

*Flight*  
*and*  
*Feathers*

**KS 2 Workbook  
for Teachers**

Links to Art and Design, Design Technology, English,  
Geography, Information and Communication Technology,  
Maths, Music, Science and Physical Education

## Activity 1: Why do birds fly?

**Curriculum Focus – English, Science, Maths, Music, Geography, Information and Communication Technology**

### Basic Activity

**Curriculum Focus – English, Science, Maths**

### Key Curriculum Links

#### English –

- En3 Writing
  - Composition 1a, 1b, 1d, 1e
  - Planning and drafting 2a, 2b, 2c, 2d, 2e
  - Standard English 6a

#### Science –

- Sc2 Life processes and living things
  - Life processes 1a
  - Humans and other animals 2b

#### Maths –

- Ma3 Space, shape and measures
  - Understanding measures 4d

As a class, discuss all the reasons the students can think of that they move in a single day.

For instance, ask them to think about the morning before they left for school. Did they move to get out of bed, did they move to go to the toilet, did they move to get breakfast and a drink, and did they move to go to the bathroom and wash?

Write a class list on the board of everything the students have moved for that day. To make it easier to think of things, break this list into the morning, at school and the evening.

Then, using the class list as a basis, students should complete the worksheet entitled 'Moving'. Some teacher assistance may be required to complete this worksheet.

Once the worksheets have been completed, initiate a discussion on why birds fly by relating the students' movements to the day of a bird. That is, discuss

the fact that the reasons birds fly are very similar to the reasons humans must move - to find food, to find water, to find a mate, avoid predators, to find shelter, to preen, and to excrete.

You may wish to take your class somewhere they can observe birds, such as local woodland, to complete this activity. Alternatively, your visit to Birdworld would be an excellent time to observe many birds moving for various reasons.

## **Extension Activity**

### **Information Technology + English**

Rather than simply filling in the blank spaces on the 'Movement' worksheet, students should use the sentence beginnings to write a small passage about why they move, using a word processor.

They should give their work a title (e.g. Why I Move, centred and in large text) and follow it with a series of simple sentences explaining why they move.

They should save their work.

Once the class has compared why they move to why a bird moves, they should retrieve their file.

They should copy their passage into another file and manipulate it so that the focus of the passage is on why birds fly.

## **Extension Activity 2**

### **Curriculum Focus - English and Music**

#### **Key Curriculum Links**

##### **English-**

- En1 Speaking and listening
  - Speaking 1b, 1d
  - Drama 4a, 4b, 4c, 4d

##### **Music -**

- Controlling sounds through singing and playing - performing skills 1b, 1c
- Creating and developing musical ideas - composing skills 2a, 2b

- Responding and reviewing 3a, 3b, 3c
- Listening and applying knowledge and understanding 4a, 4b

PE -

With the teacher acting as a scribe, the class should write a short piece on a day in the life of a bird based on their understanding of why birds fly. The characters in the play could include a birdwatcher to act as the narrator, a main bird, a predator, and other birds in the area.

The narrator will give a spoken overview of the piece whilst the actors convey the action.

As an extra challenge, the students not acting in the play could provide a musical background that sets the mood of the piece.

The music can be very simple, for example a shrill blow on whistle to convey the panic of a predator attack or taps on a triangle for basic flight. The teacher should offer potential sounds for the class to select from.

The final piece of music should be close to continuous, with the students playing the instruments matching the words of the narrator and the actions of the actors.

## Extension Activity 2

Curriculum Focus - Geography, Information and Communication Technology, Maths

### Key Curriculum Links

#### Geography-

- Geographical and enquiry skills 1a, 1b, 1c, 1e, 2a, 2c, 2d, 2f
- Knowledge and understanding of places 3a, 3b, 3g

#### Information and Communication Technology-

- Developing ideas and making things happen 2a
- Exchanging and sharing information 3a, 3b
- Reviewing, modifying and evaluating work 4a, 4b, 4c

#### Maths-

- Ma4 Handling data
  - Using and applying handling data 1a, 1f
  - Processing, Representing and interpreting data 2c, 2d, 2f

Select four pieces of music to represent the four seasons (Vivaldi's 'The Four Seasons' obviously provides a good selection).

Divide a large piece of card into four sections, each section titled with one of the seasons, and display it at the front of the class.

Play all four music selections and discuss which selection the class feels represents which season. You may need to play them several times to reach a consensus.

Once you have reached consensus, play each piece again individually. At the end of each piece, discuss what words, thoughts and feelings the music and the season put into the students heads. Write all the words down on the card under the appropriate heading.

Play each piece one last time, but this time use the following types of questions to prompt the students to imagine they are a bird. What are they feeling in each season, especially when the winter comes? Are they warm or cold, is there any food around, is there anywhere to shelter?

Provide each student with a piece of cardboard. They should divide the cardboard into four squares, one for each season.

With the teacher's assistance, each student should write a simple sentence about how they feel about each season as if they were a bird. For example, 'I

do not like winter because it is cold and wet' or 'I do not like winter because there is no food to eat.'

Using a word processor, the students can design their sentences to match each season by using different colours and fonts. They should print out the sentences and paste them neatly into each square.

They can then decorate each square according to the season by drawing, using computer images, making a collage, or cutting and pasting pictures from magazines.

Extend the activity by introducing the class to the idea that whilst some birds migrate to avoid seasons.

Review the reasons why birds fly with your class. Then extend the discussion by prompting the class to think about what birds do when the seasons change and they can no longer find food or shelter by flying short distances. Introduce the idea that some birds migrate for the winter.

Using a variety of resources, including ICT, students should then complete the worksheet '**Why Bother Migrating?**' on bird migration. This is quite a complex worksheet, so it would probably be best to read through it and discuss the questions asked as a class first. An excellent reference book for the worksheet is Atlas of Bird Migration (Random House, 1995).

The answers to the worksheet are as follows -

1. Autumn
  2. Beginning to get cold and wet - to cold for insects
  3. Trees loose leaves and plants die - no food for insects
  4. Spring
  5. Generally fine and warm - perfect for insects
  6. Trees begin to get leaves and flower, seasonal plants also begin to flower - plenty to attract insects
- 
1. Birds migration in driven primarily by the changing seasons. Winter brings both bad weather and a lack of food -a combination many birds cannot survive. Some birds may also migrate to reach a particular area, for example special breeding grounds.

2. Swallows begin returning to England in small numbers in late March, when the weather begins to warm and the trees and plants flower. The majority will return in April, when the dangers of late frost should have passed.
  
3. Some of the dangers of migration are -
  - a. Predation by birds of prey
  - b. Ocean crossings (long periods without food or a place to land)
  - c. Mountain crossings with unpredictable thunderstorms
  - d. Strong winds blowing birds off course
  - e. Desert crossings (little food or water and dust storms)
  - f. Highly unpredictable weather throughout (e.g. late frosts may mean no food upon arrival at destination, sudden storms)
  
4. Fieldfares migrate to England from Scandinavia and western Russia. The UK's winter is relatively mild compared to these places, and fruit and berries can be found in relative abundance.

At the completion of the worksheet, you may wish to extend the activity further by asking the children to produce a report suitable for display outlining their research. The report should include written information, climatic graphs, and climatic and migratory maps.

## Why Bother Migrating?

Every year swallows migrate 12 000 miles (20 000 kilometres), from England to South Africa and then back again.

Research the climates of both countries using a variety of sources (the Internet, atlases, encyclopaedias). Create a database of climatic information about both countries including when the seasons fall and rainfall and temperature variations across the year. Use the database to create graphical representation of both the temperature and rainfall variations.

With the information you have collected, answer the following questions

Swallows begin to leave England for Africa in about October.

1. What season does October fall into in England?
2. How would you describe the weather in England at this time?
3. What is generally happening to the plants and trees at this time in England?
4. What season does October fall into in South Africa?
5. How would you describe the weather in South Africa at this time?
6. What do you think will be happening to the plants and trees at this time in South Africa?

Now, try to use your own knowledge in combination with the information you have collected to try to answer the following question. You may need to do some research.

1. Explain in your own words why you think birds migrate?
2. Based on the information you have collected, in what month do you think you may start to see swallows again in England?
3. What are some of the dangers of migration?
4. Fieldfares follow an opposite migration pattern to swallows. They arrive in England at the start of winter and leave again at the start of summer. Using your knowledge of migration, try to work out what area of the

world they migrate to England from. Locate a country in that region and set up a climatic database for it the same way you have set one up for England and South Africa.

## Activity 2: Feather and Wing Structure

**Curriculum Focus -**

**Basic Activity**

Curriculum Focus - English, Art, Design Technology

**Key Curriculum Links**

**English -**

- En1 Speaking, listening and understanding
  - Listening 2a, 2b, 2c
  - Group discussion and interaction 3a, 3b

As a class group, try to think of all the different reasons birds have feathers. Although they may come up with other reasons as well, the four main reasons should be -

1. Flight
2. Keeping warm
3. Keeping dry (especially water birds)
4. Camouflage and/or display

Extend the discussion by introducing the fact each bird actually has three different types of feather, each with a different job.

Put the children into groups of about 5 (group sizes will have to vary according to the number of children in the class). Read out the following descriptions of the three main types of feather to the class -

1. **Flight feathers** - These are the feathers found on a bird's wing that help the bird to fly. One side of the feather is always straighter and thinner than the other side. Also, flight feathers generally feel far stiffer than the other feather types. They give colour to the bird's wing.
2. **Contour feathers** - These are the feathers that cover a bird's body. Both sides of the feather are round and equal in size. They are also much softer to the touch than the flight feathers. They give colour to the bird's body.

3. **Down feathers** - These feathers are covered by the contour feathers on a bird, so you cannot see them - but they cover the bird's entire body. They are the feathers that keep a bird warm. They are soft and fluffy and are generally white or grey.

Give each group a feather pack and ask them to sort the feathers into groups based on the verbal descriptions given.

Then give each group a magnifying glass and time to really study each of the different types of feather. The groups should make notes of the differences and similarities they see between each of the feathers. In particular, students should make note of -

1. The texture of the feather.
2. The shape of the feather.
3. Whether or not the feather has a quill.
4. Whether or not the feather has barbs (that is, can it be pulled apart and zipped back up by running finger down the feather and then back up).
5. Whether or not the feather is symmetrical on either side of the quill (a flight feather is not, a contour feather is).

As a class, discuss the variations and similarities of the different types of feathers.

## **Extension activity 1**

### **Curriculum Focus - Art and Design**

#### **Key Curriculum Links**

##### **Art and Design -**

- Exploring and developing ideas 1a
- Investigating and making art, craft and design 2a, 2b, 2c
- Knowledge and understanding 4a

Students should draw representations of the different types of feather, both as it appears normally and as it appears under a magnifying glass. The drawings should be an accurate representation of what

they see. For example the flight feather should clearly show its asymmetrical nature.

The students should then be given a selection of different materials (cloth, paper, cardboard, Velcro, felt, plastic, wool, cotton wool etc) to feel. They should select materials to add to their drawings, so their work also demonstrates the 'feel' of the feathers.

Students should be able to choose freely which materials they wish to use. However, they should be able to explain why they chose as they did.

## Extension activity 2

### Curriculum Focus - English

#### Key Curriculum Links

##### English -

- En2 Reading
  - Reading Strategies 1b, 1c
  - Understanding texts 2a
  - Reading for information 3a, 3b, 3c, 3d
  - Non fiction and non-literary texts 5a, 5d, 5f, 5g

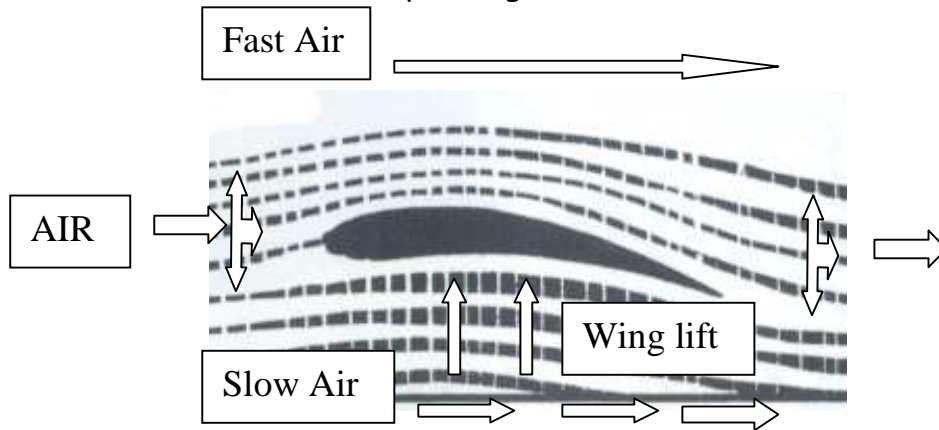
Students should read the short passage about wing structure over the page, and then try to answer the questions following.

The comprehension can be used as the basis for a classroom discussion on the basics of flight. Pictures of various types of wings - bird, aeroplane and helicopter should be used to help understanding.

Read the paragraph about wing structure and then answer the questions below.

## Wing Structure

A bird wing is the same basic shape as an aeroplane wing. This basic shape is called an aerofoil - and it is the key to flight.



The shape of the aerofoil means that air travels faster over the top of the wing than below it. As a result, air below the wing is basically sucked upwards into the faster moving air above. As the slower air moves upwards, it also lifts the wing.

The wing feathers aid flight. There are three main types of flight feather-

1. **The covert feathers** - These are the small feathers covering the top part of the wing. They slowly increase in size down the wing.
2. **The secondary feathers** - These are the feathers on the inside edge of the wing, closest to the bird's body. They help form the curved shape of the wing.
3. **The primary feathers** - There are 10 primary feathers. They are the longest feathers and are found on the outer edge of the wing. They help provide the bird with the power for flight.

1. What is the basic shape of a bird's wing called?
2. Does air travel faster over the top of bird's wing or below it?
3. Explain how the shape of an aerofoil helps a bird to fly.
4. Look at your worksheet called 'The Wing'. Mark in -

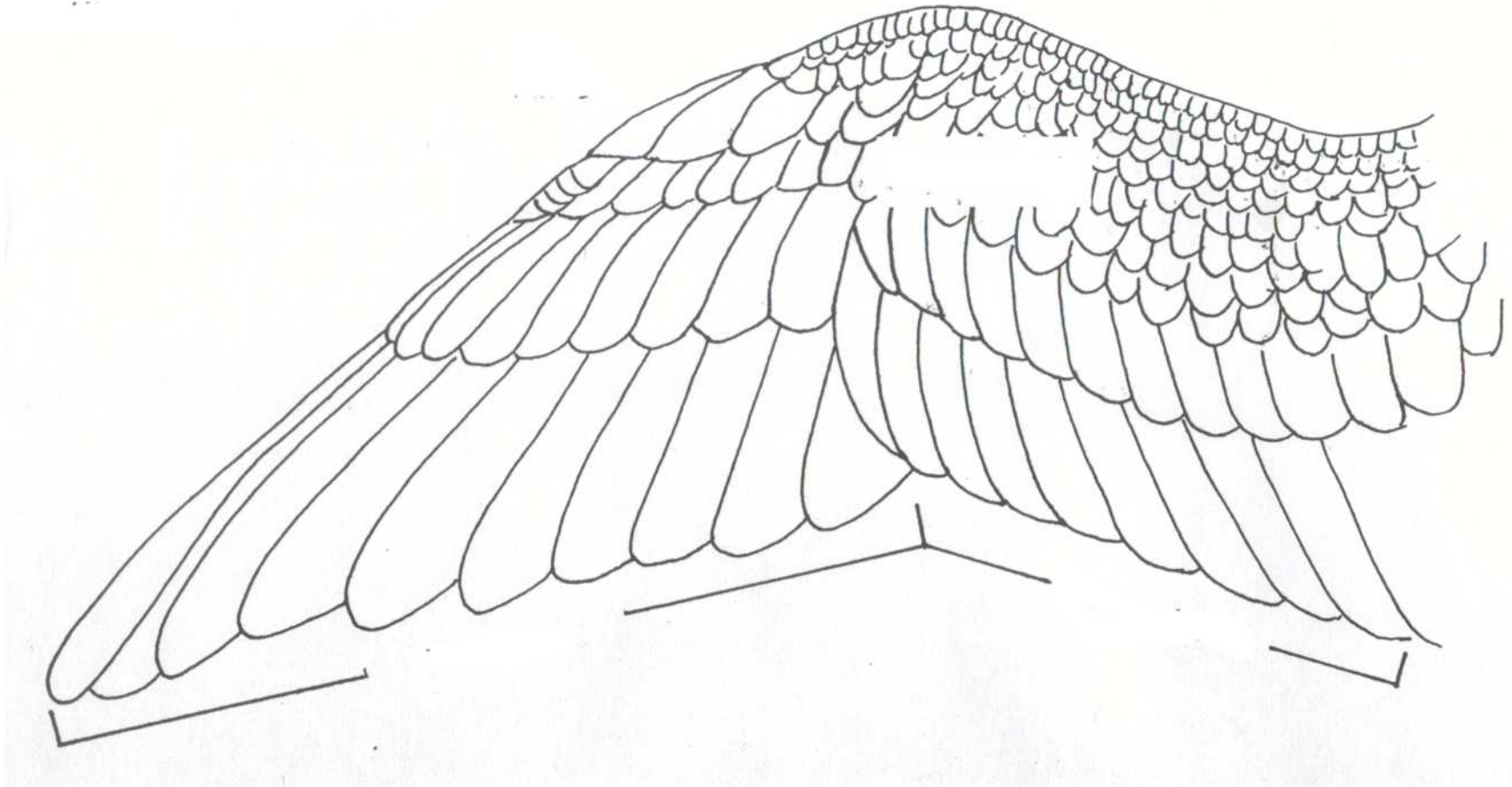
- a. The covert feathers
- b. The secondary feathers
- c. The primary feathers.

5. How many primary feathers are there?

6. What do the primary feathers help provide?



## The Wing



## Extension Activity 3

### Curriculum Focus - Art, Design Technology

#### Key Curriculum Links

##### Art-

- Exploring and developing ideas 1a, 1b, 1c
- Investigating and making art, craft and design 2a
- Knowledge and understanding 4a, 4b

##### Design Technology-

- Planning, developing and communicating ideas 1b, 1c
- Working with tools, equipment materials and components 2a, 2b, 2d

Using the diagram from the comprehension as a model, students should design and construct their own 3-dimensional bird.

**To construct the wings**, students should trace and cut the basic wing shape out of card twice. They can use the wing diagram from the previous exercise as a template.

Students should decorate the wings with any material they wish and with any colour. However, as a challenge students might try to replicate the colour, patterns and feel of a real bird.

**To construct the bird's body**, students should select their own materials. Their choices might include things like paper mache, cardboard, plastic bottles, or toilet roll. Again, they should decorate the body as they wish using a variety of materials.

**After the body is complete**, students should add a beak, feet, tail and eyes using a variety of materials. Again, these should be the student's choice - but as an extra challenge, they might want to model on a real bird. Students should then add the wings.

Students should then design a holder for their model, so it stays upright. This might be as simple as a cardboard prop attached to a wooden base. However, it should be of a display quality.

## Activity 3: Birds in Flight

### Curriculum Focus - English, Science, Maths

#### Basic Activity

#### Curriculum Focus - English and Science

#### Key Curriculum Links

##### English -

- En1 Speaking and listening
  - Group discussion and interaction 3a, 3b, 3c

##### Science -

- Sc1 Scientific Enquiry
  - Ideas and Evidence in science 1a, 1b
  - Considering Evidence and evaluating 2i, 2j, 2l
  - Variation and classification 4a, 4b

Take your class on an observational walk anywhere they are likely to see birds in flight. Ideally, students should be able to observe at least two birds from both List 1 and List 2. The birds on these lists are the most common around southern England.

#### List 1 (straight line flight)

grey heron  
wood pigeon  
starling  
gull  
corvid family (e.g. crow, raven)  
magpie  
swallow  
swift  
collared dove  
song thrush

#### List 2 (dip and rise flight)

house sparrow  
blue tit  
blackbird  
chaffinch  
green finch  
great tit  
dunnock  
wren  
robin

**\*\*A very basic 'child-friendly' key is provided for students to use on the walk. However, it is possible that other types of birds will be seen, so ensure you take a good bird identification book with you as well.**

**Before the walk**, initiate a classroom discussion to establish how much the class actually knows about birds and flight. Some discussion points might include-

1. What birds do they think they might see?
2. How will they identify that particular type of bird?
3. Do birds get tired when they fly?
4. Do all birds flap their wings when flying?
5. Do all birds fly the same way?

Make a note of the classes predictions, so they can be reviewed when you return from the walk.

**During the walk**, students should record information about the birds they observe. They can either use the worksheet provided or, as a slightly harder activity, create their own recording sheet.

Assist the students by stimulating discussion based around the focus questions on the bottom of the worksheet.

**After the walk**, discuss the observations the students have made. Compare the original class predictions to what was actually observed, and discuss anything new the students have learnt about flight.

Extend the discussion by asking the children to think further on what they have observed. Some discussion points might include -

1. Straight line flight
  - a. Why do you think the bird leaves his wings outstretched? (To glide on the air currents).
  - b. Is a small wing or a large wing better for gliding? (Large).
  - c. Can you think of ways humans use gliding to fly? (Hang gliding, planes).
2. Dip and rise flight
  - a. Why do some birds dip and rise when they fly? (They dip when they tuck their wings in to rest and rise when they flap).
  - b. Ask the class to imagine riding a bike up and down a hill or sitting on a roller coaster. When do they go fastest? When is it easiest to ride? Then compare dipping and rising flight to either of these activities and discuss how it saves energy (i.e. the bird is able to rest its wings and gain speed when it dips).
  - c. Why else might a small bird use dipping and rising whilst it flies? (Helps to avoid predators).

## Extension Activity

### Curriculum Focus - English

#### Key Curriculum Links

##### English -

- En1 Speaking and listening
  - Speaking 1d, 1e, 1f
  - Listening 2e
  - Language Variation 6a
- En2 Reading
  - Literature 4a, 4f
  - Non-fiction and non-literary texts 5a
  - Language structure and variation 6
- En3 Writing
  - Composition 1a, 1b
  - Planning and Drafting 2a, 2b, 2c, 2d, 2f
  - Spelling 4a, 4b, 4c, 4d, 4e, 4f

#### Vocabulary

During the walk, students should generate a list of at least 20 words they can think of that relate to flight. If they cannot think of 20 words during the walk, they can use resource materials (thesaurus, dictionary etc) to help them when they return to class.

The list should contain both science-based words (e.g. feathers, flapping, gliding) and descriptive words (e.g. flittering, bobbing, graceful).

When they return to the classroom, the students should begin a flight vocabulary list by finding out and writing down the meanings of each of their 20 words. Throughout the topic, they should add any other new or interesting words they come across to do with birds and flight.

Students should focus particularly on the correct spelling and pronunciation of any new words in their vocabulary list.

#### Composition

The student should then use the vocabulary list to compose a Japanese Haiku on birds or flight.

The Haiku is a particularly appropriate form of poetry for this type of activity and age group. It makes good use of nature-based vocabulary without requiring rhyme. It also teaches syllables, metre and tight sentence structure.

Below are a few sample Haikus by students to share with the your students. See if they can find the syllable pattern (1<sup>st</sup> line 5 syllables, 2<sup>nd</sup> line 7 syllables, 3<sup>rd</sup> line 5 syllables), before you tell them.

### **The Robin**

Little red Robin -  
What a pretty thing you are.  
The brightest bird round.

### **Mysterious Bird**

Fast flash of colour,  
Feathers flutter so softly.  
What bird might you be?

### **Two Views of a Seagull**

Squawking, ugly bird  
Fighting for my fish and chips.  
Beauty when you fly.

\*\* There are also numerous Internet sites available with examples of haiku poetry, if you want your students to read more samples.

## Bird Identification Key

Type of bird	Colours	Size
Blackbird	Black all over body, yellow beak (Female is brown)	About size of a tennis ball
Blue tit	Yellow chest, white face, blue and green wings and tail	About size of ping-pong ball
Chaffinch	Brown chest and face, grey cap on head, black and white wings and tail	Bit smaller than a tennis ball
Collared dove	Pinky grey feathers, black collar on neck	Bit smaller than a rugby ball
Corvids (crow)	Black all over, including beak	About the size of a rugby ball
Duncock	Brown almost all over, grey face	About size of ping-pong ball
Great tit	Yellow chest, black head with white cheeks, blue and green wings and tail	Bit smaller than a tennis ball
Green finch	Light green almost all over, bit of black on wings	Bit smaller than a tennis ball
Grey heron	Grey all over, very long legs and beak	Maybe taller than you
Gull (Black-headed)	White body, grey wings, red beak, head all black or white with black spot near eye	About the size of a rugby ball
House Sparrow	Brown back, grey chest and face, black line from eyes to chin (female brown all over)	About size of ping-pong ball
Magpie	Mostly black with white patches	Bit smaller than a rugby ball
Robin	Red spot on front, brown on back	Bit smaller than a tennis ball
Song Thrush	Brown all over with dark brown speckles on chest	About size of a tennis ball
Starling	Black all over, but shines different colours in the sun,	About size of a tennis ball

	yellow beak	
Swallow	Black back, red chin, white body, long double pointed tail	Bit smaller than a tennis ball
Swift	Grey and black all over, double pointed tail	Bit smaller than a tennis ball
Wood pigeon	Grey back and head, pinky-grey chest, white and green collar	Bit smaller than a rugby ball
Wren	Brown back, speckled brown face, white chest	About size of ping-pong ball

# Bird Observation Sheet

Fill in the table below as you observe different birds. Thinking about the focus questions will help you.

Bird Identification		Birds in Flight (put a tick in the correct box)		Flight Patterns (draw the flight pattern in the correct box)	
Species Name	Key Features	Wings outstretched	Wings Tucked	Straight Flight	Rise and Fall
E.g. House sparrow	Ping-pong ball size, brown back, grey face and chest				

Bird Identification

**ion** - What key features can you observe? Do you know of any bird with those features? Can you find a bird with those features in your identification book?

**Birds in Flight -**

Now observe the bird in flight. Does the bird flap continuously? Why does the bird stop flapping? (Flap your arms for as long as you can and see what happens).

When the bird stops flapping, what does it do with its wings - leave them outstretched or tuck them into its side?

### **Flight Patterns -**

Does the bird fly in a straight line or does it dip and rise when it flies?

Observe again what it does with its wings, does a bird that flies in a straight line leave its wings outstretched or tuck them in?  
What about the bird that dips and rises?

## Extension Activity 2

### Curriculum Focus - Maths

#### Key Curriculum Links

##### Maths -

- Ma2 - Number,
  - Using and Applying Number 1a, 1b, 1d, 1f, 1h
  - Numbers and the number system 2d, 2f, 2g, 2h
  - Calculations 3a, 3b
  - Solving Numerical Problems 4a, 4b
- Ma4 - Handling Data
  - Problem solving 1a, 1b, 1c, 1d, 1e
  - Processing, representing and interpreting data 2a, 2b, 2c, 2d

During the walk, students should note each time they spot birds. They should record the species, if the birds are in a group - how large the group is, and what kind of habitat they see the bird in (for example open field, on ground near trees or hedge, in trees or hedge). They should also make note of any other types of bird they see in the same area. There is a recording sheet provided, but for an extra challenge, you may want to get students to set up their own sheets.

The students should enter data they collect into a database. They should then generate a series of graphs to represent what they have observed using the database information. The information the students are asked to graph will have to depend on how successful the walk was. The following are possibilities for graphs-

1. A pictograph or a bar graph representing how many of each species was observed.
2. A line graph representing the number of birds found in each group of a single species of bird (repeated for all types of birds).
3. A bar graph representing how many birds (total number) were found in each type of area.
4. A pictograph representing how many birds of each species was found in a particular area (repeated for each area).
5. A bar graph representing the how many of one particular species were found in each type of area (repeated for all types of birds).

From their graph work, the students should then answer a series of questions involving calculations and problem solving. Again, the questions will vary depending on the walk, and will have to be set with regard to the walk itself. The following are possibilities for questions-

1. What was the most/least common bird observed - overall; in a particular area; living in a group; found by itself.
2. What was the average number of birds generally/particular species found in a group?
3. What fraction of the birds generally/particular species were spotted on the ground/other area?
4. What percentage of the birds generally/particular species were spotted on the ground/other area?

There are limitless questions along these lines, depending on what was observed. The questions should just be altered slightly depending on your walk are.

## Species Recording Sheet

Each time you see a group of birds or an individual, mark down what species it is, how large the group is, and what kind of habitat you see the bird in (for example open field, on ground near trees or hedge, in trees or hedge). Also mark down if you see any different types of bird in the same area.

Type of bird	Number in the group	Habitat observed in	Name of any other birds in area


## Activity 4: Experimenting with Wing Types

**Curriculum Focus- Science, Design Technology, Maths, English, Information and Communication Technology**

**Basic Activity**

**Curriculum Focus - Science, Design Technology, Maths**

**Key Curriculum Links**

**Science-**

- Sc1 Scientific enquiry
  - Ideas and evidence in science 1a, 1b
  - Investigative skills 2a, 2b, 2c, 2d, 2f, 2g
  - Considering evidence and evaluating 2i, 2j, 2k, 2l, 2m

**Design Technology -**

- Developing, planning and communicating ideas 1b, 1c
- Working with tools, equipment, materials and components 2a, 2b, 2c, 2d
- Evaluating processes and products 3a
- Knowledge and understanding of materials and components 4a, 4b

**Maths-**

- Ma2 - Number
  - Using and applying number 1a, 1b, 1c, 1d, 1f, 1h
- Ma3 - Shape, space and measure
  - Using and applying space, shape and measures 1a, 1b, 1c, 1d, 1e, 1h
  - Understanding Measures 4a, 4b, 4d, 4e
- Ma4 - Handling Data
  - Using and applying data 1a, 1c, 1d, 1e

As an introductory activity, take two identical pieces of paper. Make it clear to the class that they are exactly the same weight, size and shape. Screw one of the pieces of paper into a ball and then drop both pieces from the same height at the same time.

Before dropping the pieces of paper, ask the children to predict which piece they think will hit the ground first and discuss why they think that. Try to encourage the children to think about a bird's wings.

Afterwards, discuss with class why they think the flat piece of paper took more time to reach the ground.

Then initiate a discussion on what the students think would happen if you changed one of the following factors-

1. Wing area
2. Wing shape (various shaped rectangles)
3. Body Weight

In small groups, students should choose either wing size, wing shape or body weight to experiment with.

They should first predict what they think will happen as the factor is changed. Then each group should design and build a set of models to test their predictions. It is important that students are aware only one factor can change on the models. For example-

1. If they are changing the area of the wing, the basic shape (besides size) and weight should remain constant.
2. If they are changing the weight, the size and shape of the wing as well as where and how the weight is attached should remain constant.
3. If they are changing the shape (different rectangles only) of the wing, the area and the weight should remain constant.

Students should think through their designs carefully first, ensuring they have made careful measurements of area and weight. Once they are happy with their designs, they should build their models.

Once the group is happy they have built a set of models that will test their predictions accurately, they should time how long it takes each model to fall to the ground from a given height (ensuring the height also remains constant), keeping careful records of their results. They should then repeat the experiment for accuracy.

At the completion of their experiments, the group should analyse their original predictions and draw conclusions based on their results.

### Extension Activity 1

**Curriculum Focus- Science, Maths, Information and Communication Technology, English**

**Key Curriculum Links**

### **Science-**

- Sc1 Scientific enquiry
  - Ideas and evidence in science 1a, 1b
  - Investigative skills 2h
  - Considering evidence and evaluating 2i, 2j, 2k, 2l, 2m

### **Maths-**

- Ma3 - Shape, space and measure
  - Using and applying space, shape and measures 1e, 1f
- Ma4 - Handling Data
  - Using and applying data 1f, 1g, 1h
  - Processing, representing and interpreting data 2a, 2c

### **Information and Communication Technology-**

- Developing ideas and making things happen 2a
- Exchanging and sharing information 3a, 3b
- Reviewing, modifying and evaluating work 4a, 4b, 4c

### **English -**

- En1- Speaking and Listening
  - Speaking 1a, 1d, 1e
  - Listening 2a, 2b, 2c
  - Group discussion and interaction 3a, 3b, 3f
  - Standard English 5
  - Language Variations 6a, 6c
- En3 - Writing
  - Composition 1a, 1b, 1c, 1d, 1e
  - Planning and drafting 2a, 2b, 2c, 2d, 2e, 2f
  - Handwriting and presentation 5b
  - Standard English 6a

The students should write up their experiments in the form of a formal scientific report outlining their aims, their predictions, their methods, their results and their conclusions.

The report should be produced to a display quality using a desktop publishing program, incorporating text, tables and graphs.

Using their display as a backdrop, each group should then give a formal presentation of their experiment, outlining their report to the class. At the end of the presentation, the class (and teacher) should be given the opportunity to ask questions about the group's methods and results.

At the completion of all the reports, conduct a class discussion summarising the various experiments, discussing the conclusions made and any discrepancies between different groups.

## Activity 5: What is a wing for?

**Curriculum Focus – Science, Information and Communication Technology, Art and Design, Design Technology, Music, Physical Education**

Basic Activity

**Curriculum Focus – Science, Information technology**

**Key Curriculum Links**

**Science –**

- Sc1 Scientific enquiry
  - Ideas and evidence in science 1a, 1b
  - Investigative skills 2a, 2b, 2c, 2i, 2j, 2l
- Sc2 Life processes and living things
  - Variation and classification 4c
  - Living things and their environment 5b, 5c

**Information technology –**

- Finding things out 1a, 1b

Gather a series of pictures of different types of birds in flight as well as making your own silhouettes (Appendix 1 provides outlines to work with) of the 5 different wing types.

As a class, look at the different pictures and silhouettes and discuss how they vary from each other in shape and size. Introduce to the discussion the idea that different birds have different wing types, each suited to their particular lifestyle. Using the silhouettes as a basis, discuss the five basic wing types as outlined below-

1. **Gliding wings** - Long and slender pointed wings, used for gliding over very long periods on ocean updrafts. Examples include the albatross (that can glide for up to 6 hours without flapping), gulls, frigates, and shags.
2. **Soaring wings** - Long broad wings with slotted (finger like) tips, used for soaring on updrafts of air. Examples include all large birds of prey, herons, storks and cranes.

3. **Fast flying wings** - Slender and curved pointed wings, used for speed and endurance, often during long migrations. The wing shape minimises drag and so enables fast and powerful flapping flight as well as extended gliding. Examples include the swift, the swallow, peregrine falcons, geese and ducks.
4. **Manoeuvrable wings** - Broad rounded wings, used for twisting and turning in woodland areas to catch prey or avoid predators. Examples include woodland owls, pigeons, doves, most small British birds, and hawks.
5. **Vertical take-off wings** - Very short and rounded wings, designed for a quick escape from predators through a fast vertical leap. Examples include pheasants, grouse and chickens.

Ask the children to try to group the various pictures into each of the five categories, based on the wing shape of the bird and what they know of the bird's lifestyle. Introduce pictures of birds not in flight, and ask the children to try to add them to the groups, based solely on the bird's lifestyle.

Extend the activity by asking the children to search the Internet and other sources (like magazines or encyclopaedias) for images of birds, particularly in flight. Where necessary students will need to download or photocopy the image so they can be cut out.

Put the students into small groups of three or four, and give each group a copy of the five silhouettes. The students should sort the images they have collected into the five different groups. Then on the appropriate silhouette, each group should create a collage of the images they have collected and sorted.

## **Extension Activity 1**

### **Curriculum Focus - Science**

#### **Key Curriculum Links**

##### **Science -**

- As above

On your visit to Birdworld, students should apply what they have learnt about the relationship between wings and lifestyle.

As they walk around the park, they should select at least 5 different types of bird. They should observe each bird and read about its lifestyle on the species information sign located on the aviaries. If the student chooses to observe a wild bird, species information signs about most wild birds seen around Birdworld can be found in the Woodland Walk.

The students should fill in an observation sheet recording the name of the bird, its habitat, a small drawing of its wing, and a short explanation of why they think its wing shape is suitable to its habitat and lifestyle.


When back in class, you may wish to conduct a class discussion on the various birds observed and how their wing shapes related to their lifestyle. In particular, discuss any contentious issues concerning unusual birds that did not seem to fit properly into any of the five categories.



## Birdworld Wing Watch

As you walk around the park, select 5 different types of bird you are particularly interested in. Watch the birds and read about their lifestyles on the information boards located on the front of each aviary. You can choose to watch a wild bird as well. If you do, you will be able to find out about its lifestyle on information boards in the Woodland Walk.

On the observation sheet record the name of the bird, a little bit about where it would live in the wild, a small picture of its wing and a short explanation of how its wing shape helps it.

Type of Bird	Where does it live?	What does its wing look like?	Why does it have that shaped wing?
e.g. barn owl	In woodlands + around farms		Good for twisting and turning to catch mice

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## **Extension Activity 2**

**Curriculum Focus - Art and Design, Design Technology**

### **Key Curriculum Links**

#### **Art and Design-**

- Exploring and developing ideas 1a, 1b, 1c
- Investigating and making art, craft and design 2a, 2b, 2c
- Knowledge and understanding 4a, 4b

#### **Design Technology-**

- Developing, planning and communicating ideas 1a, 1c, 1d
- Working with tools, equipment, materials and components 2a, 2b, 2c, 2d
- Evaluating products and processes 3a
- Knowledge and understanding of materials and processes 4b

Students should draw and cut out large silhouettes of the 5 basic wing types. They should then decorate each silhouette in a way that invokes to them the purpose of that wing shape.

Students should not be limited in the materials they choose. It may be anything from creating a collage of bird images with that type of wing on the silhouette, to painting or drawing their own images, to decorating the wing with different materials that invoke certain feelings.

The only condition is that the student should be able to explain the relationship between what they have chosen and the different types of flight.

After decorating the 5 silhouettes, the students should construct a mobile structure from which to hang the wing shapes. The materials used to make the mobile structure should be in keeping with the art piece as a whole.

## **Extension Activity 3**

**Curriculum Focus - Music, Physical education**

### **Key Curriculum Links**

#### **Music-**

- Controlling sounds through singing and playing - performing skills 1b
- Creating and developing musical ideas - composing skills 2a, 2b
- Responding and reviewing 3a, 3b
- Listening and applying knowledge and understanding 4a, 4b

### Physical education -

- Acquiring and developing skills 1b
- Selecting and applying skills, tactics and compositional ideas 2c
- Dance activities 6a, 6b
- Game activities 7c

Choose birds from each of the 5 different categories of basic wing type. As a class, select -

1. A musical instrument/sound to represent each bird. For example a slow drumbeat for the slow flap and glide of a heron, a shrill rising recorder note for a pheasant shooting out of the grass, fast taps on a triangle for a darting sparrow. Any sound the class agrees on is fine.
2. A physical movement to represent each bird related to the music. Using the birds above again, a heron could be long, slow strides in time to the drumbeat, a pheasant could leap into the air with arms flapping, a sparrow could be side to side leaps in time with the triangle. It is really up to the students' imaginations.

After the class has settled on representative music and dance, try each bird sound out a few times slowly - calling out the bird, playing the music and reminding the students of the movement they should be doing.

As the students get the idea, stop calling anything out - just play the representative sounds. The students should change their movements as the music changes. Music changes should get progressively faster.

Eventually, turn it into a game, where anybody doing the wrong movement is out. The winner of the game can be made the 'music master for the next game.

# APPENDIX 1

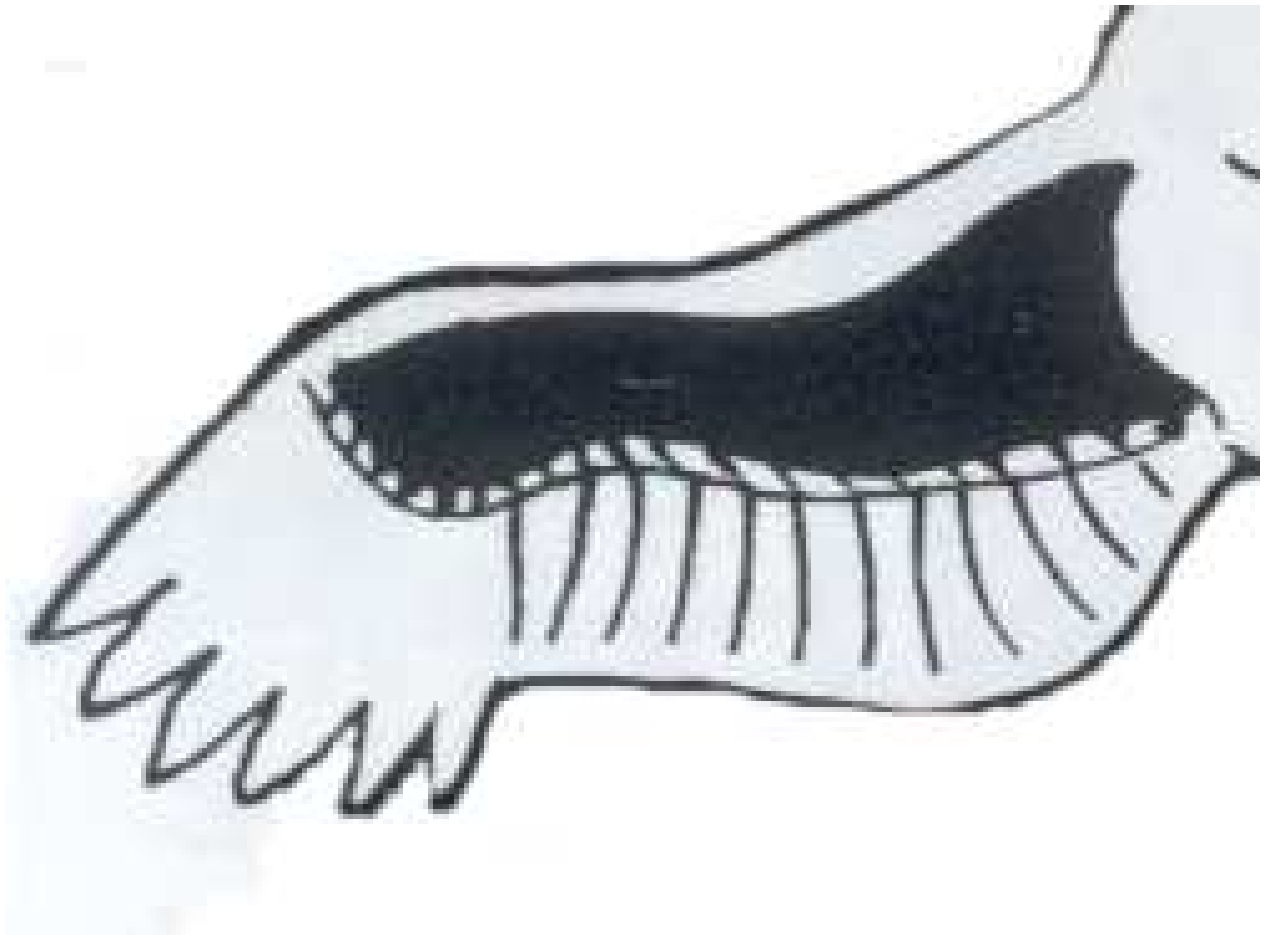
## The Five Basic Bird Wing Shapes

**Gliding wings - Long and slender pointed wings, used for gliding over very long periods on ocean updrafts. Examples include the albatross (that can glide for up to 6 hours without flapping), gulls, frigates, and shags.**



**Soaring wings - Long broad wings with slotted (finger like) tips, used for soaring on updrafts of air.**

**Examples include all large birds of prey, herons, storks and cranes.**



**Fast flying wings** - Slender and curved pointed wings, used for speed and endurance, often during long migrations. The wing shape minimises drag and so enables fast and powerful flapping flight as well as extended gliding. Examples include the swift, the swallow, peregrine falcons, geese and ducks.



**Vertical take-off wings - Very short and rounded wings, designed for a quick escape from predators through a fast vertical leap. Examples include pheasants, grouse and chickens.**



**Manoeuvrable wings** - Broad rounded wings, used for twisting and turning in woodland areas to catch prey or avoid predators. Examples include woodland owls, pigeons, doves, most small British birds, and hawks.

