The Toledo Zoo/ThinkingWorks
Teacher Overview for the Aviary Lessons
Teacher Overview: Aviary

Birds have many traits that are unique to this particular class of animals. Below is a list of general bird traits to help you and your students complete the ThinkingWorks lesson. This lesson will concentrate on typical birds that most people are familiar with.

Birds are divided into 27 groups or orders, each with its own set of features. Some of the more easily recognized orders include penguins (Sphenisciformes), pigeons and doves (Columbiformes), parrots (Psittaciformes), owls (Strigiformes) and woodpeckers and toucans (Piciformes).

We have included a list of the different birds found at The Toledo Zoo. Most of the birds are found in the Aviary, but there are also birds in the Waterfowl Pool, African savanna and the Aquarium. Note that animals move constantly in and out of the Zoo. Please call the Zoo for a current list of birds that are on exhibit and their locations.

General Bird Traits

All birds have a lightweight beak instead of teeth. The shape of the beak depends on the bird’s lifestyle.

All birds have wings, but not all birds can fly.

Strong, lightweight feathers create a contoured surface for flying (or swimming) and provide warmth and waterproofing.

Good vision

Clawed toes
**General Bird Characteristics**

- All birds have an array of lightweight, strong *feathers* that make up the *plumage*. Feathers function as an effective body insulator and as structures on the wings and tail for flight.
- The coloration of feathers plays a significant role in communication and camouflage.
- All birds have wings, but not all birds fly. Ostriches, kiwis and penguins are examples of flightless birds.
- Most birds have hollow bones that reduce weight for flight. Penguins have solid bones, an important adaptation for life underwater.
- All birds have *beaks*, but each species of bird has a beak shape that is adapted to its particular lifestyle. For example, insect eaters and seed eaters have beaks with different shapes.
- Birds rely mainly on their vision. Their eyes are large as are the optic lobes of the brain.
- Most birds (exceptions are vultures and kiwis) have a very poor sense of smell and have small olfactory lobes on the brain.
- Most birds have an extensive system of air sacs attached to the lungs to supply sufficient oxygen and to dissipate the large amount of heat generated by the flight muscles and heart during flight.
- All birds lay eggs. Eggs come in a wide variety of shapes, sizes and colors.
- Laying eggs (oviparity) is a weight-saving adaptation of all birds.
- Bird feet have a wide variety of shapes that are adapted for the lifestyle of each species. For example, raptors (e.g., hawks, owls and eagles), have sharp *talons* for capturing prey, while ducks and geese have *webbed* feet for paddling through the water.
- Many birds have a gizzard that is part of the digestive system. The gizzard is very muscular. Birds often swallow small stones that enter the gizzard. The muscular action of the gizzard combined with the stones act like teeth to grind up seeds and other hard food.
- Most birds have a very rapid and efficient digestive system. By rapidly digesting food and quickly evacuating waste products, birds keep their weight at a minimum, an important consideration when flying.

**Feather Structure**

- The hard central part of a feather is the *rachis*.
- Parallel rows of barbs make up the feather vane.
- Several hundred tiny barbules branch from each barb. Theses barbules overlap with barbules from the neighboring barbs.
- The barbules on the outer side of the barb have microscopic hooklets to help interlock the barbs, like Velcro, holding the vane together.
Types of Feathers

**Contour Feathers** - Include the body feathers, the flight feathers (including the primary and secondary wing feathers) and the tail feathers.

**Semiplumes** - Are feathers intermediate in structure between contour feathers and down feathers. They provide insulation and fill out the contour of a bird's body.

**Filoplumes** - Are fine, hair-like feathers with a few short barbs at the tip. They are sensory feathers that aid in the operation of other feathers and probably play a role in keeping the contour feathers in place.

**Down Feathers** - Are entirely fluffy feathers that provide an insulating covering for the bird.

**Bristles** - Are specialized feathers with a stiff rachis and a few barbs at the tip. They are found around the eyes and on the head and the toes of some birds. They keep debris out of the eyes and nostrils and aid in capturing insects as the bird flies.

Bird Foot Adaptations

Bird feet are adapted for the particular lifestyle of the bird species.

**Swimming Foot** - Many aquatic birds have feet adapted for swimming or paddling through the water. The three forward-facing toes are webbed, creating a paddle-like structure for pushing the bird through the water.
Walking Foot - Birds such as turkeys, quail and pheasants spend much of their time on the ground. Their feet are adapted for walking, with three long toes pointing forward in contact with the ground and one shorter toe pointing backward that is not in contact with the ground.

Perching Foot - Most birds have a perching type of foot. All four toes are free, mobile and of moderate length. The well developed hind toe is on the same plane as the forward three toes and is opposable to them.

Climbing Foot - Woodpeckers and parrots have a foot adapted for climbing. The foot, with two toes pointing forward and opposable to two toes pointing backward, provides a very firm grip.

Hunting/Catching Foot - Hawks, owls and eagles have a foot that is adapted for catching and subduing prey. Each toe is equipped with a sharp, recurved claw or talon. The undersurface of the toes of fish-eating raptors is roughened to provide better gripping power.

Wading Foot - Birds such as egrets and herons have a foot that is adapted for wading in shallow water. Generally the front three toes are very long to provide a large surface area. This prevents the bird from sinking in the soft silt or mud.
**Beak Adaptations**

**Chisel-like Beak** - Birds like woodpeckers have beaks that are adapted for chiseling wood. Woodpeckers use their beaks to search for insects or to pound out cavities for a nesting hole. Males also use their beaks to drum on a favorite tree to establish territory and to attract a mate.

**Seed-cracking Beak** - Some birds like the northern cardinal have heavy beaks that are adapted for breaking hard seed coats and extracting the "meat". These are usually the birds you see visiting your bird feeding station.

**Tearing Beak** - Raptors, such as hawks and owls, have beaks adapted for tearing flesh from their prey.

**Filter-feeding Beak** - Most ducks have beaks adapted for filtering small plants and animals from the water. Water and non-edible items are forced through ridges in the beak by pressing the tongue against the palate.

**Probing Beak** - Sandpipers have beaks that are adapted for probing for hidden insects or other small invertebrates.
Birds on Exhibit at The Toledo Zoo

Ostrich
Elegant Crested Tinamou
Jackass Penguin
Hamerkop
Saddle-Billed Stork
Red-Breasted Goose
Black-Necked Swan
Lesser Whistling Duck
Mandarin Duck
North American Wood Duck
Pintail
American Widgeon
Common Shoveler
Falcated Duck
Hottentot Teal
Silver Teal
Redhead
Tufted Duck
Canvasback
Bufflehead
Barrow's Goldeneye
Ring Teal
Smew
Hooded Merganser
Red-crested Pochard
African Pygmy Goose
North American Ruddy Duck
Steamer Duck
Cinereous Vulture
Red-tail Hawk
Bald Eagle
Secretary Bird
Peregrine Falcon
American Kestrel
Great Curassow
Chachalaca
Bobwhite
Gambel's Quail
Golden Pheasant
Red Junglefowl
Common Peafowl
Grey Peacock Pheasant
Crested Wood Partridge
Vulturine Guineafowl
Madagascar Button Quail
Stanley Crane
Demoiselle Crane
Common Trumpeter
Grey-necked Wood Rail
Black Crane
Sunbittern
Buff-crested Bustard
Double-striped Thick-knee
Egyptian Plover
Masked lapwing
Blacksmith Plover
Chestnut-bellied
Sandgrouse
Blue Ground Pigeon
Speckled Pigeon
Mauritius Pink Pigeon
Peruvian Pigeon
Plain-breasted Ground Dove
Bleeding Heart Pigeon
Red-throated Ground Dove
Crested Quail Dove
Victoria Crowned Pigeon
Crested Pigeon
Namaqua Dove
Partridge Bronzewing
Jambu Fruit Dove
Temminck's Fruit Dove
Beautiful Fruit Dove
Ring-necked Dove
Pink-headed Turtle Dove
Mourning Dove
Fischer's Lovebird
Blue-crowned Parrot
Scarlet-chested Parrot
Hooded Parrot
Grey Parrot
Violet Plantain-eater
White-cheeked Turaco
Barn Owl
Burring Owl
Common Screech Owl
Spectacled Owl
Tawny Frogmouth
Speckled Mousebird
Pygmy Kingfisher
Kookaburra
Woodland Kingfisher
Carmine Bee-eater
Blue-bellied Roller
Green Woodhoopoe
Rhinoceros Hornbill
D'Arnaud's Barbet
Channel-billed Toucan
Red-bellied Woodpecker
Downy Woodpecker
Long-tail Broadbill
Lesser Green Broadbill
Spangled Cotinaga
Screaming Piha
Hooded Pita
Fairy Bluebird
Cedar Waxwing
Common Sham Thrush
Snowy-headed Robin Chat
Eastern Bluebird
American Robin
Yellow-bellied Laughing Thrush
White-crested Laughing Thrush
Red-billed Leiothrix
Liocichla
Bearded Tit Babbler
Oriole Warbler
Great Tit
Japanese White-eye
Red-crested Finch
Black-crested Finch
Yellow-billed Cardinal
Parrot-billed Seedeater
Blue-black Grassquit
Northern Cardinal
Green Grosbeak
Rose-breasted Grosbeak
Blue Dacnis
Black-faced Dacnis
Violaceous Euphonia
Silver-beaked Tanager
Rufous-crowned Tanager
Paradise Tanager
Bay-headed Tanager
Silver-throated Tanager
<table>
<thead>
<tr>
<th>Aviary Birds</th>
<th>Aviary Birds</th>
<th>Aviary Birds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turquoise Tanager</td>
<td>Black-crowned Waxbill</td>
<td>Sudan Golden Sparrow</td>
</tr>
<tr>
<td>Spotted Tanager</td>
<td>Peter's Twin-spot</td>
<td>Golden-crested Mynah</td>
</tr>
<tr>
<td>Blue-capped Tanager</td>
<td>Red-billed Fire-finch</td>
<td>Violet-backed Starling</td>
</tr>
<tr>
<td>Blue-grey Tanager</td>
<td>Star Finch</td>
<td>Golden-breasted Starling</td>
</tr>
<tr>
<td>Swallow Tanager</td>
<td>Long-tailed Finch</td>
<td>Wattled Starling</td>
</tr>
<tr>
<td>Scarlet-headed Blackbird</td>
<td>Double-barred Finch</td>
<td>Emerald Starling</td>
</tr>
<tr>
<td>American Goldfinch</td>
<td>Zebra Finch</td>
<td>Bali Mynah</td>
</tr>
<tr>
<td>Cutthroat</td>
<td>Green-winged Pytilia</td>
<td>Lesser Bird-of-Paradise</td>
</tr>
<tr>
<td>Red Munia</td>
<td>Blue-capped Cordon-bleu</td>
<td>Common Crow</td>
</tr>
<tr>
<td>Orange-breasted Avadavit</td>
<td>White-headed Buffalo</td>
<td>Blue Jay</td>
</tr>
<tr>
<td>Gouldian Finch</td>
<td>Red Bishop</td>
<td>Plush-crested Jay</td>
</tr>
<tr>
<td>Diamond Firetail Finch</td>
<td>Pin-tail Whydah</td>
<td>Black-billed Magpie</td>
</tr>
<tr>
<td>Red-throated Parrot Finch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue-faced Parrot Finch</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>