

# Science Syllabus Primary 2008



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## PREAMBLE

This Primary Science Syllabus is a foundation for scientific studies at higher levels. The syllabus has also taken into consideration the desired outcomes of education for our primary students as well as the national education emphasis.

This syllabus is based on the Science Curriculum Framework and emphasises the need for a balance between the acquisition of science knowledge, process and attitudes. In addition, as and where the topics lend themselves, the technological applications, social implications and the value aspects of science are also considered. It also emphasises the broad coverage of fundamental concepts in the natural and physical world.

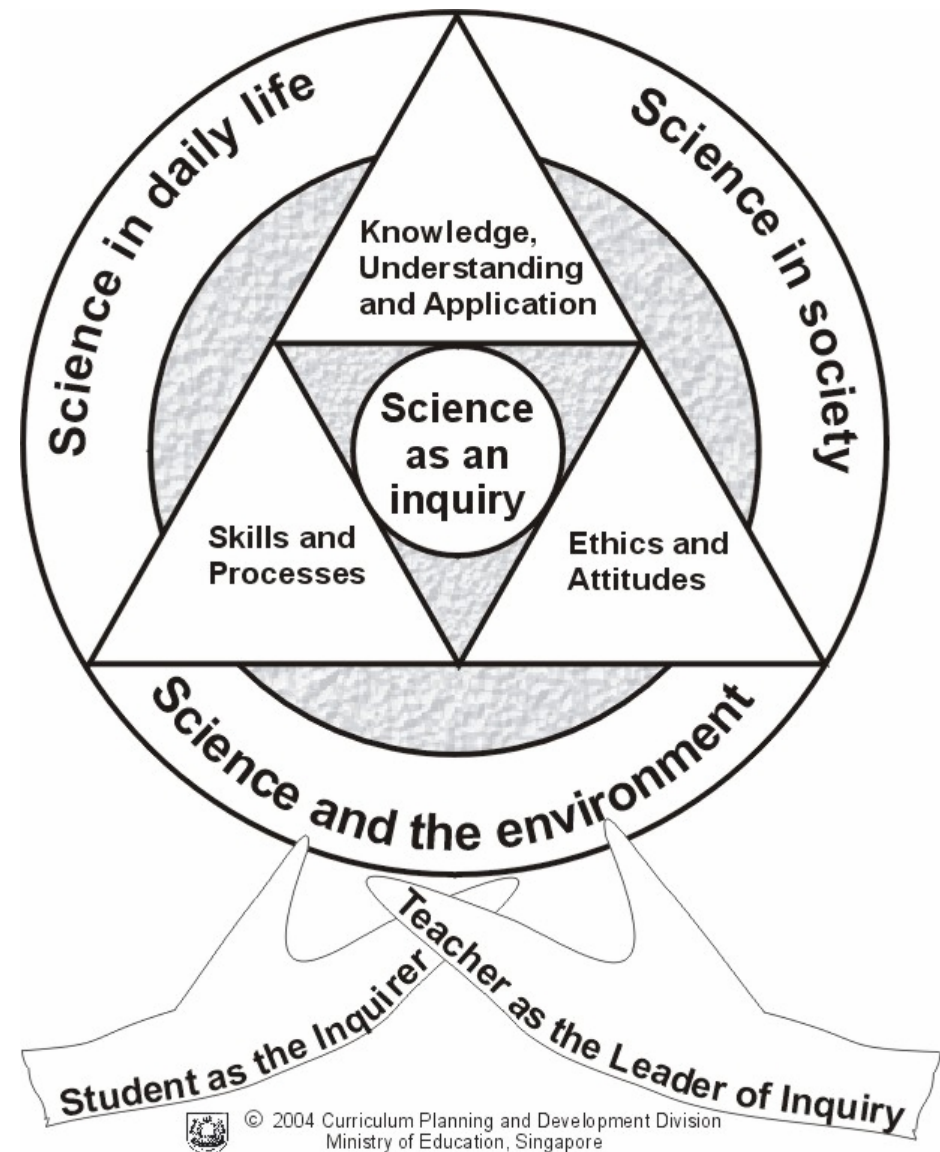
The aims spelt out in the syllabus provide the guiding principles for the suggested teaching approaches and evaluation methods. Teachers are advised not to follow the syllabus too rigidly but to exercise their professional judgement in implementing it. Schemes of work should be developed with the interests and abilities of the students uppermost in mind. Teachers are encouraged to use a variety of approaches in their teaching and to incorporate ideas and materials from various sources, in order to enhance the learning of science.

# SCIENCE CURRICULUM FRAMEWORK

# 1 SCIENCE CURRICULUM FRAMEWORK

The Science Curriculum Framework is derived from the Policy Framework for the Teaching and Learning of Science. It encapsulates the thrust of science education in Singapore to prepare our students to be sufficiently adept as effective citizens, able to function in and contribute to an increasingly technologically-driven world.

Central to the curriculum framework is the inculcation of the spirit of scientific inquiry. The conduct of inquiry is founded on three integral domains of (a) Knowledge, Understanding and Application, (b) Skills and Processes and (c) Ethics and Attitudes. These domains are essential to the practice of science. The curriculum design seeks to enable students to view the pursuit of science as meaningful and useful. Inquiry is thus grounded in knowledge, issues and questions that relate to the roles played by science in daily life, society and the environment.



The science curriculum seeks to nurture the student as an inquirer. The starting point is that children are curious about and want to explore the things around them. The science curriculum leverages on and seeks to fuel this spirit of curiosity. The end goal is students who enjoy science and value science as an important tool in helping them explore their natural and physical world.

The teacher is the leader of inquiry in the science classroom. Teachers of science impart the excitement and value of science to their students. They are facilitators and role models of the inquiry process in the classrooms. The teacher creates a learning environment that will encourage and challenge students to develop their sense of inquiry. Teaching and learning approaches centre around the student as an inquirer.

The following table shows the description of each domain which frames the practice of science:

Knowledge, Understanding and Application	Skills and Processes	Ethics and Attitudes
<ul style="list-style-type: none"> <li>• Scientific phenomena, facts, concepts and principles</li> <li>• Scientific vocabulary, terminology and conventions</li> <li>• Scientific instruments and apparatus including techniques and aspects of safety</li> <li>• Scientific and technological applications</li> </ul>	<p><u>Skills</u></p> <ul style="list-style-type: none"> <li>• Observing</li> <li>• Comparing</li> <li>• Classifying</li> <li>• Using apparatus and equipment</li> <li>• Communicating</li> <li>• Inferring</li> <li>• Formulating hypothesis</li> <li>• Predicting</li> <li>• Analysing</li> <li>• Generating possibilities</li> <li>• Evaluating</li> </ul> <p><u>Processes</u></p> <ul style="list-style-type: none"> <li>• Creative problem solving</li> <li>• Decision-making</li> <li>• Investigation</li> </ul>	<ul style="list-style-type: none"> <li>• Curiosity</li> <li>• Creativity</li> <li>• Integrity</li> <li>• Objectivity</li> <li>• Open-mindedness</li> <li>• Perseverance</li> <li>• Responsibility</li> </ul>

The domains are contextually linked to the roles played by science to establish its relevance and relationship to modern-day living:

Science in daily life  - Personal perspective focusing on the individual	Science in society  - Social perspective focusing on human interactions	Science and the environment  - Naturalistic perspective focusing on man-nature relationship
<ul style="list-style-type: none"> <li>• Using scientific skills in everyday life, e.g. observing trends and patterns, analysing data from media reports etc</li> <li>• Adaptable to scientific and technological advances</li> <li>• Able to make informed decisions that are related to science and technology e.g. consumption of GM food, health choices</li> </ul>	<ul style="list-style-type: none"> <li>• Engaging in meaningful scientific discourse with others</li> <li>• Understanding role and impact of science and technology in society</li> <li>• Contributing to the progress of science knowledge</li> </ul>	<ul style="list-style-type: none"> <li>• Understanding place of humanity in the universe</li> <li>• Awareness of safety and biological issues, e.g. SARS, AIDS, damage from pollution etc</li> <li>• Care and concern for the environment</li> </ul>



AIMS

## 2 AIMS

The Primary Science Syllabus aims to:

- provide primary students with experiences which build on their interest in and stimulate their curiosity about their environment
- provide students with basic scientific terms and concepts to help them understand themselves and the world around them
- provide students with opportunities to develop skills, habits of mind and attitudes necessary for scientific inquiry
- prepare students towards using scientific knowledge and methods in making personal decisions
- help students appreciate how science influences people and the environment

# SYLLABUS FRAMEWORK

### 3 SYLLABUS FRAMEWORK

The Primary Science Syllabus comprises:

- The knowledge, skills and attitudes that all students should acquire.
- The freed up curriculum time, known as the white space, to enable teachers to use more engaging teaching and learning approaches, and/or to implement customised school-based programmes as long as the aims of the syllabus are met. This enables teachers to make learning more meaningful and enjoyable for their students.

#### i. KNOWLEDGE, UNDERSTANDING AND APPLICATION

The approach in this revised syllabus towards the learning of science is based on themes that students can relate to in their everyday experiences, and to the commonly observed phenomena in nature. The aim is to enable students to appreciate the links between different themes/topics and thus allow the integration of scientific ideas. The five themes chosen are: Diversity, Cycles, Systems, Energy and Interactions. These themes encompass a core body of concepts in both the life and physical sciences. This body of concepts has been chosen because it provides a broad based understanding of the environment, and it will help build a foundation upon which students can rely on for further study.

Although the content of the syllabus is organised into 5 themes, the topics under each theme are not to be viewed as compartmentalised blocks of knowledge. In general, there are no clear boundaries between these themes. There may be topics common to different themes. Hence, a conscious effort is needed to demonstrate the relationship between themes

whenever possible. To help teachers and students appreciate and understand the themes, key inquiry questions<sup>1</sup> are included for each theme. These questions can guide teachers and engage students in uncovering the important ideas at the heart of each theme. They can also use these questions to raise more specific questions for the respective topics under each theme.

Another feature of the syllabus is the spiral approach. This is characterised by the revisiting of concepts and skills at different levels and with increasing depth. The spiral approach allows the learning of scientific concepts and skills to match students' cognitive development. It therefore helps students build upon their existing understanding of concepts and facilitates the gradual mastery of skills.

The focus of each theme is given below.

#### Diversity

Students should appreciate that there is a great variety of living and non-living things in the world. The study of the diversity in the world will allow students to appreciate the importance and necessity of maintaining it. Man seeks to organise the great variety of living and non-living things to better understand the world in which he lives. There are common threads that connect all living things and unifying factors in the diversity of non-living things that help him to classify them. In this theme, students learn about the diversity of living and non-living things as well as materials. Key inquiry questions in Diversity include:

- What is our environment made up of?
- Why is it important to maintain diversity?

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<sup>1</sup> Reference: Wiggins, J and Mctighe, J. (1998). Understanding by Design. Alexandria, Va.: Association for Supervision and Curriculum Development.

- How do we go about understanding the diverse range of living and non-living things?

### Cycles

Students should recognise that there are repeated patterns of change in nature and understand how these patterns arise. Examples of these cycles are the life cycles of living things and the water cycle. Understanding these cycles helps Man to predict events and processes and to understand the Earth as a self-sustaining system. In this theme, students learn about the Cycles in plants and animals as well as matter and water. Key inquiry questions include:

- What are the cycles in our everyday life?
- How are cycles important to life?

### Systems

Students should recognise that a system is a whole consisting of parts that work together to perform a function. There are systems in nature as well as man-made systems. Examples of systems in nature are the digestive and respiratory systems. Examples of man-made systems are electrical systems. Understanding these systems allows Man to understand how they operate and how parts influence and interact with one another to perform a function. In this theme, students learn about the plant, human, cell and electrical systems. Key inquiry questions include:

- What are the different parts of a system?
- How do parts of a system or different systems interact together to perform a function?

### Interactions

Students should appreciate that a study of the interactions between and within systems helps Man to better understand the

environment and his role in it. Interactions occur within an organism, between organisms as well as between organisms and the environment. There are also interactions between forces and objects. The interaction of Man with his environment drives the development of Science and Technology. At the same time, Science and Technology influences the way Man interacts with his environment. By understanding the interactions between Man and his environment, students can better appreciate the consequences of their actions and be responsible for their actions. In this theme, students learn about the interaction of forces and interactions within the environment. Key inquiry questions include:

- How does Man interact with his surroundings?
- *What are the consequences of Man's interactions with his surroundings?*

### Energy

Students should appreciate that energy affects both living and non-living things. It makes changes and movement possible in everyday life. There are many forms of energy and one form can be converted to another. Man uses energy in many ways, for many different purposes. Man is not the only animal that uses energy; all living things obtain energy and use it to carry out life processes. Understanding this theme will allow students to appreciate the importance and uses of energy and the need to conserve it. In this theme, students learn about various energy forms, uses and conversion. Key inquiry questions include:

- How does energy affect Man and his surroundings?
- Why is it important to conserve energy?

## ii. SKILLS AND PROCESSES

In this syllabus, teachers are encouraged to provide opportunities for students to use concepts and integrate skills and processes to inquire things and phenomena around them.

## Skills

- **Observing**  
This is the skill of using our senses to gather information about objects or events. This also includes the use of instruments to extend the range of our senses.
- **Comparing**  
This is the skill of identifying the similarities and differences between two or more objects, concepts or processes.
- **Classifying**  
This is the skill of grouping objects or events based on common characteristics.
- **Using apparatus and equipment**  
This is the skill of knowing the functions and limitations of various apparatus, and developing the ability to select and handle them appropriately for various tasks.
- **Communicating**  
This is the skill of transmitting and receiving information presented in various forms - verbal, pictorial, tabular or graphical.
- **Inferring**  
This is the skill of interpreting or explaining observations or pieces of data or information.
- **Predicting**  
This is the skill of assessing the likelihood of an outcome based on prior knowledge of how things usually turn out.
- **Analysing**  
This is the skill of identifying the parts of objects, information or processes, and the patterns and relationships between these parts.
- **Generating possibilities**  
This is the skill of exploring all the alternatives, possibilities and choices beyond the obvious or preferred one.
- **Evaluating**  
This is the skill of assessing the reasonableness, accuracy and quality of information, processes or ideas. This is also the skill of assessing the quality and feasibility of objects.
- **Formulating hypothesis**  
This is the skill of making a general explanation for a related set of observations or events. It is an extension of inferring.

## Processes

Processes are complex operations which call upon the use of several skills. At the primary level, the processes expected of students are:

- **Creative Problem Solving**

This is a process of analysing a problem and choosing an innovative and relevant solution in order to remedy or alter a problem situation.

- **Decision-Making**

Decision-making is the process of establishing and applying criteria to select from among seemingly equal alternatives. The process of establishing criteria involves consideration of the consequences and values.

- **Investigation**

This involves formulating questions or hypotheses, devising fair methods and carrying out those methods to find out answers to the questions or to verify the hypotheses.

It must be pointed out that there is also no one definite sequence of priority among the skills and processes listed above. For example, observation may lead to hypothesising but at other times a hypothesis can lead to observation. All the skills and processes listed above are seen as part of the total process of scientific inquiry. In science teaching and learning, effort should initially be directed at teaching explicitly each of the skills through the use of appropriate activities. Later, effort should be directed to helping students integrate some or all of the skills in scientific inquiry.

The table below shows the levels at which skills and processes can be introduced. Once introduced, these skills and processes should continue to be developed at the higher levels.

Skills	Lower Block (Primary 3 and 4) <sup>2</sup>	Upper Block (Primary 5 and 6)
Observing	✓	✓
Comparing	✓	✓
Classifying	✓	✓
Using apparatus and equipment	✓	✓
Communicating (Verbal, Pictorial)	✓	✓
Communicating (Tabular)	✓	✓
Communicating (Graphical)	✓	✓
Inferring	✓	✓
Predicting	✓	✓
Analysing	✓	✓
Generating possibilities	✓	✓
Evaluating	✓	✓
Formulating hypothesis	✓	✓
Processes	Lower Block (Primary 3 and 4)	Upper Block (Primary 5 and 6)
Creative Problem Solving	✓	✓
Decision-Making	✓	✓
Investigation	✓	✓

<sup>2</sup> This would be done in an age-appropriate manner.

## iii. ATTITUDES AND ETHICS

In all scientific inquiry, the adoption of certain mental attitudes such as Curiosity, Creativity, Integrity, Objectivity, Open-mindedness, Perseverance and Responsibility is advocated.

- **Curiosity**  
Desire to explore the environment and question what they find.
- **Creativity**  
Suggest innovative and relevant ways to solve problems.
- **Integrity**  
Handle and communicate data and information with integrity.
- **Objectivity**  
Seek data and information to validate observations and explanations objectively.
- **Open-mindedness**  
Accept all knowledge as tentative and willing to change their view if the evidence is convincing.
- **Perseverance**  
Pursue a problem until a satisfactory solution is found.
- **Responsibility**  
Show care and concern for living things and awareness of the responsibility they have for the quality of the environment.

Opportunities should be provided in the classroom for students to ask questions. Students should be encouraged to ask both closed and open questions. From the type of questions asked

by the students, teachers could gather information on their 'frame of mind' and the quality of their understanding.

Table 1 shows an overview of the Primary Science Syllabus.



Table 1: An Overview of the Primary Science Syllabus

Syllabus Requirement			White Space
Themes	* Lower Block (Primary 3 and 4)	**Upper Block (Primary 5 and 6)	The freed up curriculum time is to enable teachers to use more engaging teaching and learning approaches, and/or to implement customised school-based programmes as long as the aims of the syllabus are met. This enables teachers to make learning more meaningful and enjoyable for their students.
Diversity	<ul style="list-style-type: none"> <li>Diversity of living and non-living things (General characteristics and classification)</li> <li>Diversity of materials</li> </ul>		
Cycles	<ul style="list-style-type: none"> <li>Cycles in plants and animals (Life cycles)</li> <li>Cycles in matter and water (Matter)</li> </ul>	<ul style="list-style-type: none"> <li>Cycles in plants and animals (Reproduction)</li> <li>Cycles in matter and water (Water)</li> </ul>	
Systems	<ul style="list-style-type: none"> <li>Plant system (Plant parts and functions)</li> <li>Human system (Digestive system)</li> </ul>	<ul style="list-style-type: none"> <li>Plant system (Respiratory and circulatory systems)</li> <li>Human system (Respiratory and circulatory systems)</li> <li><u>Cell system</u></li> <li>Electrical system</li> </ul>	
Interactions	<ul style="list-style-type: none"> <li>Interaction of forces (Magnets)</li> </ul>	<ul style="list-style-type: none"> <li>Interaction of forces (Frictional force, gravitational force, <u>force in springs</u>)</li> <li>Interaction within the environment</li> </ul>	
Energy	<ul style="list-style-type: none"> <li>Energy forms and uses (Light and heat)</li> </ul>	<ul style="list-style-type: none"> <li>Energy forms and uses (Photosynthesis)</li> <li><u>Energy conversion</u></li> </ul>	

Topics which are underlined are not required for students taking Foundation Science.

TEACHING AND LEARNING  
THROUGH INQUIRY



Essential features of science as inquiry	← Amount of Student Self-Direction → More Less			
	← Amount of Guidance from Teacher or Material → Less More			
3.Explanation Students construct explanations when they ...	formulate their own explanation after summarising evidence	are guided in process of formulating explanation from evidence	are given possible ways to use evidence to formulate explanation	are provided with evidence
4.Connections Students evaluate their explanations when they ...	examine other resources and form links to explanations	are directed toward sources of knowledge	are given possible connections	are provided with connections
5.Communication Students communicate and justify their explanations when they ...	form reasonable and logical argument to communicate explanations	are coached in development of communication	are provided guidelines for communication	are given steps and procedures for communication

What are some strategies for conducting inquiry-based learning and teaching?

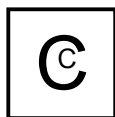
A primary purpose for inquiry-based instruction is for students to learn fundamental science concepts, principles, and theories as well as to develop science process skills and attitudes that are essential for scientific inquiry. Science teachers are already using a variety of teaching strategies in their lessons.

To further emphasise the learning of science as inquiry, teachers can incorporate in these strategies the essential features of Question, Evidence, Explanation, Connections and Communication and provide students with experiences that varies between guided (partial) and open (full) inquiry.

To meet the learning styles of students offering Foundation Science, teachers should carry out the inquiry-based approach through hands-on learning, from concrete to abstract. Hands-on learning experiences should also be situated in realistic contexts so that students can make connections with their own lives and the environment in which they live. In this way, students become engaged and excited about what they are studying and they then become motivated to learn.

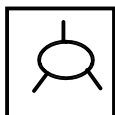
Teachers are also encouraged to use a variety of strategies to facilitate the inquiry process. Selected strategies are highlighted below to help teachers plan and deliver lessons that will engage students in meaningful learning experiences and cultivate their interest and curiosity in science. These strategies can be mixed and matched. A brief description of each of these strategies is given on the next page:

Adapted from Inquiry and the National Science Education Standards, National Research Council (2000).



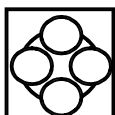
### Concept Cartoon

In concept cartoons, minimal language is used. Visual images are utilised to present concepts or questions relating to one central idea or word.



### Concept Mapping

Concept mapping is a strategy to present meaningful relationships among concepts. Concept maps are useful in organising and linking concepts or ideas.



### Cooperative Learning

In cooperative learning, activities are structured such that each student assumes certain responsibilities and contributes to the completion of tasks. In working with others, students are exposed to different points of views and solutions in accomplishing a common goal.



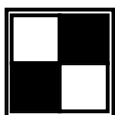
### Demonstration

Demonstration is commonly used to scaffold the learning process. This approach is recommended when the learning activity is not safe or too complex for students to set up on their own.



### Field Trip

A field trip is any learning activity outside the school. It provides opportunities for students to explore, discover and experience science in everyday life.



### Games

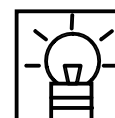
Games engage students in play or simulations for the learning of concepts or skills. This is useful in

helping students to visualise or illustrate objects or processes in the real world.



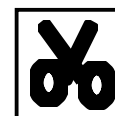
### Investigation

In scientific investigation, students engage in activities that mirror how scientists think and what they do in a decision making process, such as asking or posing questions and planning or designing investigations.



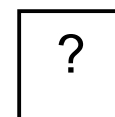
### Problem Solving

Problem solving engages students in finding solutions to problems by applying scientific knowledge and skills.



### Projects

Projects are learning activities that require students to find out about an object, event, process or phenomenon over a few weeks.



### Questioning

Questions are useful tools in the scientific inquiry process. Both teachers and students should engage in cycles of questions-answers-questions throughout the learning process.



### Role Play, Drama, Dance and Movement

Role play, drama, dance and movement allow students to express their understanding of scientific concepts and processes in a creative way.



### Strategies for Active and Independent Learning (SAIL)

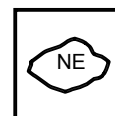
The SAIL approach emphasises learning as a formative and developmental process in which instruction and assessment point the way for students to continuously learn and improve. Learning expectations and rubrics are used to describe what students should know and be able to do. This would help students know where they are in the learning process and how they can improve.

Teachers are also encouraged to leverage on the planned learning activities to infuse Information Technology and National Education.



### Information Technology

When used as a tool to support appropriate teaching strategies, IT can enhance the teaching and learning process and lead to engaged learning. For example, teachers can tap on the Internet for alternative resources which can be used to support inquiry-based learning activities. Appropriate IT devices such as dataloggers and other hand-held devices can be used to enhance data collection and speed up data analysis. Abstract concepts in science can also be made more comprehensible with the use of simulations, scenarios and animations.



### National Education

National Education is infused into the curriculum to allow students to see how scientific phenomena and developments can contribute to or affect the nation.

Where appropriate, students should have opportunities to develop attitudes which are relevant to the study of science. Teachers are also encouraged to incorporate the ethical aspect of science wherever possible throughout the syllabus.



### Ethics and Attitudes

In scientific inquiry, the adoption of certain mental attitudes such as Curiosity, Creativity, Objectivity, Integrity, Open-mindedness, Perseverance and Responsibility is advocated. Students can also discuss the ethical implications of science and technology.

What are some features of an inquiry classroom?

An inquiry classroom is visibly different from a traditional classroom in the following ways:

Traditional	Inquiry
Students often work alone	Students often work in groups
Emphasis on mastery of facts	Emphasis on understanding of concepts
Follows a fixed curriculum closely	Allows for pursuit of student questions
Activities rely mainly on textbooks and workbook materials	Activities rely on a variety of sources
Students are viewed as “blank slates”	Students are viewed as thinkers with their own theories about the world
Teachers tend to disseminate information to students	Teachers facilitate an interactive learning environment
Teachers tend to seek correct answers	Teachers seek to understand student learning
Assessment tends to be separate from teaching	Assessment is interwoven with teaching

Adapted from *In Search of Understanding: The Case for Constructivist Classrooms*, Brooks & Brooks (1993).

What are some misconceptions about inquiry-based learning and teaching?

1: All science subject matter should be taught through student-directed inquiry.

Whereas student-directed inquiry will provide the best opportunities for cognitive development and scientific reasoning, teacher-guided inquiry can best focus learning on the development of particular science concepts. Thus, students will best benefit from experiences that vary between these two inquiry approaches.

2: Inquiry cannot be carried out by students effectively as they will not be able to discover anything worthwhile.

Although it is important that students are provided with opportunities to pursue their own questions and discover some things for themselves, scientists and students often engage in inquiry to solve problems or understand events by reading relevant materials (print and online resources) and seeking advice from experts in the specific field. They may be engaged in inquiry without actually making their own discoveries.

3: Inquiry teaching occurs whenever students are provided with hands-on activities.

Although participation by students in hands-on activities is desirable, it is equally important that they are mentally engaged with scientific reasoning and methods. Research indicates that science process skills are best learnt when used to understand specific scientific content. Understanding content without process or vice versa is insufficient to nurture students as inquirers.

# ASSESSING TEACHING AND LEARNING



## 5 ASSESSING TEACHING AND LEARNING

Assessment is an integral part of the teaching and learning process. It involves gathering information through various assessment techniques and making sound decisions. Assessment provides information to the teacher about students' achievement in relation to the learning objectives. With this information, the teacher makes informed decisions about what should be done to enhance the learning of the students and to improve teaching methods.

### Why Assess?

Assessment measures the extent to which desired knowledge, skills and attitudes are attained by students. While it complements the teaching and learning process, it also provides formative and summative feedback to teachers, students, schools and parents.

- Assessment provides feedback to students, allows them to understand their strengths and weaknesses. Through assessment, students can monitor their own performance and progress. It also points them in the direction they should go to improve further.
- Assessment provides feedback to teachers, enables them to understand the strengths and weaknesses of their students. It provides information about students' achievement of learning outcomes as well as the effectiveness of their teaching.
- Assessment provides feedback to schools. The information gathered facilitates the placement of students in the appropriate stream or course, and the promotion of students from one level to the next. It also allows the schools to review the effectiveness of their instructional programme.
- Assessment provides feedback to parents, allows them to monitor their children's progress and achievement through the information obtained.

### What to Assess?

The aims of the Primary Science Syllabus are the acquisition of knowledge, understanding and application of the science concepts, the ability to use process skills, and the development of attitudes important to the practice of science. The assessment objectives of the syllabus are aligned to the three domains in the curriculum framework as shown below:

- i. Assessment of Knowledge, Understanding and Application of Science Concepts
- ii. Assessment of Skills and Process
- iii. Assessment of Ethics and Attitudes

## How to Assess?

Assessment measures the extent to which desired knowledge, skills and attitudes are attained by students. As it serves many purposes, it is important to match the type of assessment to the specific purpose for which it is intended. Before making an assessment about a certain aspect of students' performance, the teacher should ensure that the assessment mode used will generate information that reflect accurately the particular aspect of performance the teacher intends to assess.

In an inquiry-based classroom, the assessment can take many forms. In addition to the written tests, teachers can also conduct performance-based assessment using the following modes:

- Practicals
- Projects
- Teacher observations
- Checklists
- Reflections / Journals
- Model-making
- Posters
- Games and quizzes
- Debates
- Drama / Show and Tell
- Learning Trails

Teachers can also assess students through the use of portfolio. It is a systematic collection of students' work and provides a comprehensive picture of their achievement. The work collected provides a continuous record of the students' development and progress in the acquisition of knowledge,

understanding of scientific concepts, application of process skills, and development of attitudes. It also provides opportunity for the students to have self-evaluation and reflections by revisiting their own portfolio.

The assessment modes listed above are by no means exhaustive. Adopting a variety of assessment modes enables the teachers to assess different aspects of the teaching and learning.

## Guidelines for Assessment

It is essential for assessment to be aligned to the teaching and learning process. School assessment, both formative and summative in nature, should be used to provide a complete picture of the students' performance and progress, and the effectiveness of the teaching and learning process.

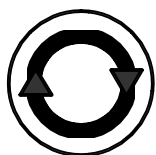
# SYLLABUS CONTENT

## 6 SYLLABUS CONTENT (P3, P4, P5 Standard Science and P6 Standard Science)

	<p><b>About Diversity:</b>                  Students should appreciate that there is a great variety of living and non-living things in the world. The study of the diversity in the world will also allow students to appreciate the importance and necessity of maintaining it. Man seeks to organise this great variety of living things to better understand the world in which he lives. There are common threads that connect all living things and unifying factors in the diversity of non-living things that help him to classify them. In this theme, we study the diversity of living and non-living things as well as materials.</p> <p>Note:                  * Lower Block                  ** Upper Block</p>	<p>Suggested Key Inquiry Questions in Diversity include:</p> <ul style="list-style-type: none"> <li>• <i>What is our environment made up of?</i></li> <li>• <i>Why is it important to maintain diversity?</i></li> <li>• <i>How do we go about understanding the diverse range of living and non-living things?</i></li> </ul>
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<i>Learning Outcomes</i>		
<i>Knowledge, Understanding and Application</i>	<i>Skills and Processes</i>	<i>Ethics and Attitudes</i>
<i>Diversity of Living and Non-Living Things</i>		
<ul style="list-style-type: none"> <li>• *Describe the characteristics of living things.                             <ul style="list-style-type: none"> <li>- need water, food and air to survive</li> <li>- grow, respond and reproduce</li> </ul> </li> <li>• *Recognise some broad groups of living things.                             <ul style="list-style-type: none"> <li>- plants (e.g. flowering, non-flowering)</li> <li>- animals (e.g. birds, fish, insects, mammals)</li> <li>- fungi (e.g. mushroom, yeast)</li> <li>- bacteria</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• *<u>Observe</u> a variety of living and non-living things and <u>infer</u> differences between them.</li> <li>• *<u>Classify</u> living things into broad groups (plants and animals) based on similarities and differences of common observable characteristics.</li> </ul>	<ul style="list-style-type: none"> <li>• *Show <u>curiosity</u> in exploring the surrounding living and non-living things.</li> <li>• *Value individual effort and team work.</li> </ul>

Learning Outcomes		
Knowledge, Understanding and Application	Skills and Processes	Ethics and Attitudes
Diversity of Living and Non-Living Things		
<ul style="list-style-type: none"> <li>*List the various types of materials and relate their properties to their uses. e.g. plastics, wood, rubber, metals</li> </ul>	<ul style="list-style-type: none"> <li>*<u>Compare</u> materials based on their physical properties.                             <ul style="list-style-type: none"> <li>- hardness</li> <li>- strength</li> <li>- flexibility</li> <li>- ability to float/sink in water</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>*Show <u>objectivity</u> by using data and information to validate observations and explanations about the properties and uses of materials.</li> </ul>



About Cycles:

There are repeated patterns of change in nature. Examples of these cycles are the life cycles of living things and the water cycle. Understanding these cycles helps Man to predict events and processes and to appreciate the Earth as a self-sustaining system. In this theme, we learn about the Cycles in plants and animals as well as matter and water.

Note:

\* Lower Block

\*\* Upper Block

Suggested Key Inquiry Questions in Cycles include:

- *What are the cycles in our everyday life?*
- *How are cycles important to life?*

*Learning Outcomes*

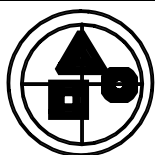
<i>Knowledge, Understanding and Application</i>	<i>Skills and Processes</i>	<i>Ethics and Attitudes</i>
<i>Cycles in Plants and Animals</i>		
<ul style="list-style-type: none"> <li>• *Show an understanding that different organisms have different life cycles.                             <ul style="list-style-type: none"> <li>- Plants</li> <li>- Animals</li> </ul> </li> <li>• **Show an understanding that living things reproduce to ensure continuity of their kind and that many characteristics of an organism are passed on from parents to offspring.</li> </ul>	<ul style="list-style-type: none"> <li>• *<u>Observe</u> and <u>compare</u> the life cycles of plants grown from seeds over a period of time.</li> <li>• *<u>Observe</u> and <u>compare</u> the life cycles of animals over a period of time. e.g. butterfly, mealworm, grasshopper, cockroach, chicken, frog</li> <li>• **<u>Investigate</u> the various ways in which plants reproduce and <u>communicate</u> findings.                             <ul style="list-style-type: none"> <li>- spores</li> <li>- seeds</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• *Show <u>curiosity</u> in exploring the surrounding plants and animals and question what they find.</li> <li>• *Show <u>concern</u> by being responsible towards plants and animals such as their own pets.</li> <li>• *Value individual effort and team work.</li> <li>• **Show <u>curiosity</u> in exploring the surrounding plants and animals and question what they find.</li> </ul>

Learning Outcomes		
Knowledge, Understanding and Application	Skills and Processes	Ethics and Attitudes
Cycles in Plants and Animals		
<ul style="list-style-type: none"> <li>• **Recognise the processes in the sexual reproduction of flowering plants.               <ul style="list-style-type: none"> <li>- pollination</li> <li>- fertilisation (seed production)</li> <li>- seed dispersal</li> <li>- germination</li> </ul> </li> <li>• **Recognise the process of fertilisation in the sexual reproduction of humans.</li> <li>• **Recognise the similarity in terms of fertilisation in the sexual reproduction of flowering plants and humans.</li> </ul>		<ul style="list-style-type: none"> <li>• **Show <u>concern</u> by being responsible towards plants and animals such as their own pets.</li> <li>• **Value individual effort and team work.</li> </ul>

Learning Outcomes		
Knowledge, Understanding and Application	Skills and Processes	Ethics and Attitudes
<b>Cycles in Matter and Water</b>		
<ul style="list-style-type: none"> <li>• *State that matter is anything that has mass and occupies space.</li> <li>• *Differentiate between the three states of matter (solid, liquid, gas) in terms of shape and volume.</li> <li>• **Recognise that water can exist in three interchangeable states of matter.</li> <li>• **Show an understanding of how water changes from one state to another.               <ul style="list-style-type: none"> <li>- Melting (solid to liquid)</li> <li>- Evaporation / Boiling (liquid to gas)</li> <li>- Condensation (gas to liquid)</li> <li>- Freezing (liquid to solid)</li> </ul> </li> <li>• **Show an understanding of the terms melting point of ice (or freezing point of water) and boiling point of water.</li> <li>• **Show an understanding of the roles of evaporation and condensation in the water cycle.</li> </ul>	<ul style="list-style-type: none"> <li>• *<u>Measure</u> mass and volume using appropriate apparatus.</li> <li>• **<u>Compare</u> water in 3 states.</li> <li>• **<u>Investigate</u> the effect of heat gain or loss on the state of water and <u>communicate</u> findings.               <ul style="list-style-type: none"> <li>- when ice is heated, it melts and changes to water at 0°C</li> <li>- when water is cooled, it freezes and changes to ice at 0°C</li> <li>- when water is heated, it boils and changes to steam at 100 °C</li> <li>- when steam is cooled, it condenses to water</li> </ul> </li> <li>• **<u>Investigate</u> the factors which affect the rate of evaporation and <u>communicate</u> findings.               <ul style="list-style-type: none"> <li>- wind</li> <li>- temperature</li> <li>- exposed surface area</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• *Show <u>curiosity</u> in exploring the surrounding matter and question what they find.</li> <li>• **Show <u>concern</u> for water as a limited natural resource and the need for water conservation.</li> </ul>



Learning Outcomes		
Knowledge, Understanding and Application	Skills and Processes	Ethics and Attitudes
Cycles in Matter and Water		
<ul style="list-style-type: none"><li>• **Recognise the importance of the water cycle.</li><li>• **Recognise the importance of water to life processes.</li><li>• **Describe the impact of water pollution on Earth's water resources.</li></ul>		



About Systems:

A system is a whole consisting of parts that work together to perform a function. There are systems in nature as well as man-made systems. Examples of systems in nature are the digestive and respiratory systems. Examples of man-made systems are electrical systems. Understanding these systems allows Man to understand how they operate and how parts influence and interact with one another to perform a function. In this theme, we learn about the plant, human, cell and electrical systems.

Note:

\* Lower Block

\*\* Upper Block

Suggested Key Inquiry Questions in System include:

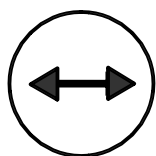
- *What are the different parts of a system?*
- *How do parts of a system or different systems interact together to perform a function?*

<i>Learning Outcomes</i>		
<i>Knowledge, Understanding and Application</i>	<i>Skills and Processes</i>	<i>Ethics and Attitudes</i>
<i>Plant System</i>		
<ul style="list-style-type: none"> <li>• *Identify the different parts of plants and state their functions.                             <ul style="list-style-type: none"> <li>- leaf</li> <li>- stem</li> <li>- root</li> </ul> </li> <li>• **Identify the parts of the plant transport system and describe their functions.</li> </ul>	<ul style="list-style-type: none"> <li>• *<u>Observe</u> plant parts.</li> <li>• **<u>Investigate</u> the functions of plant parts and <u>communicate</u> findings.                             <ul style="list-style-type: none"> <li>- leaf</li> <li>- stem</li> <li>- root</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• *Show <u>curiosity</u> in exploring the surrounding plants and question what they find.</li> <li>• *Show <u>concern</u> by being responsible towards plants.</li> <li>• **Show <u>objectivity</u> by seeking data and information to validate observations and explanations about plant parts and functions.</li> </ul>

Learning Outcomes		
Knowledge, Understanding and Application	Skills and Processes	Ethics and Attitudes
Human System		
<ul style="list-style-type: none"> <li>● *Identify the organ systems in human (digestive, respiratory, circulatory, skeletal and muscular).</li> <li>● *Identify the organs in the human digestive system and describe their functions.</li> <li>● **Recognise that air is a mixture of gases such as nitrogen, carbon dioxide, oxygen and water vapour.</li> <li>● **Identify the organs of the human respiratory and circulatory systems and describe their functions.</li> <li>● **Recognise the integration of the different systems (digestive, respiratory and circulatory) in carrying out life processes.</li> </ul>	<ul style="list-style-type: none"> <li>● **<u>Compare</u> how plants, fish and mammals take in oxygen and give out carbon dioxide.</li> <li>● **<u>Compare</u> the ways in which nutrients, water and oxygen are transported within plants and humans.                             <ul style="list-style-type: none"> <li>- plants: tubes that transport food and water</li> <li>- humans: blood vessels that transport digested food and other substances</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>● *Show <u>curiosity</u> in exploring their own body and questioning about the structures or functions of the body.</li> <li>● **Show <u>objectivity</u> by seeking data and information to validate observations and explanations about their body.</li> </ul>

Learning Outcomes		
Knowledge, Understanding and Application	Skills and Processes	Ethics and Attitudes
<b>Cell System</b>		
<ul style="list-style-type: none"> <li>• <b>**Show an understanding that a cell is a basic unit of life.</b></li> <li>• <b>**Identify the different parts of a typical plant cell and animal cell and relate the parts to the functions.</b> <ul style="list-style-type: none"> <li>- parts of plant cell: cell wall, cell membrane, cytoplasm, nucleus and chloroplasts</li> <li>- parts of animal cell: cell membrane, cytoplasm, nucleus</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <b>**<u>Compare</u> a typical plant and animal cell.</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>**Show <u>curiosity</u> in exploring the microscopic world and questioning what they find.</b></li> <li>• <b>**Value individual effort and team work.</b></li> </ul>

Learning Outcomes		
Knowledge, Understanding and Application	Skills and Processes	Ethics and Attitudes
<b>Electrical System</b>		
<ul style="list-style-type: none"> <li>• <b>**Recognise that an electric circuit consisting of an energy source (battery) and other circuit components (wire, bulb, switch) forms an electrical system.</b></li> <li>• <b>**Show an understanding that a current can only flow through a closed circuit.</b></li> <li>• <b>**Identify electrical conductors and insulators.</b></li> <li>• <b>**Recognise that good conductors of electricity are generally good conductors of heat.</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>**<u>Construct</u> simple circuits from circuit diagrams.</b></li> <li>• <b>**<u>Investigate</u> the effect of some variables on the current in a circuit and <u>communicate</u> findings.</b> <ul style="list-style-type: none"> <li>- number of batteries (arranged in series)</li> <li>- number of bulbs (arranged in series and parallel)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <b>**Show <u>concern</u> for the need to conserve and to have proper use and handling of electricity.</b></li> <li>• <b>**Value individual effort and team work.</b></li> </ul>



About Interactions:

Understanding the interactions between and within systems helps Man to better understand the environment and his role in it. Interactions occur within an organism, between organisms as well as between organisms and the environment. There are also interactions between forces and objects. The interaction of Man with his environment drives the development of Science and Technology. At the same time, Science and Technology influences the way Man interacts with his environment. By understanding the interactions between Man and his environment, students can better appreciate the consequences of their actions and be responsible for their actions. In this theme, we learn about the interaction of forces and interactions in the environment.

Note:

\* Lower Block

\*\* Upper Block

Suggested Key Inquiry Questions in Interactions include:

- *How does Man interact with his surroundings?*
- *What are the consequences of Man's interactions with his surroundings?*

*Learning Outcomes*

<i>Knowledge, Understanding and Application</i>	<i>Skills and Processes</i>	<i>Ethics and Attitudes</i>
<i>Interactions of Forces</i>		
<ul style="list-style-type: none"> <li>• *Recognise that a magnet can exert a push or a pull.</li> <li>• *Identify the characteristics of magnets.                             <ul style="list-style-type: none"> <li>- magnets can be made of iron or steel</li> <li>- magnets have two poles. A freely suspended bar magnet comes to rest pointing in a N-S direction</li> <li>- unlike poles attract and like poles repel</li> <li>- magnets attract magnetic materials</li> </ul> </li> <li>• *List some uses of magnets in everyday objects.</li> </ul>	<ul style="list-style-type: none"> <li>• *<u>Compare</u> magnets and non-magnets.</li> <li>• *<u>Make</u> a magnet by the 'Stroke' method and the electrical method.</li> </ul>	<ul style="list-style-type: none"> <li>• *<u>Show curiosity</u> in exploring magnets and question what they find.</li> </ul>

Learning Outcomes		
Knowledge, Understanding and Application	Skills and Processes	Ethics and Attitudes
Interactions of Forces		
<ul style="list-style-type: none"> <li>● <b>**Identify a force as a push or a pull.</b></li> <li>● <b>**Show an understanding of the effects of a force.</b> <ul style="list-style-type: none"> <li>- A force can move a stationary object</li> <li>- A force can speed up, slow down or change the direction of motion</li> <li>- A force can stop a moving object</li> <li>- A force may change the shape of an object</li> </ul> </li> <li>● <b>**Recognise and give examples of the different types of forces.</b> <ul style="list-style-type: none"> <li>- magnetic force</li> <li>- gravitational force</li> <li>- elastic spring force</li> <li>- frictional force</li> </ul> </li> <li>● <b>**Recognise that objects have weight because of the gravitational force between them and the Earth.</b></li> </ul>	<ul style="list-style-type: none"> <li>● <b>**<u>Investigate</u> the effect of friction on the motion of objects and <u>communicate</u> findings.</b></li> <li>● <b>**<u>Investigate</u> the effects of forces on springs and <u>communicate</u> findings.</b></li> </ul>	<ul style="list-style-type: none"> <li>● <b>**Show <u>objectivity</u> by using data and information to validate observations and explanations about forces.</b></li> <li>● <b>**Value individual effort and team work.</b></li> </ul>

Learning Outcomes		
Knowledge, Understanding and Application	Skills and Processes	Ethics and Attitudes
<b>Interactions within the Environment</b>		
<ul style="list-style-type: none"> <li>• <b>**Describe the characteristics of a local environment. e.g. temperature, amount of light</b></li> <li>• <b>**Identify the factors that affect the survival of an organism.</b> <ul style="list-style-type: none"> <li>- physical characteristics of the environment</li> <li>- availability of food</li> <li>- types of other organisms present</li> </ul> </li> <li>• <b>**Discuss the effect on organisms when the environment becomes unfavourable. e.g. organisms adapt and survive; move to other places or die</b></li> <li>• <b>**Trace the energy pathway from the Sun through living things and identify the roles of various organisms (producers, consumers, decomposers; predators, preys) in a food chain and a food web.</b></li> <li>• <b>**Differentiate among the terms organism, population and community.</b> <ul style="list-style-type: none"> <li>- An organism is a living thing.</li> <li>- A population is defined as a group of</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <b>**<u>Observe, collect and record</u> information regarding the interacting factors within an environment.</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>**<u>Show concern</u> by being respectful and responsible towards the environment and the organisms living in it.</b></li> <li>• <b>**<u>Show concern</u> for Man's impact on the environment.</b></li> <li>• <b>**Value individual effort and team work.</b></li> </ul>



Learning Outcomes		
Knowledge, Understanding and Application	Skills and Processes	Ethics and Attitudes
Interactions within the Environment		
<p>plants and animals of the same kind, living and reproducing at a given place and time.</p> <ul style="list-style-type: none"> <li>- A community consists of many populations living together in a particular place.</li> </ul> <ul style="list-style-type: none"> <li>• **Show an understanding that different habitats support different communities. e.g. garden, field, pond, seashore, tree</li> <li>• **Recognise that adaptations serve to enhance survival and can be structural or behavioural.                             <ul style="list-style-type: none"> <li>- cope with physical factors</li> <li>- obtain food</li> <li>- escape predators</li> <li>- reproduce by finding and attracting mates or dispersing seeds</li> </ul> </li> <li>• **Give examples of man's impact (both positive and negative) on the environment. e.g. deforestation, global warming, pollution</li> </ul>		



About Energy:

Students should appreciate that energy affects both living and non-living things. It makes changes and movement possible in everyday life. There are many forms of energy and one form can be converted to another. Man uses energy in many ways, for many different purposes. Man is not the only animal that uses energy; all living things obtain energy and use it to carry out life processes. Understanding this theme will allow students to appreciate the importance and uses of energy and the need to conserve it. In this theme, we learn about various energy forms, uses and conversions.

Note:

\* Lower Block

\*\* Upper Block

Suggested Key Inquiry Questions in Energy include:

- *How does Energy affect Man and his surroundings?*
- *Why is it important to conserve energy?*

<i>Learning Outcomes</i>		
<i>Knowledge, Understanding and Application</i>	<i>Skills and Processes</i>	<i>Ethics and Attitudes</i>
<i>Energy Forms and Uses</i>		
<ul style="list-style-type: none"> <li>• *Recognise that an object can be seen when it reflects light or when it is a source of light.</li> <li>• *Recognise that a shadow is formed when light is completely or partially blocked by an object.</li> </ul>	<ul style="list-style-type: none"> <li>• *<u>Investigate</u> the transparency of materials to light and <u>communicate</u> findings. e.g. using datalogger</li> </ul>	<ul style="list-style-type: none"> <li>• *Show <u>concern</u> for the need to conserve energy.</li> </ul>

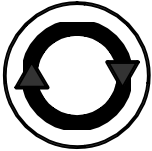
Learning Outcomes		
Knowledge, Understanding and Application	Skills and Processes	Ethics and Attitudes
Energy Forms and Uses		
<ul style="list-style-type: none"> <li>• *List some common sources of heat.</li> <li>• *State that the temperature of an object is a measurement of its degree of hotness.</li> <li>• *Differentiate between heat and temperature. <ul style="list-style-type: none"> <li>- heat is a form of energy</li> <li>- temperature is a measurement of the degree of hotness of an object</li> </ul> </li> <li>• *Show an understanding that heat flows from a hotter to a colder object until both reach the same temperature.</li> <li>• *Relate the change in temperature of an object to the gain or loss of heat by the object.</li> <li>• *List some effects of heat gain/loss in our everyday life. <ul style="list-style-type: none"> <li>- contraction / expansion of objects</li> <li>- change in state of matter</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• *<u>Measure</u> temperature using a thermometer or a datalogger.</li> </ul>	<ul style="list-style-type: none"> <li>• *Show <u>objectivity</u> by seeking data and information to validate observations and explanations about heat.</li> </ul>

Learning Outcomes		
Knowledge, Understanding and Application	Skills and Processes	Ethics and Attitudes
Energy Forms and Uses		
<ul style="list-style-type: none"> <li>• *Identify good and bad conductors of heat.</li> <li>- good conductors: metals</li> <li>- bad conductors: wood, plastic, air</li> </ul>		

Learning Outcomes		
Knowledge, Understanding and Application	Skills and Processes	Ethics and Attitudes
Energy Forms and Uses		
<ul style="list-style-type: none"> <li>• **Recognise that energy is required to make things work or move.</li> <li>• **State that living things need energy to carry out life processes.</li> <li>• **Recognise that the Sun is our primary source of light and heat energy.</li> <li>• **Show an understanding that food produced by plants becomes the source of energy for animals.</li> <li>• **Differentiate the ways in which plants and animals obtain their food.</li> </ul>	<ul style="list-style-type: none"> <li>• **<u>Investigate</u> the requirements (water, light energy and carbon dioxide) for photosynthesis (production of sugar and oxygen) and <u>communicate</u> findings.</li> </ul>	<ul style="list-style-type: none"> <li>• **Show <u>objectivity</u> by using data and information to validate observations and explanations about photosynthesis.</li> </ul>

Learning Outcomes		
Knowledge, Understanding and Application	Skills and Processes	Ethics and Attitudes
Energy Conversion		
<ul style="list-style-type: none"> <li>• <b>**Recognise that energy from most of our energy resources is derived in some ways from the Sun.</b></li> <li>• <b>**Recognise and give examples of the various forms of energy.</b> <ul style="list-style-type: none"> <li>- kinetic energy</li> <li>- potential energy</li> <li>- light energy</li> <li>- electrical energy</li> <li>- sound energy</li> <li>- heat energy</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <b>**<u>Investigate</u> energy conversion from one form to another and <u>communicate</u> findings.</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>**Show <u>concern</u> for the need to conserve energy usage in our everyday life.</b></li> </ul>

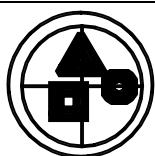
## SYLLABUS CONTENT (P5 Foundation Science and P6 Foundation Science)

 <p>About Cycles: There are repeated patterns of change in nature. Examples of these cycles are the life cycles of living things and the water cycle. Understanding these cycles helps Man to predict events and processes and to appreciate the Earth as a self-sustaining system. In this theme, we learn about the Cycles in plants and animals as well as matter and water. Note: <b>** Upper Block</b></p>	<p>Suggested Key Inquiry Questions in Cycles include:</p> <ul style="list-style-type: none"> <li>• <i>What are the cycles in our everyday life?</i></li> <li>• <i>How are cycles important to life?</i></li> </ul>
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<i>Learning Outcomes</i>		
<i>Knowledge, Understanding and Application</i>	<i>Skills and Processes</i>	<i>Ethics and Attitudes</i>
<i>Cycles in Plants and Animals</i>		
<ul style="list-style-type: none"> <li>• <b>**State the processes in the sexual reproduction of flowering plants.</b> <ul style="list-style-type: none"> <li>- pollination</li> <li>- fertilisation (seed production)</li> <li>- seed dispersal</li> <li>- germination</li> </ul> </li> <li>• <b>**State the process of fertilisation in the sexual reproduction of humans.</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>**<u>Observe</u> and <u>compare</u> the various ways in which plants reproduce and <u>communicate</u> findings.</b> <ul style="list-style-type: none"> <li>- spores</li> <li>- seeds</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <b>**Show <u>curiosity</u> in exploring the surrounding plants and animals and question what they find.</b></li> <li>• <b>**Show <u>concern</u> by being responsible towards plants and animals such as their own pets.</b></li> <li>• <b>**Value individual effort and team work.</b></li> </ul>

Learning Outcomes		
Knowledge, Understanding and Application	Skills and Processes	Ethics and Attitudes
Cycles in Matter and Water		
<ul style="list-style-type: none"> <li>• <b>**Recognise that water can exist in three interchangeable states of matter.</b></li> <li>• <b>**State how water changes from one state to another.</b> <ul style="list-style-type: none"> <li>- Melting (solid to liquid)</li> <li>- Evaporation / Boiling (liquid to gas)</li> <li>- Condensation (gas to liquid)</li> <li>- Freezing (liquid to solid)</li> </ul> </li> <li>• <b>**State the melting point of ice (or freezing point of water) and boiling point of water.</b></li> <li>• <b>**Recognise the changes in states of water in the water cycle.</b></li> <li>• <b>**Recognise the importance of the water cycle.</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>**<u>Compare</u> water in 3 states.</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>**Show <u>concern</u> for water as a limited natural resource and the need for water conservation.</b></li> </ul>





**About Systems:**

A system is a whole consisting of parts that work together to perform a function. There are systems in nature as well as man-made systems. Examples of systems in nature are the digestive and respiratory systems. Examples of man-made systems are electrical systems. Understanding these systems allows Man to understand how they operate and how parts influence and interact with one another to perform a function. In this theme, we learn about the plant, human, cell and electrical systems.

Note:

\*\* Upper Block

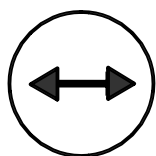
Suggested Key Inquiry Questions in System include:

- *What are the different parts of a system?*
- *How do parts of a system or different systems interact together to perform a function?*

<i>Learning Outcomes</i>		
<i>Knowledge, Understanding and Application</i>	<i>Skills and Processes</i>	<i>Ethics and Attitudes</i>
<i>Plant System</i>		
<ul style="list-style-type: none"> <li>• **Recognise how water is transported from the roots to other parts of the plants and how food is transported from the leaves to the other parts of the plants.</li> </ul>	<ul style="list-style-type: none"> <li>• ** <u>Observe</u> and recognise the functions of plant parts and <u>communicate</u> findings.                             <ul style="list-style-type: none"> <li>- leaf</li> <li>- stem</li> <li>- root</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• **Show <u>objectivity</u> by seeking data and information to validate observations and explanations about plant parts and functions.</li> </ul>

Learning Outcomes		
Knowledge, Understanding and Application	Skills and Processes	Ethics and Attitudes
Human System		
<ul style="list-style-type: none"> <li>• <b>**Recognise that air is a mixture of gases such as nitrogen, carbon dioxide, oxygen and water vapour.</b></li> <li>• <b>**Identify the organs of the human respiratory and circulatory systems and state their functions.</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>**<u>Compare</u> how plants and mammals take in oxygen and give out carbon dioxide.</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>**Show <u>objectivity</u> by seeking data and information to validate observations and explanations about their body.</b></li> </ul>

Learning Outcomes		
Knowledge, Understanding and Application	Skills and Processes	Ethics and Attitudes
<b>Electrical System</b>		
<ul style="list-style-type: none"> <li>• <b>**Recognise</b> that an electric circuit consisting of an energy source (battery) and other circuit components (wire, bulb, switch) forms an electrical system.</li> <li>• <b>** State</b> that a current can only flow through a closed circuit.</li> <li>• <b>**Identify</b> electrical conductors and insulators.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>**<u>Construct</u></b> simple circuits from circuit diagrams.</li> <li>• <b>**<u>Investigate</u></b> the effect of some variables on the current in a circuit and <b><u>communicate</u></b> findings. <ul style="list-style-type: none"> <li>- number of batteries (arranged in series)</li> <li>- number of bulbs (arranged in series)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <b>**Show <u>concern</u></b> for the need to conserve and to have proper use and handling of electricity.</li> <li>• <b>**Value</b> individual effort and team work.</li> </ul>



About Interactions:

Understanding the interactions between and within systems helps Man to better understand the environment and his role in it. Interactions occur within an organism, between organisms as well as between organisms and the environment. There are also interactions between forces and objects. The interaction of Man with his environment drives the development of Science and Technology. At the same time, Science and Technology influences the way Man interacts with his environment. By understanding the interactions between Man and his environment, students can better appreciate the consequences of their actions and be responsible for their actions. In this theme, we learn about the interaction of forces and interactions in the environment.

Note:

\*\* Upper Block

Suggested Key Inquiry Questions in Interactions include:


- *How does Man interact with his surroundings?*
- *What are the consequences of Man's interactions with his surroundings?*

*Learning Outcomes*

<i>Knowledge, Understanding and Application</i>	<i>Skills and Processes</i>	<i>Ethics and Attitudes</i>
<i>Interaction of Forces</i>		
<ul style="list-style-type: none"> <li>• <b>**Identify a force as a push or a pull.</b></li> <li>• <b>**State the effects of a force.</b> <ul style="list-style-type: none"> <li>- A force can move a stationary object</li> <li>- A force can speed up, slow down or change the direction of motion</li> <li>- A force can stop a moving object</li> <li>- A force may change the shape of an object</li> </ul> </li> <li>• <b>**Recognise and give examples of the different types of forces.</b> <ul style="list-style-type: none"> <li>- magnetic force</li> <li>- gravitational force</li> <li>- frictional force</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• <b>**<u>Investigate</u> the effect of friction on the motion of objects and <u>communicate</u> findings.</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>**Show <u>objectivity</u> by using data and information to validate observations and explanations about forces.</b></li> <li>• <b>**Value individual effort and team work.</b></li> </ul>

Learning Outcomes		
Knowledge, Understanding and Application	Skills and Processes	Ethics and Attitudes
Interaction of Forces		
<ul style="list-style-type: none"><li>• **Recognise that objects have weight because of the gravitational force between them and the Earth</li></ul>		

Learning Outcomes		
Knowledge, Understanding and Application	Skills and Processes	Ethics and Attitudes
Interactions within the Environment		
<ul style="list-style-type: none"> <li>• <b>**Identify the following factors that affect the survival of an organism.</b> <ul style="list-style-type: none"> <li>- temperature and light</li> <li>- availability of food</li> <li>- types of other organisms present</li> </ul> </li> <li>• <b>**Trace the energy pathway from the Sun through living things and identify the roles of various organisms (producers, predators, preys) in a food chain.</b></li> <li>• <b>**Recognise that different habitats support different organisms. e.g. garden, field, pond, seashore, tree</b></li> <li>• <b>**Recognise that adaptations serve to enhance survival and can be structural or behavioural.</b> <ul style="list-style-type: none"> <li>- cope with physical factors</li> <li>- obtain food</li> <li>- escape predators</li> <li>- reproduce by finding and attracting mates or dispersing seeds</li> </ul> </li> <li>• <b>**Give examples of man's impact (both positive and negative) on the environment. e.g. deforestation, global warming, pollution</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>**<u>Observe, collect and record</u> information regarding the interacting factors within an environment.</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>**Show <u>concern</u> by being respectful and responsible towards the environment and the organisms living in it.</b></li> <li>• <b>**Show <u>concern</u> for Man's impact on the environment.</b></li> <li>• <b>**Value individual effort and team work.</b></li> </ul>

	<p><b>About Energy:</b>          Students should appreciate that energy affects both living and non-living things. It makes changes and movement possible in everyday life. There are many forms of energy and one form can be converted to another. Man uses energy in many ways, for many different purposes. Man is not the only animal that uses energy; all living things obtain energy and use it to carry out life processes. Understanding this theme will allow students to appreciate the importance and uses of energy and the need to conserve it. In this theme, we learn about various energy forms and uses.</p> <p>Note:  <b>** Upper Block</b></p>	<p><b>Suggested Key Inquiry Questions in Energy include:</b></p> <ul style="list-style-type: none"> <li>• <i>How does Energy affect Man and his surroundings?</i></li> <li>• <i>Why is it important to conserve energy?</i></li> </ul>
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Learning Outcomes		
Knowledge, Understanding and Application	Skills and Processes	Ethics and Attitudes
<b>Energy Forms and Uses</b>		
<ul style="list-style-type: none"> <li>• <b>**Recognise that energy is required to make things work or move.</b></li> <li>• <b>**Recognise that the Sun is our primary source of light and heat energy.</b></li> <li>• <b>**Recognise that food produced by plants becomes the source of energy for animals.</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>**<u>Investigate</u> the requirements (water, light energy and carbon dioxide) for photosynthesis (production of sugar and oxygen) and <u>communicate</u> findings.</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>**Show <u>objectivity</u> by using data and information to validate observations and explanations about photosynthesis.</b></li> <li>• <b>**Show <u>concern</u> for the need to conserve energy usage in our everyday life.</b></li> </ul>

# GLOSSARY OF TERMS



# GLOSSARY OF TERMS

	Term	Description of meaning
1.	classify	to group things based on common characteristics
2.	compare	to identify similarities and differences between objects, concepts or processes
3.	construct	to put a set of components together, based on a given plan
4.	describe	to state in words (using diagrams where appropriate) the main points of a topic
5.	discuss	to reflect on and explore a topic in speech or writing
6.	differentiate	to identify the differences between objects, concepts or processes
7.	identify	to select and/or name the object, event, concept or process
8.	infer	to draw a conclusion based on observations
9.	investigate	to find out by carrying out experiments
10.	list	to give a number of points or items without elaboration
11.	manipulate	to control an object in order to explore and discover its behaviour
12.	measure	to obtain a reading from a suitable measuring instrument
13.	observe	to obtain information through the use of the senses
14.	recognise	to identify facts, characteristics or concepts that are critical to the understanding of a situation, event, process or phenomenon
15.	relate	to identify and explain the relationships between objects, concepts or processes
16.	show an understanding	to recall information (facts, concepts, models, data), translate information from one form to another, explain information and summarise information
17.	state	to give a concise answer with little or no supporting argument
18.	trace	to follow a path

# ACKNOWLEDGEMENTS

Members of the Primary Science Syllabus Review Committee (2004-2005) are:

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