism can affect other organisms, e.g.: **Ask the children what would happen to the vervet monkeys if there were no grasshoppers?** *Answer: the vervet monkeys would feed on trees/fruit more – this may reduce the number of fruits available for other animals.* **What would happen to the number of zebra if the lion population decreased?** *Answer: the zebra population would increase because there are fewer lions.* *Or the zebra population would decrease because fewer lions mean more African wild dogs who eat the zebra.* **Tell the children to read pages 29—31 of their field notebooks and answer the questions.** *Answers: (1) grass and fig tree* *(2) 4* *(3) the grasshopper population would increase* *(4) zebra would have an increased predation pressure as lions are no longer feeding on baboons.*	

Time	Lesson/activity	Teachers notes
PowerPoint (Slide 11) *10 minutes*	Watch the video on ecosystem services (link in the top right corner of the PowerPoint). Discuss the different types of ecosystem services provided by nature: • Provisioning: products obtained from ecosystems (e.g. water). • Regulating: for example, climate, disease and water regulation. • Cultural: non-material benefits (e.g. inspirational, aesthetic, education and cultural heritage). • Supporting services: necessary for the production of other ecosystem services (e.g. soil formation, nutrient cycling and primary production). Get the children into small groups—ask them to discuss what benefits they get from nature. **Ask the children why it is important to maintain high biodiversity in ecosystems?** *Answer: ecosystems with higher biodiversity are healthier, more stable (better at recovering from disasters), species are dependent on one another - loss of biodiversity can affect the whole system.* If there is time at the end of the lesson then the students can discuss ways humans are affecting the environment and how this may impact ecosystem services.	

Pathway: Nature

Lesson 3: Conservation

Pathway: Nature

Topic: Conservation

Prerequisites:

African Animals; Ecosystems

Advised prior lessons:

None

Learning outcomes:

Understand what extinction is and how organisms are categorised by extinction risk.

Know the benefits and costs of conservation in National Parks and zoos.

Know about National Parks that are in your home country.

Cross Curricular Links:

How human impacts affect biodiversity and the environment.

Pathway aims:

The pathway Nature looks to support the curriculum by providing environmental education about the ecology of Africa. The aims of this program are for children to understand the diversity of life in Africa, ecosystem relationships and conservation.

Lesson Overview: Understand extinction risk to species and different ways that we can conserve them.

Keywords: Conservation, extinction, National Parks, zoos

Resources: PowerPoint, paperclips or counters, pens and the field notebooks.

Time	Lesson/activity	Teachers notes
PowerPoint (Slide 1 & 2) *3 minutes*	Introduce the topic conservation and go through the learning outcomes. Hand out the field notebooks.	
PowerPoint (Slide 3) *3 minutes*	Explain what extinction is and give examples of extinct animals from your country. **Ask the children why the extinction of animals is bad?** *Example answers: we can never bring them back, other animals in the ecosystem may rely on them or they may provide an ecosystem service.* Explain that there are lots of species at risk of extinction because of human impacts.	*Extinction: when the last individual of a species dies.* *You can also look at local extinctions (e.g. the grey wolf is no longer found in the United Kingdom but is still found in other parts of the world).*
PowerPoint (Slide 4) *4 minutes*	Scientists can measure the risk of extinction for each organism using this scale. Red—Extinct and Extinct in the wild. Orange—in danger of coming extinct: Critically Endangered, Endangered and Vulnerable. Green—Least Concern and Near Threatened. The green categories are not in danger of going extinct however the Near Threatened class is close to moving into the Vulnerable category.	Page 36 in the field notebooks gives more information on this.
PowerPoint (Slide 5) 10 minutes	The children are to play the survival game (found on pages 38—41 of their field notebooks). They can play this in pairs. The instructions are in the field notebooks. **Ask the children to answer the questions on the board and discuss their answers.**	You will need: Counters or paperclips
PowerPoint (Slide 6) *10 minutes*	**Ask the children to complete the activity on pages 42—43 of their field notebooks—answers are at the end of this resource.** This will provide a recap about biodiversity and how humans are affecting the environment. **Ask the children to discuss the questions on the board in pairs.**	

Time	Lesson/activity	Teachers notes
PowerPoint (Slide 7, 8 & 9) *12 minutes*	Explain what conservation is and that it can occur in lots of different places (*for example, zoos, aquariums, botanical gardens, National Parks or safari areas*). **Split the class in half. One half of the class is to discuss the advantages of protecting primates in zoos and the other half of the class is to discuss the advantages of protecting primates in National Parks.** *Example answers are on slide 8.* **Then have the same groups discuss the disadvantages of protecting primates in zoos and National Parks** *The answers are on slide 9.*	Tell the class to complete pages 44—45 of their field notebook.
PowerPoint (Slide 10) *3 minutes*	**Homework:** **Tell the class to complete the exercise on pages 46—49 of the field notebook**—answers for the fill in the gap exercise are in the box below. The children should find the answers online.	The Kavango Zambezi Transfrontier Conservation Area is a large area protected for conservation that covers five different countries (called transboundary conservation). It contains many National Parks, areas of conservation, safari areas and Victoria Falls– one of the natural wonders of the world.
Answers for field notebooks	**Page 42:** Biodiversity is the variety of life on earth and currently biodiversity loss is one of the biggest **threats** to our planet. The current rate of extinction is 100-1000x the **normal** rate due to human activities. The loss of biodiversity is damaging the **stability** of ecosystems. All species are connected to each other in some way (seen in food chains and food webs). And the loss of even **one** species may change how ecosystems work. The human population is growing exponentially. In 2019 the human population was 7.7 billion and is expected to reach **9.7 billion** by 2050. As the human population grows so does the demand for **food** and other goods leading to threats including **unsustainable** agriculture and logging.	

Time	Lesson/activity	Teachers notes
Answers for field notebooks	Natural vegetation is cleared for agriculture reducing **habitat** size and species evenness causing a loss of diversity as one dominant crop type is planted. **Deforestation** causes a reduction in biodiversity, habitat loss, soil erosion and much more. Between 1990 and 2015 it is estimated that an area equivalent to **79.98 million** football fields of native forest was lost worldwide. **Page 46:** National Parks are (near) natural areas that are large enough to conserve whole **ecosystems** and protect biodiversity, ecosystems and ecosystem **services**. As well as its focus on conservation, National Parks promote **education** and recreation (both for local people and tourists) as well as taking into account the needs of local communities. One of the most famous **National Parks** in Africa is the Kavango Zambezi Transfrontier Conservation Area. This area is larger than Zimbabwe and covers **5** countries (Namibia, Zambia, Zimbabwe, Botswana and Angola). It contains many conservation areas and attractions for tourists including **Victoria Falls**; one of the seven natural wonders of the world.	