

Summary of students' performance by the end of Grade 3

Scientific enquiry

Students devise fair tests based on predictions and recognise when a conclusion is justified. They identify patterns in their observations. They collect and organise observations and data in tabular and pictorial forms. They draw valid conclusions from observations and data and use pictures and explanations to communicate what they have found out. They use scientific equipment correctly without risk to themselves or others.

Life science

Students recognise that individuals of the same species (including humans) show variation. They group animals and plants together on the basis of common characteristics. They know that humans and other animals have lungs for gas exchange, intestines for absorbing food, kidneys for dealing with waste and a heart for circulating blood around the body. They know that the blood carries gases, food and waste. They explain how exercise affects heart rate and know that exercise and diet are important to good health. They give examples of animals that have a skeleton and know that the skeleton functions in protection, support and movement. They know that light, air, water and heat affect the growth of green plants and that the leaves of green plants are important to their growth. They know that some organisms are too small to be seen by the unaided eye.

Materials

Students classify simple materials on the basis of their physical properties. They show how we use different materials for different purposes, such as food, clothing, shelter and transport, and recognise that some materials have many different uses. They compare materials according to common properties and test the properties of materials to find out how appropriate they are for the use made of them. They recognise that the properties of materials can be modified by the way they are processed.

Physical processes

Students recognise that a force acts in a particular direction. They know that there are forces of attraction and repulsion between magnets, recognise that only certain kinds of materials are magnetic and state some of the ways magnets are used in everyday life. They recognise that a stretched or a compressed spring can exert a force. They know that shadows occur when a light source is blocked by an object and correctly apply the words *transparent* and *opaque* to objects. They know that the shape of a shadow is similar to the shape of the object that makes it. They use a mirror to reflect light and a magnifying glass to focus it.

The balance between scientific enquiry and the subject content strands

The science standards for Grade 3 are grouped into four strands: three content strands – life science, materials and physical processes – and the scientific enquiry skills strand, which addresses the development of scientific practical and intellectual skills across all the content strands.

The teaching of the content standards in life science, materials and physical processes should take approximately 70% of the time allocated to science in Grade 3. It is intended that the remaining time is devoted to developing further science enquiry skills and the language, mathematical and communication skills that are important for science. This may be done using *any* science content topics, not just the content topics prescribed in these standards.

Assessment weightings for Grade 3

There are three assessment objectives for the science curriculum:

- knowledge and understanding;
- application of knowledge and understanding, analysis and evaluation of information;
- scientific enquiry skills and procedures.

The balance between these three general objectives will vary from grade to grade. As students' scientific proficiency and experience develops, there should be a greater emphasis on the application of knowledge to solve problems in new situations.

For Grade 3, the weightings of the subject content strands are as follows:

	Life science	Materials	Physical processes
Assessment weighting	30 to 40%	30 to 40%	30 to 40%

For Grade 3, the weightings of the assessment objectives to be applied to each content strand are as follows:

	Knowledge and understanding	Application, analysis and evaluation	Scientific enquiry skills and procedures
Assessment weighting	35 to 45%	20 to 30%	30 to 40%

Scientific enquiry

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Students should:

1 Use methods of scientific investigation

- 1.1 Devise a fair test or comparison and recognise when conclusions are justified.
- 1.2 Make and test predictions and draw conclusions from observations and data.
- 1.3 Make systematic observations and identify patterns.
- 1.4 Design, make and test a device to help investigate or solve a scientific or technological problem.

2 Process and communicate information

- 2.1 Classify data according to shared characteristics and identify trends and patterns.
- 2.2 Display data and observations in tables.
- 2.3 Use labelled pictures to communicate observations.
- 2.4 Use words in their scientific context.
- 2.5 Use a variety of methods to record and communicate observations and data collected.

Make a project booklet on telling the time. Include secondary information as well as primary information from experiments and measurements (e.g. making and testing a candle clock and a sundial).

3 Handle equipment and make measurements

- 3.1 Handle simple equipment correctly, safely and without damage to carry out simple experiments.
- 3.2 Use appropriate equipment to measure length, mass, time and temperature.
- 3.3 Use a hand lens to study small objects.

Key standards

Key performance standards are shown in shaded rectangles, e.g. 1.3.

Examples of learning exercises

The examples of active learning exercises shown in italics are intended to be illustrative and do not represent the full range of possible exercises.

Cross-references to scientific enquiry skills

Some of the suggested learning exercises are cross-referenced where appropriate to scientific enquiry skills.

ICT opportunity

Use word processing and simple DTP programs to create topic booklets, including digital images.

Life science

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Students should:

4 Identify similarities and differences between organisms of the same type

- 4.1 Describe qualitative and quantitative similarities and differences between humans and between individuals of the same type of other organisms.

Using a collection of specimens of the same plant species, measure and describe the key features of each.

Using a collection of pictures of different breeds of one animal species (e.g. dogs, cats or horses), describe how one breed is similar to and different from others.

Using qualitative and quantitative features such as hair colour, eye colour, height, hand-span and shape of ear lobes, determine how students look similar and different.

Using pictures of people from different areas of the world, make observations of similarities and differences.

Enquiry skills 1.3, 2.1, 2.2, 2.3

5 Group animals and plants together on the basis of common characteristics

- 5.1 Use the observable characteristics of animals and plants to cluster them into meaningful groupings.

Use specimens, models or pictures of plants and animals of different species to create displays of organisms that have common characteristics.

Using specimens, models or pictures of groups of animals, decide what features they have in common and which distinguish one group from another.

Enquiry skills 1.3, 2.5

ICT opportunity

Construct a simple database of animals and/or plants.

6 Know that living things have internal structures with specialised functions

- 6.1 Know that inside living things are structures with specialised functions.

Examine specimens, models, drawings or pictures that show the internal organs of various animals.

Enquiry skill 1.3

- 6.2** Know that humans and other animals have lungs for gas exchange, intestines for absorbing food, kidneys for dealing with waste and a heart for circulating blood.

Examine a model, chart or diagram of the human torso and identify the lungs, intestines, kidneys and heart.

Enquiry skills 1.3, 2.5

Design a T-shirt that shows the position of the lungs, intestines, kidneys and heart.

Dissect a fish and identify its internal organs.

- 6.3** Know that the heart pumps blood around the body in blood vessels to carry gases, food and waste.

Examine a model of a human heart (or pictures of a heart).

Enquiry skills 1.3, 2.5

Make a model heart from paper and card.

Examine a model (or pictures) of the circulatory system.

Use rubber tubing of different diameter and wall thickness to demonstrate different blood vessels.

- 6.4** Know how exercise affects heart rate and that regular exercise and a proper diet is important to health.

Measure pulse rate before and immediately after exercise and again after resting. Draw tables and graphs to show the differences in pulse rate.

Enquiry skills 1.2, 1.3, 2.2, 3.1

Keep a food diary and exercise record; discuss what and how much people eat in relation to the exercise they take.

Discuss the information on food labels.

- 6.5** Compare the structure of humans and animals and recognise that some have an internal skeleton that provides protection and support and allows for movement.

Make an exhibition of specimens, models or pictures of different vertebrate and invertebrate animals.

Enquiry skills 1.3, 1.4, 2.5, 3.1

Examine skeletons (or model skeletons) of different animals.

Using hollow cardboard tubes to represent the bones of a skeleton, determine the mass that can be supported by tubes of different length and diameter.

Make a model skeleton.

Examine the joints on butchered meat.

- 6.6** Know that organisms have organs specialised for reproduction.

7 Identify environmental factors that affect the growth of green plants and know the importance of leaves of green plants

- 7.1** Identify that light, air, water and heat affect the growth of green plants.

Observe and record over time the growth of similar green plants of the same species kept in different conditions.

Enquiry skills 1.3, 2.5, 3.1

- 7.2** Know that the leaves of green plants are important to their growth.

Remove some of the leaves of one of a pair of similar green plants of the same species and compare their growth over time.

Enquiry skills 1.3, 2.5

8 Know that some organisms are too small to see with the unaided eye

8.1 Know that individual micro-organisms cannot be seen by the unaided eye.

Look at scale pictures or drawings of micro-organisms and compare their size with that of objects such as grains of rice, beads and small stones.

Make scale models of micro-organisms.

Look at prepared slides of micro-organisms.

Enquiry skills 1.2, 2.5, 3.1

Materials

By the end of Grade 3, students classify simple materials on the basis of their physical properties. They show how we use different materials for different purposes, such as food, clothing, shelter and transport, and recognise that some materials have many different uses. They compare materials according to common properties and test the properties of materials to find out how appropriate they are for the use made of them. They recognise that the properties of materials can be modified by the way they are processed.

Students should:

9 Compare the properties of materials

9.1 Classify simple materials in various ways on the basis of their physical properties.

Set up an exhibition of objects brought in by children. Classify the objects in various ways (e.g. 'things that are used in the home', 'things made of wood'). This exhibition can be put to many uses to support other standards.

Classify the objects as living, once lived and never lived. Discuss and write down the questions that are asked to make this classification.

Enquiry skill 1.3

9.2 Identify and recall a range of common materials such as different cloths, plastics, paper, ceramics and construction materials.

Conduct a survey around the school showing how different materials are used for different purposes. Classify materials according to their main uses. Make a project booklet showing the use of different building materials.

**Enquiry skills 2.1, 2.5
ICT opportunity**

Use digital photography in project work.

9.3 Realise that some materials are used for many different purposes.

Display, in the exhibition, different objects made from the same material (such as wood).

9.4 Compare materials according to common properties, such as hardness, strength, flexibility, transparency.

Use descriptive words to refer to the main properties of materials. Draw up a table showing the main properties of materials such as wood, concrete, glass, metals, ceramics, cloth, rubber, plastic.

**Enquiry skill 2.2
ICT opportunity**

Construct a simple database of materials' properties.

- 9.5** Know that the use we make of materials depends on their properties and devise tests to find out how appropriate they are for the use made of them.

Devise a test for comparing what happens to different materials when they are rubbed.

Devise a test for comparing how much water different cloths and papers can absorb.

Devise a fair strain test to compare different fibres.

Devise a hardness test by marking with a dropped object.

Test clothes for coolness in hot weather.

Draw conclusions from all the tests on the appropriateness of the materials for the use that is made of them.

Enquiry skill 1.1

- 9.6** Show and understand how the way in which the material is used can affect its properties.

Make a strong rope out of grass or polythene bags and test it.

Make a mat from palm leaves or twigs.

Make bricks out of mud and test them.

Make new paper out of newspaper.

Consider how the cost of the material affects how it is used.

Enquiry skill 1.1

Physical processes

By the end of Grade 3, students recognise that a force acts in a particular direction. They know that there are forces of attraction and repulsion between magnets, recognise that only certain kinds of materials are magnetic and state some of the ways magnets are used in everyday life. They recognise that a stretched or a compressed spring can exert a force. They know that shadows occur when a light source is blocked by an object and correctly apply the words *transparent* and *opaque* to objects. They know that the shape of a shadow is similar to the shape of the object that makes it. They use a mirror to reflect light and a magnifying glass to focus it.

Students should:

10 Know that there are many different kinds of force

- 10.1** Know that the effects of a force depend on its direction as well as its size.

Investigate a variety of everyday examples of forces, such as pushing, throwing and kicking a ball to show the importance of size and direction.

- 10.2** Demonstrate that there are forces of attraction and repulsion between magnets.

Use a variety of different magnets to explore what happens when they are brought together.

Devise a test to compare the strength of different magnets (such as the 'paperclip chain' test). Record the results graphically.

Enquiry skill 1.1

- 10.3** Know that some metal objects are attracted to a magnet but others, such as aluminium cans, are not.

Classify materials into magnetic and non-magnetic.

Devise activities that show clearly between magnetic materials and materials that are magnetised.

Investigate fridge magnets showing that they are plastics that contain tiny particles of iron that have been magnetised.

Enquiry skills 2.1, 2.2

- 10.4** Know that magnetic forces can act through non-metallic materials.

Devise a test for showing how well magnetism works through different materials (e.g. cloth, plastic, magnetic and non-magnetic metals).

Enquiry skills 1.1, 1.3

- 10.5** Give examples of some of the ways that magnets are used in everyday life.

Search the environment, books and the Internet for examples of magnets being used in everyday life. Make a display of the uses, including the names of the devices.

ICT opportunity

Access information on the Internet.

- 10.6** Show that a stretched or a compressed spring can exert a force.

Collect examples of springs being used in everyday life. Classify them according to whether they are being compressed or extended. Describe the direction of forces exerted by the springs.

Make a simple forcemeter from elastic bands for propelling toy cars or containers along a flat surface.

Predict and then measure what happens to objects propelled by stretching the bands by different amounts. Explain the result in terms of the size of the force exerted.

Enquiry skills 1.2, 1.4

11 Understand how light can cause shadows

- 11.1** Explain that shadows occur when a light source is blocked by an object.

- 11.2** Recognise that the shape of a shadow is similar to the shape of the object that makes it.

Use the overhead projector (or a torch) to make differently shaped shadows from folded paper or their hands.

Note the position of the shadow of an object in relation to the light source.

Study how the size and position of a shadow changes throughout the day.

- 11.3** Show that light can pass through a transparent object but not through an opaque one.

Use the overhead projector to classify objects as transparent or opaque. Recognise that there are degrees of opacity.

- 11.4** Know that many objects are transparent only to light of a particular colour.

Place some coloured transparent objects on the overhead projector and note that they let through only light of their particular colour.

- 11.5** Know that light can be reflected by mirrors.

Reflect the light of the sun onto the wall using a mirror or other bright object. Note that blocking the ray of light from the mirror destroys the reflection.

Light up a dark space in the room using reflected light.

Reflect the light from the Sun several times using more than one mirror.

Look at instruments that use mirrors (e.g. a kaleidoscope, a periscope). Work out how they work. Make models of them from mirrors.

11.6 Use a magnifying glass to focus light.

Focus sunlight on a piece of paper and note that the light is concentrated into a spot

Use a magnifying glass to look at small things.

11.7 Know that heat and light have many similar properties.

Repeat the activity in Standard 11.6 and note that the paper catches fire, showing that heat is focused as well as light.

Observe that the Sun generates heat as well as light.

Reflect radiant heat (from the Sun) using a mirror onto the back of a hand or a thermometer.

See Standard 8.1

Safety

Fire hazard. Use strict supervision.

Do not allow the light to be focused on anyone's skin or clothes.

