

Goals

The Science Curriculum will:

- Encourage a spirit of wonder and enjoyment of the natural world, and the universe
- Foster a spirit of curiosity and scientific inquiry into the physical and material world
- Develop an awareness of the value and role of scientific knowledge in different cultures
- Develop a responsible attitude toward the application of scientific knowledge
- Foster the ability to apply scientific knowledge and skills to practical situations and problem solving
- Develop an understanding of the individual's place in the natural world and the inter-relationships between systems
- Develop students' awareness of their responsibility to the local and global environment and empower them to make positive personal choices accordingly
- Help students to value and preserve the environment
- Develop the process skills of science: observing, classifying, measuring, questioning, manipulating, experimenting, interpreting, inferring, predicting, hypothesizing, communicating and recording
- Lead to the acquisition of a body of knowledge and an understanding of significant concepts
- Develop an understanding of science as a constantly changing and evolving body of knowledge
- Provide opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to enjoy, protect and improve the environment

What will be learnt?

The curriculum strives for a balance between the search for understanding, the acquisition of essential knowledge and skills, the development of positive attitudes and the opportunity for positive action. In terms of achieving balance, the curriculum emphasizes five components:

Concepts

Powerful ideas which have relevance within and across the disciplines and which students must explore and re-explore in order to develop understanding

Knowledge

Significant and relevant subject matter we wish the students to explore and know about

Skills

Acquiring and applying a range of skills to complement the construction of meaning and therefore understanding. These skills are best developed in the context of meaningful situations

Attitudes

Developing positive values, beliefs and feelings about learning, the environment and people

Action

Demonstrations of deeper learning in responsible behavior through positive action and service.

What do we want the students to understand?

Within the science curriculum there are 8 over-riding concepts which underpin the learning of science. Eight key questions, linked to the key concepts, form the basis of this inquiry-based curriculum

Causation - Why is it the way it is?

Causation is the effect brought about by an intended or unintended action or reaction

Change - How is it changing?

Change is an inevitable aspect of the physical world as things become different or pass from one form or phase to another. Change can be natural or brought about and accelerated by outside influences

Connection - How is it connected to other things?

The Earth and beyond is full of interacting items in which parts and sets depend on each other to form a working whole

Form - What is this thing like?

Most things have a form or shape with an outward, or visible appearance or manifestation, and internal structure

Function - How does it work?

The special activities, properties or purposes, natural or endowed, of a creature or thing is its function

Perspective - What are the different points of view?

Events and findings can be interpreted differently depending upon knowledge, experiences and motives. The difference between a proven fact and supposition must be emphasized

Reflection - How do we know that we know?

Reflecting on the various kinds of evidence we have for knowledge and experience and assessing their relative importance

Responsibilities - What is our responsibility to it?

We have a responsibility to the world in which we live. This involves being aware of how scientific knowledge can be used to improve or worsen the quality of life and all living things. Responsibility entails action as well as awareness.

What do we want the students to be able to do?

Design

Through practical experiences involving design, students will:

- Recognize the types of questions which are open to scientific investigation
- Understand the notion of variables and their control such as in a ‘fair test’
- Understand the principles underlying a variety of experimental designs, such as the use of models or the principles underlying field investigations in biology
- Understand the way hypotheses and theories are used to determine the type of data to be collected

Measurement

Through practical experiences involving measurement, students will:

- Choose and use appropriate instruments and measurement procedures
- Understand the importance of accuracy and the purpose of repeat readings in increasing the reliability of data
- Understand sampling procedures and their limitations

Data Organization

Through practical experience in organizing data, students will:

- Recognize the relationship between the methods of organizing information and the design and collection of data in an experiment
- Understand how data are used to support the development of models, laws or theories

Acting Responsibly

Students working in Science should become aware of issues that need to be considered when making decisions about their actions and those of others.

Students act responsibly when they:

- Adopt safe and hygienic practices
- Care for each other and all living things
- Care for the environment
- Adopt open and critical stances in relation to evidence and how it relates to conclusions
- Consider issues relating to the use of scientific knowledge and technologies
- Consider the ethical dimensions of the scientific enterprise at personal, community, economic and political levels
- Acknowledge and respect the values and traditional knowledge of different cultures.

How do we want the students to feel?

The development of positive attitudes towards people, environment and learning are an integral part of learning.

Students will develop:

- **Appreciation:** of the Earth and universe around them and its diversity
- **Commitment to learning:** to apply themselves, to persevere, to show self-discipline and responsibility to the task in hand
- **Courage to take risks:** to feel confident to make decisions and choices especially when these are difficult. This attitude includes being able to deal with unfamiliar situations
- **Creativity:** being creative and imaginative in their thinking and in their approach to problem solving
- **Curiosity:** being curious about the universe, the Earth, its people, and its culture
- **Empathy:** imaginatively projecting oneself into another's situation in order to understand their feelings and emotions
- **Enthusiasm:** excitement about learning new things
- **Flexibility:** to be willing to co-operate, to collaborate, to lead and to follow as the situation demands. Balancing humor and gravity is an important part of being flexible
- **Integrity:** to develop constructive values and to defend what they believe
- **Independence:** thinking and acting independently making their own judgements based on reasoned principles and being able to defend their judgements
- **Respect for life:** their own, others and the environment. Practicing safe procedures during projects and experimentation
- **Sensitivity:** towards cultural diversity and the situations and beliefs of others, and an acceptance of the ambiguity of some situations

Science Overview

The Science Program will:

- Include the study of
 - Life and Living – Ecosystems/Structure and Function
 - Natural and Processed Materials – Materials/Chemistry
 - Energy & Change – Energy and its Uses/Motions and Forces
 - Earth & Beyond – Earth Sciences/Astronomy
- Help students to value the environment and understand the interdependence of living systems
- Develop an inquiring mind and a scientific approach to problem-solving including the acquisition and practice of science process skills
- Provide opportunities for practical activities including planned experimentation

Cycles

The Science curriculum operates in two years cycles. All four topics (Life and Living, Natural and Processed Materials, Energy and Change and Earth and Beyond) are covered each academic year, but teachers may choose the order in which they teach them. In academic years beginning with even numbers topics are taken from cycle A and from cycle B in years beginning with odd numbers, as outlined below. Although one topic should be a key focus each term, individual teachers may also investigate others. The curriculum outline identifies Cycles A and B as follows:

2000/2001 Academic Year – Cycle A

2001/2002 Academic Year – Cycle B

2002/2003 Academic Year – Cycle A

2003/2004 Academic Year – Cycle B

These cycles are designed so the students on the multi-level classes that operate at BHIS do not repeat topics.

Methodology

Teachers will endeavor to:

- Provide an environment that encourages respect for and tolerance of the views and opinions of other
- Stimulate interest and an enthusiasm for the past and the environment
- Provide situations which stimulate, interest and motivate students
- Develop inquiry skills for individual research, and encourage further study and investigation
- Provide a supportive environment that encourages students to explore, experiment, and take risks in all aspects of the program

- Provide students with opportunities to apply their skills, knowledge and experience in increasingly more challenging and demanding situations
- Be aware of and accommodate the specialized needs of students with specific learning needs and students who do not have English as their first language
- Be aware of and accommodate the different learning styles that exist among students
- Employ a variety of organizational strategies, allowing children to work individually, cooperatively in small and large group lessons and together as a whole class
- Provide opportunities for students to discuss and evaluate their own and other's work
- Continually assess students' progress, using a variety of techniques such as diagnostic, formative and summative evaluations, and to maintain evidence and records of their progress

Kindergarten Curriculum

Children working in Kindergarten will have experiences:

- Investigating to answer simple questions
- Carrying out instructions and procedures involving a small number of steps
- Sorting a variety of objects by comparing and matching
- Making simple observations and interpreting
- Reporting findings with drawings and simple statements and relating to other situations
- Identifying ways science is used in daily life
- Working with others to care for living things.

At this level, students recognize ways in which science is a part of their everyday lives. They use the language and literacy skills to describe their explorations in science. Science activities will at times be integrated into other learning areas, and at other times is the context for language and number work. Learning will take place through direct experience, using the senses. Supportive texts such as picture books, stories and computers will enhance the program.

Students will begin to use the language of science and relate appropriate words. They will identify information learnt, make informed comments, draw comparisons, recount events, ask questions and draw pictures with comments describing their explorations. They will begin to take responsibility for carrying out procedures.

Life and Living

Cycle A

Ecosystems

- Identify personal needs
- Compare the needs of baby animals – food, shelter, etc.
- Describe places where particular living things are found
- Observe and describe creatures found in our environment
 - in houses
 - in gardens and school grounds
 - at the seashore

Cycle B

Structure

- List external body parts
- Draw the external parts of pets or farm animals (e.g. paws, tails, claws, fur, scales, horns)
- Investigate the changes in bodies over time (e.g. height, weight, teeth)
- Investigate the changes that occur in animals (e.g. egg to hen, kitten to cat)
- Identify the characteristics of plants
- Describe the need for water, light and food
- Investigate the changes in plants over time

Natural and Processed Materials

Cycle A

Materials

- Identify materials and comment on their suitability for different uses (e.g. food wrappings for keeping food fresh)
- Predict what would happen if we used inappropriate materials for particular purposes
- Associate words and meanings rough/ smooth, hard/ soft/, shiny/ dull, strong/ weak/, thick/ runny when discussing materials
- Compare the properties and behavior of different types of liquids, such as milk, water and honey
- Compare materials by using the senses
- Compare collected materials, both natural and processed

Cycle B

Chemistry

- Use senses to recognize change (e.g. heat and the rate of melting of common materials such as ice, butter, etc.)
- Compare changes in materials when cooking (e.g. jello, popcorn, butter, eggs)
- Recognize solids and liquids
- Describe observable changes such as rusting, dissolving, burning, bleaching, washing and heating
- Comment on possible causes of observable changes

Energy & Change

Cycle A

Energy and its Uses

- Describe ways energy is used in daily life (e.g. the sun for warmth, fuel for transport and food for people)
- Make comments on ways energy is wasted at school and at home
- Describe and draw sequences of connected events that achieve an outcome where energy is transferred
- Draw pictures showing the necessary parts of simple devices that we use to transfer energy (e.g. a flashlight)
- Identify the sources of energy in a variety of devices (e.g. battery in a torch)

Cycle B

Motions and Forces

- Use pulleys and levers to lift loads and draw these actions
- List materials according to whether they are magnetic or not
- Discuss experiences in building with wood or scrap materials; suggest alternative materials that could be used
- Use picture books to learn about how things move and draw pictures showing the necessary parts of simple devices
- Describe the movement of constructions built (e.g. sand castles collapsing)

Earth & Beyond

Cycle A

Space

- Identify features of the day and night sky and relate them to patterns of behavior in everyday life
- Arrange in order familiar daily events
- Draw the shapes of the moon in its monthly cycle
- Distinguish between those events that are done at night, and those done mainly in the daytime
- Explore shadows and discuss the ways in which they change

Cycle B

Earth

- List ways that the local environment influences daily life
- Use pictures to record the weather and relate weather to their daily activities
- Identify types of weather predicted at different seasons
- Collect pictures that relate to the seasons
- Discuss what people wear and do in different types of weather
- Identify features of the local landscape such as hills, beaches and rivers
- Distinguish between natural physical features and those that result from human activity, such as mining

Examples of context and learning activities:

- Make connections between words such as shiny, hard, soft, rough, smooth, strong, weak, thick, or runny and everyday materials that the words describe
- Compare changes in materials when cooking, such as in jelly, popcorn or butter
- Compare materials by using senses; match materials with similar features
- Discuss experiences in building with wood or scrap materials; suggest alternative materials that could be used
- Match the drawing of a material with its name using a computer
- Use picture books to learn about how things move, how problems are tackled and how things are invented
- List materials in groups according to whether they are attracted to a magnet or not
- Suggest ways of powering common electrical appliances
- Describe the movement of constructions students build
- Explore shadows and discuss the ways in which they change
- Discuss what people wear and do in different types of weather
- Name and sort pictures of animals that awake at night or during the day.
- Make informed comments, based on computer resources such as simple picture dictionaries and encyclopedias, about how day and night and seasons affect their daily lives
- Tell a story about what people need to do to look after a pet.
- Identify objects in a 'feely' box
- Present information through computer drawings and text about the needs of living things
- Talk about simple experiments to investigate the needs of plants for water and light

Grades 1 and 2 Curriculum

Children working in Grades 1 and 2 will have experiences:

- Formulating questions to assist in observation and investigation
e.g. What will happen if?
How can we measure?
- Conducting tests and reporting observations
e.g. report with diagrams or words on outcomes of tests
- Drawing conclusions from data collected
e.g. explain findings in writing, using factual descriptions, graphs, models etc.
- Suggesting possible improvements to investigations in the light of findings
- Describing the ways people in the community use science
- Explaining ways that applications of science protect people.

At this level students will begin to explore relationships between phenomena. They will interpret information in terms of their own experiences, and propose explanations about how things work. They will identify and link relevant aspects of their observations, as well as classify them according to similarities and differences. They will predict outcomes and interpret data collected to describe simple patterns. They will be introduced to more specific scientific vocabulary. Students will have experiences comparing, ordering and classifying in a number of different ways.

Life and Living

Cycle A

Ecosystems

- Describe the characteristics of animals and sort them according to their similarities and differences
- Name distinguishing features of vertebrates, invertebrates, amphibians and reptiles
- Link habitat with animal characteristics and describe relationships between living things
- Create sets of rules to sort animals
- Create sets of rules to sort plants
- Investigate the diversity of local plant forms
- Describe the contributions of plants to the environment
- Link habitat with plant characteristics
- Perform simple experiments to investigate what seeds need to germinate
- Examine the main parts of local plants

Cycle B

Structure

- Identify external parts of human beings and describe how they are used
- Explore the physical changes of growth (e.g. height, weight, losing teeth)
- Focus on the 5 senses
- Examine factors of heredity
- Discuss the work of doctors, nurses and agencies in caring for human beings
- Observe the stages of growth and development in a variety of animals (e.g. birds, dogs, fish)
- Link observable features to their functions in familiar living things

Natural and Processed Materials

Cycle A

Materials

- List the ways common materials such as water, wood, metal and fabrics are used
- Design and use fair tests to explore different properties of materials
- Compare the suitability of different materials for different purposes (e.g. water resistant material for raincoats)
- Examine closely and describe the visible structure of common materials
- Investigate shapes of particles of materials
- Describe some advantages and disadvantages of humankind's uses of natural and processed materials

Cycle B

Chemistry

- Distinguish between changes that cannot be readily reversed and those that can (e.g. simple mixtures and compounds)
- Draw and label the stages at which changes to materials occur in cooking (e.g. in butter, popcorn or cake mixture)
- Attempt to reverse processes such as whipping cream, dissolving salt in water, or mixing sand and salt
- Recognize solids, liquids and gases
- Describe changes from solid to liquid, liquid to gas and back
- Describe changes that occur in nature, such as decomposition

Energy and Change

Cycle A

Energy and its Uses

- Explore the forces of wind and water, solar energy and magnetism, and how people use them
- Discuss safety issues associated with electricity
- Explain the ways people in the community use energy
- Identify human foodstuffs as energy sources, human activities as energy consumption
- Investigate the properties of light, sound, heat and movement
- Investigate ways sound and light travel through and are reflected by materials

Cycle B

Motions and Forces

- Examine components of simple machines
- Describe the effects of pulleys and levers
- Describe the workings of bikes and other toys
- Predictions what happens when objects of different weights collide, and check predictions
- List ways that motion energy can be given to a golf ball or a balloon
- Conduct experiments where an object, such as an elastic band or bouncing ball, regains its shape and gives back energy
- Make predictions about what will and will not float

- Record observations and suggest reasons for some things floating while other things do not
- Build models of things that will float

Earth and Beyond

Cycle A

Space

- Examine the rotation and revolution of the earth
- Investigate the angle of the sun and the passing of time during the day by measuring shadows
- Create scenarios on the effects of blocking out the sun for an hour, a month, and a year
- Record observations of the phases of the moon in a table of labeled drawings

Cycle B

Earth

- Use simple instruments to collect information about the weather and identify reasons why such collections are important
- Examine the causes of cyclones, earthquakes, floods, etc. and observe how instruments are used to measure such events
- Examine changes that have occurred in the local environment
- Observe seasons and the effects on animals and plants
- Investigate the water cycle

Examples of context and learning activities:

- Draw and label the stages at which changes to materials occur in cooking, such as in butter, popcorn or cake mixture
- Use a test to explore different properties of materials and relate the results to the uses of the materials (e.g. whether plastic wrap or grease-proof paper is best for keeping a sandwich fresh the longest)
- Discuss the features that make a string telephone work well
- Draw and label data collected from simple experiments with mirrors to identify how light is reflected
- Predict the change in the sound that a bottle containing water will make if more water is added or water is removed; relate their prediction to their observations
- Make a game that uses magnets
- Compose and send messages which record, give information or ask questions about the current state of the weather
- Draw pictures annotated with simple prose to show how weather changes affect the environment.
- Record observations of the phases of the moon in a table of labeled drawings
- Discuss the data that students collect about weather using instruments they make to measure the weather
- Use computer symbols to record information about the weather
- Use appropriate software programs to draw pictures of different animals and sort them according to their differences
- Interpret data from simple experiments to investigate life cycles, such as what seeds require to germinate

Grades 3 and 4 Curriculum

Children working in Grades 3 and 4 will have experiences:

- Conducting investigations giving consideration to fairness
- Organizing equipment to gather and present information
- Drawing conclusions on the basis of collected information
- Comparing ways of solving problems and finding explanations
- Identifying ways science is used responsibly in the community

At this level students identify the relationships between living things and discuss how these interdependent relationships aid survival. They link habitats with what they have learned about the factors necessary for the survival of living things. They use subject specific vocabulary to view things from a scientific rather than personal perspective. Students will identify the main structural features that work together to form systems in plants and animals, and identify the role of the system as a whole.

The students will describe investigations that compare observable properties of common household solids, liquids and gases. They will identify what makes solids, liquids and gases different and use this information to group materials into these categories. They will carry out experiments to explore reversible changes in common substances, and recognize that some changes are reversible and others are not.

Students will identify energy changes in everyday electrical appliances and their own simple electrical circuits that they have designed and built. They will recognize electricity, light, sound and movement as energy, and through their discussions about energy changes they will infer that energy is changed from one form to another and does not disappear. By investigating a range of everyday situations students will identify the actions of forces. They will describe how things can be moved and stopped.

Students will describe how the processes of weathering and erosion alter features of the landscape. They will undertake field work and carry out tests in the classroom to model the relationship between physical processes and the environment. Students will become aware of the scientific ideas about the movement of the Earth and model the effects of the Earth's rotation on its axis. They will describe important features of our solar system.

Life and Living

Cycle A

Ecosystem

- Describe the types of relationships between living things – draw food chains
- Relate feeding relationships such as predator/prey, carnivore, herbivore and omnivore to survival
- Identify the dependence of animals on plants and other animals for shelter
- Identify the dependence of plants on other plants and animals for places to grow
- Compare and contrast similarities and differences within and between familiar living things in the ocean and on land
- Describe the impact of human beings on living things in the ocean, and on land, and the efforts made by humankind to reduce and repair the damage
- Map relationships between living things in a habitat
- Explain why some living things have become extinct and identify current endangered species
- Investigate programs instigated to conserve endangered species

Cycle B

Structure/Ecosystem – The Land

- Identify external and internal features of living things that work together to form systems with particular functions in plants and animals, on land and in the ocean
- Link observable features to their function in familiar living things
- Recognize that parts of a system all have the same common function (e.g. parts of the digestive system work together to break down and absorb nutrients)
- Identify the bones that comprise the skeletal system
- Identify the main roles of a system (e.g. the skeletal system providing support, movement and protection of internal organs)

Examples of context and learning activities:

- Construct a simple food chain showing hierarchies of consumers and producers using computer graphics and text
- Report on investigations of the relations between living things observed in an aquarium, pond, creek or rock pool
- Prepare a poster to show the living things that coexist in a particular environment such as a tree, pond or compost heap
- Design and produce a creature feeder and then investigate the animals attracted to it
- Write a story about an animal and the relationships it has with other living things which help it survive in the environment
- Create a new animal and, through drawing, identify the main structural features that work together to form one or more of its systems
- Make a model to represent a system showing the main features
- Write a poem or a song which tells how the main features of a plant or an animal system work together
- Display the main features of a plant or animal system using an electronic presentation
- Collect and discuss information that highlights how modern medicine can replace main parts of a body system

Natural and Processed Materials

Cycle A

Materials

- Demonstrate how combining common materials with others alters their performance
- Relate results of investigations of properties of common substances to their suitability for particular use
- Make connections between the structure of common materials and their properties, for example, wood and concrete
- Illustrate ways natural materials are processed and the consequences for humans and the environment
- Describe how the composition and alignment of fibers in materials affects strength (e.g. test the strength of mud bricks with different kinds of reinforcement such as stones and straw)
- Classify a range of materials as solids, liquids or gases

- Make generalizations about solids, liquids and gases e.g.
 - a solid cannot change its shape and volume
 - a liquid can change its shape but not its volume
 - a gas can change its shape and volume
- Investigate how some substances can change form, for example, ice can change from solid to liquid to gas

Cycle B

Chemistry

- Distinguish between changes that cannot be readily reversed and those that can, and discuss the environments in which these changes occur
- Identify that mixing, dissolving, melting, boiling and evaporating can often be reversible changes
- Compare the processes of mixing, dissolving, melting, boiling and evaporating
- Describe the processing of common materials and highlight the irreversible changes that occur
- Experiment with conditions that contribute to visible change occurring, and those that appear to prevent change, for example, the rusting, or prevention of rusting, in nails

Examples of context and learning activities:

- Classify everyday materials as solid, liquid or gas by comparing and discussing their visible properties
- Arrange everyday materials in a continuum from solid to liquid to gas and discuss the properties which make substances difficult to classify (e.g. talc, lemonade)
- Compare the shape and volume of solids, liquid and gases and test whether the shape and volume can change
- Design and construct a floating vehicle that is propelled by air from balloons and evaluate the model in relation to the suitability of the properties of the materials
- Carry out and report on a fair test which compares liquids such as water, salt water and milk as they are heated to boiling point and cooled
- Solve the problem of separating a mixture of salt and sand
- Design, construct and evaluate a plant container that only requires watering a few times a year
- Create a computer generated representation of the water cycle using graphics and text
- Grow crystals of common substances such as sugar or salt

Energy and Change

Cycle A

Energy and its Uses

- Explain the way people in the community use energy
- Gather information on the sources of energy, particularly locally, and the chain of users
- Describe and explain ways of enabling or impeding the transfer of energy
- Recognize a range of examples of energy changes involving electricity, light, sound, heat and movement
- Recognize that energy can be changed from one form to another
- Identify the energy changes in common appliances
- Construct simple electric circuits
- Identify problems with human use of energy
- Make suggestions about ways to reduce energy consumption
- Compare energy use at different times of the year, times of day, and in different parts of the world

Cycle B

Motions and Forces

- Identify the action of forces by investigating a variety of everyday situations
 - recognize that a force is a push or a pull
 - identify attraction/repulsion forces between the ends of two bar magnets
 - identify through observation the forces that cause things to move or stop
 - identify through observation the forces that change speed or direction of motion (e.g. friction)
- Design and build simple machines that slow down, increase speed, or purposefully direct the transfer of energy (e.g. containers to slow down the rate at which ice melts, materials that act as sound absorbers, electric circuits aimed at performing functions, mirrors to direct light, devices powered by rubber bands, and solar cookers)
- Predict how simple machines such as household appliances work, then dismantle to identify the sequence of energy transfers
- Use gears and levers to conserve energy

Examples of context and learning activities:

- Build simple electric circuits with globes, fans and buzzers and identify the energy transformations that occur (e.g. the globe lights up, the globe gets hot, the fan moves and the buzzer makes a sound)
- Use role play to represent the energy changes that occur in an electric circuit with different components such as globes, fans and buzzers
- Create a collage to show how electrical appliances are classified by their energy transformation (e.g. those that light up, those that move and those that make sound)
- Produce a poster, based on research using a range of resources, to describe how simple appliances work (e.g. a light bulb, door bell, windmill or water wheel)
- Construct and test parachutes of different design and identify the variables that affect rate of fall and stability
- Report on a fair test designed to investigate the properties of magnets

- Use electronic presentation to display photographs of students pushing and pulling objects
- Investigate different toys and relate their movement to the application of forces
- Discuss ways in which society uses knowledge about forces to make things move more easily (e.g. pulleys and wheels)

Earth and Beyond

Cycle A

Space

- Locate and describes features of our solar system
- Define the words rotation and axis in relation to the Earth
- Simulate and describe the effects of the Earth rotating on its axis
- Make a model of the Earth rotating on its axis which shows the day and night cycle
- Research and compare features of environments on different planets and compare with Earth
- Illustrate patterns of change observable on Earth caused by the relationship between the Sun, Earth and Moon (e.g. demonstrate the passing of a day, year and month; report on evidence of the Earth's revolution around the sun and the moon around the Earth; model the link between the tilt of the Earth's axis and the seasons; and, describe how eclipses occur)
- Investigate the way people's explanations of day and night and the seasons have changed over time, including differences between cultures

Cycle B

Earth

- Relate changes in the physical environment to physical processes (e.g. the effects of wind, rain, sun, ice, and ocean waves on the landscape, and simulate these changes)
- Suggest ways to reduce or avoid the effects of weathering and erosion
- Identify landscapes in the environment that have been affected by weathering and erosion
- Illustrate ways that the use of the Earth's resources changes the physical environment, for example, mining, logging, the use of water, farming
- Distinguish between the terms weathering and erosion
- Suggest ways to reduce or avoid the effects of weathering and erosion
- Describe human endeavors to limit the negative effects of using the Earth's resources
- Record ways we monitor and use information about changes to the Earth

Examples of context and learning activities:

- Represent through labeled drawings the sequence of events that may take place during the processes of weathering and erosion
- Report on investigation using a tilted sandbox to show how running water can move earth materials
- Present an example of erosion in the local environment using an electronic presentation
- Design, construct and evaluate a system that reduces erosion in the playground

- Prepare a poster, based on research using the Internet, of how features in the landscape can be altered by weathering and erosion
- Represent the Earth rotating on its axis using role play
- Make a model to represent the Earth rotating on its axis
- Write an imaginary story about the day the Earth stopped rotating and the effects on the length of the night and day
- Use computers to enter and carry out calculations on data drawn from observations of the length of daylight during a set period of time
- Research historical ideas about the movement of the Earth using the Internet

Grades 5 and 6 Curriculum

Children working in Grades 5 and 6 will have experiences:

- Demonstrating the need to include controls in scientific explorations and ways of achieving these controls
- Using instruments to accurately collect information and record it appropriately
- Drawing conclusions linked to the information gathered and the purposes of the investigation
- Commenting on the reasonableness of answers as related to the conclusions reached
- Describing techniques used by people to find out information about the different fields of science
- Identifying information needed to make decisions about an application of a science

Students in Grades 5 and 6 will investigate the factors in the environment which affect the survival of living things. They will make simple predictive statements about how non-living factors, such as temperature and availability of water, contribute to survival. They will investigate the functioning of systems in plants and how such systems contribute to the plant's survival. They will develop the concept of adaptation – that an organism is more likely to survive if it has structures which will help it obtain what it needs, or compete successfully with others. Students will describe the systems of animals (including humans) and explain their functions. They will focus their attention on how animals' systems enable them to function in their environments.

In Natural and Processed materials, students will develop their understanding of the properties of a substance, and what features make it suitable to be used for particular purposes. They will continue to explore the significance of fair testing, the control of variables, and the concepts of physical and chemical change.

In Grades 5 and 6, students will investigate simple devices that produce and control energy transfers or transformations. They will design and build devices of their own and describe their operation. Students will observe the effects of simple combinations of forces on objects and link these effects to their investigations of the motion of objects.

At this level students will expand their knowledge and ideas of distance, time and space by becoming aware of the relationship of Earth to other members of the solar system. They will relate the causes and characteristics of natural disasters to interactions in the atmosphere and the outer layers of the Earth. Students will investigate the ways scientists predict weather patterns and natural events. They will broaden their knowledge of the role of scientific instruments and technologies in gathering data about the Earth and its atmosphere, and other parts of the solar system.

Life and Living

Cycle A

Ecosystems

- Identify features of groups of living things that enable them to compete successfully in their environments, particularly in deserts and the rainforest
- Identify events that affect balance in an ecosystem (e.g. describing how populations are naturally controlled in an ecosystem, the affect of humans, the introductions of new species, and the affect of seasons)
- List separately the living (biotic) and non-living (abiotic) factors in an organism's environment

- Describe the roles of living things in recycling, energy and matter
- Identify human attempts to protect ecosystems

Cycle B

Structure and Function

- Explain how different systems function together within living things
- Compare the major systems of animals (including humans). With specific emphasis on the muscular, skeletal, reproductive and digestive systems
- Compare and explain how the structure of these systems assists animals in their respective environments
- Identify plant parts
- Compare the way plant parts perform different functions
- Describe in simple terms the transport of water in vascular plants

Examples of context and learning activities:

- Compare the requirements of a pet fish and indoor potted plant in a poster presentation
- Report on theories about why dinosaurs became extinct in an electronic presentation
- Identify living and non-living factors of the environment and list examples of their effect on living things (e.g. disease-causing organisms, and drought)
- Compile a media folio of articles related to conservation issues and identify factors contributing to the problems
- Demonstrate, from their own investigations, the relationships of the structure of a flower to its function
- Design and report on an experiment to show the path taken by water through the plant
- Describe the way the circulatory system and respiratory system work together to transport oxygen to the cells
- Explain why ringbarking kills trees
- Explain why animals and plants living in different conditions have differences in their structures

Natural and Processed Materials

Cycle A

Materials

- Identify factors that determine the choice of materials for particular purposes determining properties such as density, melting point, strength, conductivity, elasticity, malleability, brittleness, resistance to corrosion and flexibility
- Assess the effectiveness of materials used for particular purposes giving considerations to technical, economical and environmental factors
- Make and use models for the substructure of materials to explain their properties and behavior
- Make models for particular purposes describing why certain materials were chosen
- Design and complete a range of fair tests to compare observable physical properties of common substances
- Explore the properties of plastics and discuss why they have so many uses

Cycle B

Chemistry

- Distinguish between physical and chemical changes, such as the physical change of state in dissolving being reversible, as opposed to the chemical change which produces a new substance
- Use a particle model to explain diffusion in liquids and gases, such as the spreading of a scent
- Explain the differences between mixtures and compounds
- Investigate the separation of mixtures through processes such as filtration, flotation, evaporation, crystallization and magnetism
- Recognize and describe conditions that influence reactions and change in materials
- Recognize basic elements and draw their atomic structure

Examples of context and learning activities:

- Design and complete fair tests to compare the strength of a range of common adhesives, and form reasoned conclusions about the results
- Design fair tests to determine which materials best insulate a hot or cold drink, and draw reasoned conclusions from the result
- Create an electronic presentation about gold, and how its properties make it so valued by society
- Use a spreadsheet to chart the melting points, strength and density of a variety of common metals, and determine from the data which would be most suitable for building a fast plane
- Investigate and discuss the changes that accompany rusting; identify rust as a new and different substance produced as a result of change
- Identify bubbles, produced when baking soda and vinegar are mixed, as evidence of the formation of a gas, and hence a chemical change
- Photograph the physical and chemical changes occurring in a class investigation; create an electronic presentation that displays the changes
- Prepare a poster or multimedia presentation to show the physical and chemical changes that occur as a metal is produced from its ore

Energy and Change

Cycle A

Energy and Its Uses

- Compare energy sources available for particular purposes, and the essential nature of the sun
- Learn that energy is a property of many substances and is associated with heat, light, electricity, mechanical motion, sound, nuclei, and the nature of a chemical
- Identify processes of energy transfer and conditions that affect them
- Identify and draw forms of transformation of energy in sequences of interaction
- Design, build and describe the operation of simple devices that transfer and transform energy
- Focus on electrical circuits providing a means of transferring electrical energy when heat, light, sound and chemical changes are produced

Cycle B

Motion and Forces

- Describe the motion of an object by its position, direction of motion, and speed
- Describe and experiment with models the effects of two forces acting on an object in the same direction, different directions, and magnitudes
- Describe the effects of friction forces, magnetic attraction/repulsion forces and balanced forces on an object
- Describe and explain motion (walking, floating, sliding, rolling) and the effects of smooth and rough surfaces
- Explain flotation and Archimedes Principle
- Make graphs to measure and represent motion
- Define common forces using simple mathematical expressions and diagrams

Examples of context and learning activities:

- Investigate the operation of an electric torch to note the battery, globe, switch and connections
- Build a working torch that can be switched on and off
- Use simple materials to make a musical instrument which produces at least two sounds
- Observe the operation of a simple working model that transfers energy
- Discuss the effect of slippery surfaces on ease of walking
- Describe the action of water in pushing up a floating object
- Investigate friction by measuring and comparing the different times taken by a toy car to roll down first a smooth, then a rough slope
- Investigate magnetic attraction and repulsion

Earth and Beyond

Cycle A

Space

- Examine ways scientists investigate the solar system and the universe (e.g. satellites, probes and telescopes)
- Report on early attempts to send rockets and probes into space
- Identify the planets of our solar system
- Model the relative sizes of planets and their distances from the sun
- Compare and contrast the conditions on Earth with those of other planets and our moon
- Locate and describes features of our universe, including: stars, planets, moons, black holes, comets, meteors, galaxies and constellations
- Chart the position of the stars in the night sky and compare at different times of the year
- Explain the meaning of Light Years
- Describe the ways in which scientists estimate quantities like distances to the stars

Cycle B

Earth

- Identify changes in the atmosphere and interior of the Earth that cause catastrophic events including earthquakes, volcanoes, drought, cyclones and tidal waves
- Identify the layers within the Earth and atmosphere
- Map the location of earthquake zones and explain their positions
- Examines geological features of the Earth, including erosion, the rock cycle and plate tectonics
- Describe the formation of metamorphic, igneous and sedimentary rocks
- Chart the features of, and techniques used to describe, rocks
- Identify the uses of metamorphic, igneous and sedimentary rocks

Examples of context and learning activities:

- Investigate features of the atmosphere by describing an imaginary trip in an air balloon
- Construct a model seismograph and demonstrate its use
- Interpret the simulation of a cyclone using swirling water in connected bottles
- Map the location of world volcanic activity and relate it to earthquake zones
- Describe simply the use of scientific instruments and technologies, such as satellites, seismographs and weather balloons in predicting weather patterns and natural events such as earthquakes, cyclones, volcanic activity, tsunamis or severe storms
- Report on the role of the Bureau of Meteorology in predicting and monitoring natural disasters
- Show the relationship between members of the solar system by constructing mobiles
- Prepare a space travel tourist brochure advertising the attractions of a named planet or other component of the solar system
- Explain why the names given to the planets may or not be appropriate
- Devise crossword puzzles based on characteristics of members of the solar system
- Show the formation and activity of a volcano or cyclone by drawing, selecting and editing graphics to create images
- Compare selected characteristics of some planets and other members of our solar system by accessing, sorting and analyzing electronic data

Grades 7 and 8 Curriculum

Children working in Grades 7 and 8 will have experiences:

- Selecting appropriate ways of conducting investigations taking into account purpose and the resources available
- Using instruments and techniques to provide accurate and reliable results
- Selecting ways of presenting information that clarifies patterns and assists in making generalizations
- Identifying and considering factors that influence the level of confidence in making a conclusion
- Identifying factors that influence people's perception of science (e.g. discussing the reasons for and against following careers in different scientific fields)
- Proposing and comparing options when making decisions or taking actions

Students in Grades 7 and 8 will examine the biological basis for classification of organisms and the ways in which the organisms interact in ecosystems. They will investigate cells as the basic unit of living things and use their scientific knowledge, together with evidence from their observations, to explain the relationship between the structure and organization of cells and their particular function. Through observations of major structural characteristics and by using dichotomous keys, students will classify a range of organisms into the major groups in the hierarchy of the 5-Kingdom system. The students will explain observations of living things in terms of obtaining, transporting and using nutrients. They will also evaluate diseases of organs in the context of a 21st century lifestyle.

In Natural and Processed Materials, students will discover that properties, changes and uses of substances are related to their particular structure. They will use more abstract ideas and models to explain many properties of materials. They will practice safe handling, use and disposal of hazardous substances. Students will continue to investigate chemical change, and represent changes with word equations. They will investigate conditions for chemical reactions. Students will learn methods to separate, isolate and/or identify components.

In Energy and Change, students will use formal terms for abstract concepts and to identify formal relationships and patterns in phenomena. They will investigate the actions of gears, levers and pulleys and explain how mechanical systems act to control and modify force and motion. They will investigate and compare the transmission and reflection of heat, light and sound. They will build series and parallel circuits and describe their operation. They will identify a field as a region of space where an object experiences a force and use this idea to explain simple magnetic and electrostatic effects.

Grades 7 and 8, students will investigate the structure of the Earth in more detail. They will learn about the formation of rocks, their composition and the continual cycling of rock material over time to regenerate new material. They will classify rocks according to properties such as mineral components, texture and color. They will investigate methods of age dating rocks. Students will explain observable phenomena such as tides, eclipses, seasons and the apparent movement of stars, in terms of the changing positions of the Earth, moon and sun, relative to each other and the stars. Students will investigate ways knowledge of celestial bodies is used as navigational aids.

Life and Living

Cycle A

Ecosystems

- Explain the biological basis of classification of organisms into major groups
- Explain the classification of living organisms – the Dichotomous key, the Five Kingdoms
- Analyze the effects of environmental change on living things and ecosystems, specifically global warming and the ozone layer
- Identify environmental disasters that have occurred, the effects, the responses, the possibilities for future disasters and the efforts being made to reduce the risks
- Investigate some organisms' capacity to take advantage of environmental change
- Describe interactions between living things within their ecosystem, including competition, predation, collaboration, parasitism, pollination, reproduction and parenting
- Construct pyramids showing the relationships between members of food chains including a parasite-host relationship and producer and consumers

Cycle B

Structure and Function

- Present researched evidence that plants and animals are made up of functional units called cells and use a microscope to identify the structure of different plant and animal cells (e.g. guard cells, xylem cells, ciliated cells, goblet cells, sperm cells)
- Identify similarities and differences in specimens of cells from different parts of plants and animals, and describe their functions
- Explain how plants obtain, store and transport nutrients, transform and transfer energy, and manage wastes. Specific topics include photosynthesis, respiration and transpiration
- Describe the ways some plants, such as parasites and saprophytes, depend on energy sources other than photosynthesis
- Explain how animals obtain, transport and use nutrients, specifically focussing on the mechanical and chemical process of digestion and the role of the circulatory system in transporting the products of digestion to cells
- Describe interactions between human body systems (e.g. digestive, respiratory, reproductive, circulatory, skeletal, nervous and immune)
- Identify the relationship between lifestyle (dietary habits, smoking, lack of exercise, etc.) and certain diseases

Examples of context and learning activities:

- Use a dichotomous key to sort a range of organisms into their major groups
- Investigate the work of Carolus Linnaeus and his system of naming organisms
- Report on the work of a taxonomist in an herbarium or museum and why such work is important
- Examine a local ecosystem and construct a food web of organisms
- Prepare a presentation on the way a termite/ant colony functions and its relationship to its ecosystem
- Prepare a wet mount or examine a prepared microscope slide and draw the location of structures such as stomata, transport and photosynthetic tissues

- Compile an electronic data sheet relating structures of cells to their function
- Explain in general terms why the classification of some organisms has been changed over time
- Investigate the relationship between pollinators, such as birds and insects and flowering plants
- Explain through role play why multi-cellular organisms require specialized organs and systems
- Investigate how some diseases affect the functioning of body organs and systems
- Measure certain body functions using scientific equipment and evaluate the readings

Natural and Processed Materials

Cycle A

Materials

- Describe the structure of solids, liquids and gases by explaining the arrangement and motion of particles in each physical state
- Relate particle movement to observable properties of matter, such as conduction of heat, expansion and contraction in solids, convection and diffusion in gases and liquids, and latent heat associated with changes of state
- Relate the safe use and disposal of common substances to their physical and chemical properties
- Give examples of environmental problems caused by the inappropriate disposal of toxic substances
- Describe techniques and underlying principles used in the production of some useful materials
- Describe and demonstrate recycling of materials
- Report on the finite nature of the Earth's resources

Cycle B

Chemistry

- Make models of atoms and molecules and use them to explain elements, compounds, crystals and common chemical reactions
- Identify the atomic structure of elements and use the periodic table
- Show that atoms combine to produce substances with properties very different from those of the component elements
- Use the chemical names of common elements and compounds in describing reactions
- Explain ways of producing chemical change and influencing rate
- Describe simple reactions using balanced chemical equations and discuss valences
- Explain how materials such as carbon can exist in different forms
- Describe factors which affect the rate of a reaction (e.g. temperature, surface area, and the roles of catalysts and enzymes)
- Relate procedures for preparing and separating mixtures and solutions to production and separation processes commonly used in society
- Identify landmarks in the identification of elements

Examples of context and learning activities:

- Explore a software program that simulates aspects of a particle model
- Investigate heat conductivity of a variety of materials, link the observations and results to the materials used for cooking pots, fireside utensils and other everyday objects
- Discuss latent heat in terms of a particle model, explore how this property is used in the operation of evaporative coolers and refrigerators
- Make a multimedia presentation to discuss a heavy metal, such as mercury, describe its properties, handling, uses, and environmental problems that result from inappropriate disposal
- Investigate safety warnings of hazardous substances in a range of packaged household and garden chemicals; present a report to the class on chemical hazards in the home
- Investigate by controlled experiment the influences of concentration and temperature on the speed at which a reacting solution becomes cloudy; use light sensors to measure the turbidity of the reaction mixture
- Investigate the effects of grinding an effervescent tablet, to different degrees, on the rate of production of bubbles
- Design and conduct a procedure to obtain pure water and salt crystal from a sample of seawater

Energy and Change

Cycle A

Energy and Its Uses

- Use terms, including current and voltage, to describe the operation of series and parallel circuits
- Use appropriate symbols to diagram and describe circuits
- Make models and describe appropriate uses of series and parallel circuits in real life contexts
- Make models to transfer electrical energy to purposefully produce heat, light, and sound changes
- Describe the characteristics and applications of the transmission and reflection of heat, light and sound for example:
 - use the terms conduction, convection, radiation and absorption to describe heating and cooling effects
 - describe the operation of heated containers that keep substances cool or hot
 - recognize patterns of reflection of light from plane and curved mirrors and relate these to applications of mirrors
- Make models to explain the above characteristics and applications

Cycle B

Motions and Forces

- Describe simple magnetic and electrostatic effects for example:
 - describe field patterns, as indicated by iron filings, surrounding differently shaped magnets and simple combinations of magnets
 - describe attraction and repulsion of magnets and objects near magnets as effects on the magnetic field
 - explain the action of a compass as the movement of a magnet in the magnetic field of the Earth
 - represent attraction and repulsion of charged objects as resulting from the electric field around them
- Explain how mechanical systems can control and modify force and motion for example:
 - identify the action of mechanical parts such as gears, pulleys, and levers in transmitting and modifying forces and motion
 - define the operation of one or more examples of simple mechanical systems
 - model the operation of one or more examples of everyday tools, equipment and appliances

Examples of context and learning activities:

- Compare the brightness of two similar torch globes connected in series to a battery, and the brightness of one single globe, to the brightness of two globes connected in parallel to the same battery
- Measure the current flowing through a torch globe and link the value of the current to the brightness of the globe
- Design, construct and evaluate a game that features an electrical circuit as an integral part
- Investigate light reflection using plane and curved mirrors
- Make a kaleidoscope using plastic mirrors and explain the formation of the patterns created
- Use iron filings to observe and record magnetic field patterns of magnets of various shapes and combinations
- Make models of different gear systems and report on their operation and applications
- Prepare a poster or slide show to display one or more simple mechanical systems
- Use print and electronic media to investigate and report on the operation of a useful simple machine such as a zipper, velcro, can opener or hand drill
- Investigate simple mechanical appliances or toys which use gears, levers and pulleys

Earth and Beyond

Cycle A

Space

- Explain scientific techniques used in monitoring space from the Earth
- Describe early navigation techniques and the history of astronomy
- Explain the observable effects of the relative movements of the planets, moon, sun and stars:
 - demonstrate the positions of the Earth, moon and sun in explaining the tides
 - account for the different phases of the moon in the lunar cycle
 - explain the phenomenon of the seasons in terms of relative positions of the Earth and sun
 - account for the apparent movement of the stars and constellations across the sky
- Describe the features of other planets and examine possible scientific solutions to the problems of supporting life in space
- Research human endeavors to support life in space
- Explain the ways that space exploration and understanding has affected us here on Earth
- Identify the stage our sun is in its evolution and predict the future of life on Earth
- Explain what is meant by supernovae, red giants, white dwarfs, universes, stars, meteorites, nebulae, asteroids, galaxies and black holes

Cycle B

Earth

- List characteristics of the Earth, such as its atmosphere, temperatures, rotational speed and tilt of the axis, that are conducive to life on Earth and discuss why they are important
- Explain theories on the formation and geological history of the Earth
- Describe theories of the internal structure of the Earth
- Identify the lithosphere as the region of the Earth where rocks are formed
- Identify and name rocks according to their mode of formation
- Describe the relationship between rocks, ores and minerals
- Identify minerals and discuss formation and classification techniques
- Describe, in general terms, how evidence is obtained for estimating the time of formation of rocks
- Review sedimentary, igneous and metamorphic rocks, and apply properties such as composition, grain size, color, and texture in describing them
- Describe the role of science in assessing the impact on the surface of the Earth of human intervention in particular places
- Identify and describe the geological information needed in building such things as buildings, dams, roads, bridges and tunnels in Sumbawa
- Analyze how scientific techniques are used to extract and process resources (e.g. gold/copper mining in Sumbawa)

Examples of context and learning activities:

- Identify the kinds of data obtained from satellite imaging, aerial photography and field explorations, which are used to determine the nature of land formations
- Investigate how fossils provide clues about the formation and age of rocks
- Investigate the geological information to be considered before constructing and building, tunnels and dams
- Examine stone artifacts, implements and rock materials, relating the materials and construction to their purpose
- Compare the importance of rock types as viewed by a sculptor, a dam builder, a geologist and a landscape designer
- Design and construct a building positioned to maximize use of solar heating panels
- Investigate legends about the origin of constellations
- Prepare a multimedia report on an investigation into the contribution of space probes or telescopes, such as Voyager, the Hubble and Australian Space Involment, to our knowledge of features of the universe
- Construct a web site providing links to information about selected features of the universe such as black holes, nebula, life cycle of stars, asteroids, galaxies
- Calculate the time it would take to travel to the nearest star using a variety of modes of travel such as supersonic jet, bicycle, car and spacecraft

APPENDIX A- Student Outcomes
(Grid form)

Life and Living

Cycle A	Cycle B
Kindergarten	
<p>Ecosystems</p> <ul style="list-style-type: none"> • Identify personal needs • Compare the needs of baby animals – food, shelter, etc. • Describe places where particular living things are found • Observe and describe creatures found in our environment <ul style="list-style-type: none"> - in houses - in gardens and school grounds - at the seashore 	<p>Structure</p> <ul style="list-style-type: none"> • List external body parts • Draw the external parts of pets or farm animals (e.g. paws, tails, claws, fur, scales, horns) • Investigate the changes in bodies over time (e.g. height, weight, teeth) • Investigate the changes that occur in animals (e.g. egg to hen, kitten to cat) • Identify the characteristics of plants • Describe the need for water, light and food • Investigate the changes in plants over time
Grade 1 and 2	
<p>Ecosystems</p> <ul style="list-style-type: none"> • Describe the characteristics of animals and sort them according to their similarities and differences • Name distinguishing features of vertebrates, invertebrates, amphibians and reptiles • Link habitat with animal characteristics and describe relationships between living things • Create sets of rules to sort animals • Create sets of rules to sort plants • Investigate the diversity of local plant forms • Describe the contributions of plants to the environment • Link habitat with plant characteristics • Perform simple experiments to investigate what seeds need to germinate • Examine the main parts of local plants 	<p>Structure</p> <ul style="list-style-type: none"> • Identify external parts of human beings and describe how they are used • Explore the physical changes of growth (e.g. height, weight, losing teeth) • Focus on the 5 senses • Examine factors of heredity • Discuss the work of doctors, nurses and agencies in caring for human beings • Observe the stages of growth and development in a variety of animals (e.g. birds, dogs, fish) • Link observable features to their functions in familiar living things
Grade 3 and 4	
<p>Ecosystem</p> <ul style="list-style-type: none"> • Describe the types of relationships between living things – draw food chains • Relate feeding relationships such as predator/prey, carnivore, herbivore and omnivore to survival • Identify the dependence of animals on plants and other animals for shelter • Identify the dependence of plants on other plants and animals for places to grow • Compare and contrast similarities and differences within and between familiar living things in the ocean and on land • Describe the impact of human beings on living things in the ocean, and on land, and the efforts made by humankind to reduce and repair the damage • Map relationships between living things in a habitat • Explain why some living things have become extinct and identify current endangered species • Investigate programs instigated to conserve endangered species 	<p>Structure/Ecosystem – The Land</p> <ul style="list-style-type: none"> • Identify external and internal features of living things that work together to form systems with particular functions in plants and animals, on land and in the ocean • Link observable features to their function in familiar living things • Recognize that parts of a system all have the same common function (e.g. parts of the digestive system work together to break down and absorb nutrients) • Identify the bones that comprise the skeletal system • Identify the main roles of a system (e.g. the skeletal system providing support, movement and protection of internal organs)

Grade 5 and 6	
<p>Ecosystems</p> <ul style="list-style-type: none"> • Identify features of groups of living things that enable them to compete successfully in their environments, particularly in deserts and the rainforest • Identify events that affect balance in an ecosystem (e.g. describing how populations are naturally controlled in an ecosystem, the affect of humans, the introductions of new species, and the affect of seasons) • List separately the living (biotic) and non-living (abiotic) factors in an organism’s environment • Describe the roles of living things in recycling, energy and matter • Identify human attempts to protect ecosystems 	<p>Structure and Function</p> <ul style="list-style-type: none"> • Explain how different systems function together within living things • Compare the major systems of animals (including humans). With specific emphasis on the muscular, skeletal, reproductive and digestive systems • Compare and explain how the structure of these systems assists animals in their respective environments • Identify plant parts • Compare the way plant parts perform different functions • Describe in simple terms the transport of water in vascular plants
Grade 7 and 8	
<p>Ecosystems</p> <ul style="list-style-type: none"> • Explain the biological basis of classification of organisms into major groups • Explain the classification of living organisms – the Dichotomous key, the Five Kingdoms • Analyze the effects of environmental change on living things and ecosystems, specifically global warming and the ozone layer • Identify environmental disasters that have occurred, the effects, the responses, the possibilities for future disasters and the efforts being made to reduce the risks • Investigate some organisms’ capacity to take advantage of environmental change • Describe interactions between living things within their ecosystem, including competition, predation, collaboration, parasitism, pollination, reproduction and parenting • Construct pyramids showing the relationships between members of food chains including a parasite-host relationship and producer and consumers 	<p>Structure and Function</p> <ul style="list-style-type: none"> • Present researched evidence that plants and animals are made up of functional units called cells and use a microscope to identify the structure of different plant and animal cells (e.g. guard cells, xylem cells, ciliated cells, goblet cells, sperm cells) • Identify similarities and differences in specimens of cells from different parts of plants and animals, and describe their functions • Explain how plants obtain, store and transport nutrients, transform and transfer energy, and manage wastes. Specific topics include photosynthesis, respiration and transpiration • Describe the ways some plants, such as parasites and saprophytes, depend on energy sources other than photosynthesis • Explain how animals obtain, transport and use nutrients, specifically focussing on the mechanical and chemical process of digestion and the role of the circulatory system in transporting the products of digestion to cells • Describe interactions between human body systems (e.g. digestive, respiratory, reproductive, circulatory, skeletal, nervous and immune) • Identify the relationship between lifestyle (dietary habits, smoking, lack of exercise, etc.) and certain diseases

Natural and Processed Materials

Cycle A	Cycle B
Kindergarten	
<p>Materials</p> <ul style="list-style-type: none"> Identify materials and comment on their suitability for different uses (e.g. food wrappings for keeping food fresh) Predict what would happen if we used inappropriate materials for particular purposes Associate words and meanings rough/ smooth, hard/ soft/, shiny/ dull, strong/ weak/, thick/ runny when discussing materials Compare the properties and behavior of different types of liquids, such as milk, water and honey Compare materials by using the senses Compare collected materials, both natural and processed 	<p>Chemistry</p> <ul style="list-style-type: none"> Use senses to recognize change (e.g. heat and the rate of melting of common materials such as ice, butter, etc.) Compare changes in materials when cooking (e.g. jello, popcorn, butter, eggs) Recognize solids and liquids Describe observable changes such as rusting, dissolving, burning, bleaching, washing and heating Comment on possible causes of observable changes
Grade 1 and 2	
<p>Materials</p> <ul style="list-style-type: none"> List the ways common materials such as water, wood, metal and fabrics are used Design and use fair tests to explore different properties of materials Compare the suitability of different materials for different purposes (e.g. water resistant material for raincoats) Examine closely and describe the visible structure of common materials Investigate shapes of particles of materials Describe some advantages and disadvantages of humankind's uses of natural and processed materials 	<p>Chemistry</p> <ul style="list-style-type: none"> Distinguish between changes that cannot be readily reversed and those that can (e.g. simple mixtures and compounds) Draw and label the stages at which changes to materials occur in cooking (e.g. in butter, popcorn or cake mixture) Attempt to reverse processes such as whipping cream, dissolving salt in water, or mixing sand and salt Recognize solids, liquids and gases Describe changes from solid to liquid, liquid to gas and back Describe changes that occur in nature, such as decomposition
Grade 3 and 4	
<p>Materials</p> <ul style="list-style-type: none"> Demonstrate how combining common materials with others alters their performance Relate results of investigations of properties of common substances to their suitability for particular use Make connections between the structure of common materials and their properties, for example, wood and concrete Illustrate ways natural materials are processed and the consequences for humans and the environment Describe how the composition and alignment of fibers in materials affects strength (e.g. test the strength of mud bricks with different kinds of reinforcement such as stones and straw) Classify a range of materials as solids, liquids or gases Make generalizations about solids, liquids and gases e.g. <ul style="list-style-type: none"> a solid cannot change its shape and volume a liquid can change its shape but not its volume a gas can change its shape and volume Investigate how some substances can change form, for example, ice can change from solid to liquid to gas 	<p>Chemistry</p> <ul style="list-style-type: none"> Distinguish between changes that cannot be readily reversed and those that can, and discuss the environments in which these changes occur Identify that mixing, dissolving, melting, boiling and evaporating can often be reversible changes Compare the processes of mixing, dissolving, melting, boiling and evaporating Describe the processing of common materials and highlight the irreversible changes that occur Experiment with conditions that contribute to visible change occurring, and those that appear to prevent change, for example, the rusting, or prevention of rusting, in nails

Grade 5 and 6	
<p>Materials</p> <ul style="list-style-type: none"> Identify factors that determine the choice of materials for particular purposes determining properties such as density, melting point, strength, conductivity, elasticity, malleability, brittleness, resistance to corrosion and flexibility Assess the effectiveness of materials used for particular purposes giving considerations to technical, economical and environmental factors Make and use models for the substructure of materials to explain their properties and behavior Make models for particular purposes describing why certain materials were chosen Design and complete a range of fair tests to compare observable physical properties of common substances Explore the properties of plastics and discuss why they have so many uses 	<p>Chemistry</p> <ul style="list-style-type: none"> Distinguish between physical and chemical changes, such as the physical change of state in dissolving being reversible, as opposed to the chemical change which produces a new substance Use a particle model to explain diffusion in liquids and gases, such as the spreading of a scent Explain the differences between mixtures and compounds Investigate the separation of mixtures through processes such as filtration, flotation, evaporation, crystallization and magnetism Recognize and describe conditions that influence reactions and change in materials Recognize basic elements and draw their atomic structure
Grade 7 and 8	
<p>Materials</p> <ul style="list-style-type: none"> Describe the structure of solids, liquids and gases by explaining the arrangement and motion of particles in each physical state Relate particle movement to observable properties of matter, such as conduction of heat, expansion and contraction in solids, convection and diffusion in gases and liquids, and latent heat associated with changes of state Relate the safe use and disposal of common substances to their physical and chemical properties Give examples of environmental problems caused by the inappropriate disposal of toxic substances Describe techniques and underlying principles used in the production of some useful materials Describe and demonstrate recycling of materials Report on the finite nature of the Earth's resources 	<p>Chemistry</p> <ul style="list-style-type: none"> Make models of atoms and molecules and use them to explain elements, compounds, crystals and common chemical reactions Identify the atomic structure of elements and use the periodic table Show that atoms combine to produce substances with properties very different from those of the component elements Use the chemical names of common elements and compounds in describing reactions Explain ways of producing chemical change and influencing rate Describe simple reactions using balanced chemical equations and discuss valences Explain how materials such as carbon can exist in different forms Describe factors which affect the rate of a reaction (e.g. temperature, surface area, and the roles of catalysts and enzymes) Relate procedures for preparing and separating mixtures and solutions to production and separation processes commonly used in society Identify landmarks in the identification of elements

Energy and Change

Cycle A	Cycle B
Kindergarten	
Energy and its Uses <ul style="list-style-type: none"> Describe ways energy is used in daily life (e.g. the sun for warmth, fuel for transport and food for people) Make comments on ways energy is wasted at school and at home Describe and draw sequences of connected events that achieve an outcome where energy is transferred Draw pictures showing the necessary parts of simple devices that we use to transfer energy (e.g. a flashlight) Identify the sources of energy in a variety of devices (e.g. battery in a torch) 	Motions and Forces <ul style="list-style-type: none"> Use pulleys and levers to lift loads and draw these actions List materials according to whether they are magnetic or not Discuss experiences in building with wood or scrap materials; suggest alternative materials that could be used Use picture books to learn about how things move and draw pictures showing the necessary parts of simple devices Describe the movement of constructions built (e.g. sand castles collapsing)
Grade 1 and 2	
Energy and its Uses <ul style="list-style-type: none"> Explore the forces of wind and water, solar energy and magnetism, and how people use them Discuss safety issues associated with electricity Explain the ways people in the community use energy Identify human foodstuffs as energy sources, human activities as energy consumption Investigate the properties of light, sound, heat and movement Investigate ways sound and light travel through and are reflected by materials 	Motions and Forces <ul style="list-style-type: none"> Examine components of simple machines Describe the effects of pulleys and levers Describe the workings of bikes and other toys Predictions what happens when objects of different weights collide, and check predictions List ways that motion energy can be given to a golf ball or a balloon Conduct experiments where an object, such as an elastic band or bouncing ball, regains its shape and gives back energy Make predictions about what will and will not float Record observations and suggest reasons for some things floating while other things do not Build models of things that will float
Grade 3 and 4	
Energy and its Uses <ul style="list-style-type: none"> Explain the way people in the community use energy Gather information on the sources of energy, particularly locally, and the chain of users Describe and explain ways of enabling or impeding the transfer of energy Recognize a range of examples of energy changes involving electricity, light, sound, heat and movement Recognize that energy can be changed from one form to another Identify the energy changes in common appliances Construct simple electric circuits Identify problems with human use of energy Make suggestions about ways to reduce energy consumption Compare energy use at different times of the year, times of day, and in different parts of the world 	Motions and Forces <ul style="list-style-type: none"> Identify the action of forces by investigating a variety of everyday situations <ul style="list-style-type: none"> recognize that a force is a push or a pull identify attraction/repulsion forces between the ends of two bar magnets identify through observation the forces that cause things to move or stop identify through observation the forces that change speed or direction of motion (e.g. friction) Design and build simple machines that slow down, increase speed, or purposefully direct the transfer of energy (e.g. containers to slow down the rate at which ice melts, materials that act as sound absorbers, electric circuits aimed at performing functions, mirrors to direct light, devices powered by rubber bands, and solar cookers) Predict how simple machines such as household appliances work, then dismantle to identify the sequence of energy transfers Use gears and levers to conserve energy

Grade 5 and 6	
<p>Energy and Its Uses</p> <ul style="list-style-type: none"> • Compare energy sources available for particular purposes, and the essential nature of the sun • Learn that energy is a property of many substances and is associated with heat, light, electricity, mechanical motion, sound, nuclei, and the nature of a chemical • Identify processes of energy transfer and conditions that affect them • Identify and draw forms of transformation of energy in sequences of interaction • Design, build and describe the operation of simple devices that transfer and transform energy • Focus on electrical circuits providing a means of transferring electrical energy when heat, light, sound and chemical changes are produced 	<p>Motion and Forces</p> <ul style="list-style-type: none"> • Describe the motion of an object by its position, direction of motion, and speed • Describe and experiment with models the effects of two forces acting on an object in the same direction, different directions, and magnitudes • Describe the effects of friction forces, magnetic attraction/repulsion forces and balanced forces on an object • Describe and explain motion (walking, floating, sliding, rolling) and the effects of smooth and rough surfaces • Explain flotation and Archimedes Principle • Make graphs to measure and represent motion • Define common forces using simple mathematical expressions and diagrams
Grade 7 and 8	
<p>Energy and Its Uses</p> <ul style="list-style-type: none"> • Use terms, including current and voltage, to describe the operation of series and parallel circuits • Use appropriate symbols to diagram and describe circuits • Make models and describe appropriate uses of series and parallel circuits in real life contexts • Make models to transfer electrical energy to purposefully produce heat, light, and sound changes • Describe the characteristics and applications of the transmission and reflection of heat, light and sound for example: <ul style="list-style-type: none"> - use the terms conduction, convection, radiation and absorption to describe heating and cooling effects - describe the operation of heated containers that keep substances cool or hot - recognize patterns of reflection of light from plane and curved mirrors and relate these to applications of mirrors • Make models to explain the above characteristics and applications 	<p>Motions and Forces</p> <ul style="list-style-type: none"> • Describe simple magnetic and electrostatic effects for example: <ul style="list-style-type: none"> - describe field patterns, as indicated by iron filings, surrounding differently shaped magnets and simple combinations of magnets - describe attraction and repulsion of magnets and objects near magnets as effects on the magnetic field - explain the action of a compass as the movement of a magnet in the magnetic field of the Earth - represent attraction and repulsion of charged objects as resulting from the electric field around them • Explain how mechanical systems can control and modify force and motion for example: <ul style="list-style-type: none"> - identify the action of mechanical parts such as gears, pulleys, and levers in transmitting and modifying forces and motion - define the operation of one or more examples of simple mechanical systems - model the operation of one or more examples of everyday tools, equipment and appliances

Earth and Beyond

Cycle A	Cycle B
Kindergarten	
<p>Space</p> <ul style="list-style-type: none"> Identify features of the day and night sky and relate them to patterns of behavior in everyday life Arrange in order familiar daily events Draw the shapes of the moon in its monthly cycle Distinguish between those events that are done at night, and those done mainly in the daytime Explore shadows and discuss the ways in which they change 	<p>Earth</p> <ul style="list-style-type: none"> List ways that the local environment influences daily life Use pictures to record the weather and relate weather to their daily activities Identify types of weather predicted at different seasons Collect pictures that relate to the seasons Discuss what people wear and do in different types of weather Identify features of the local landscape such as hills, beaches and rivers Distinguish between natural physical features and those that result from human activity, such as mining
Grade 1 and 2	
<p>Space</p> <ul style="list-style-type: none"> Examine the rotation and revolution of the earth Investigate the angle of the sun and the passing of time during the day by measuring shadows Create scenarios on the effects of blocking out the sun for an hour, a month, and a year Record observations of the phases of the moon in a table of labeled drawings 	<p>Earth</p> <ul style="list-style-type: none"> Use simple instruments to collect information about the weather and identify reasons why such collections are important Examine the causes of cyclones, earthquakes, floods, etc. and observe how instruments are used to measure such events Examine changes that have occurred in the local environment Observe seasons and the effects on animals and plants Investigate the water cycle
Grade 3 and 4	
<p>Space</p> <ul style="list-style-type: none"> Locate and describes features of our solar system Define the words rotation and axis in relation to the Earth Simulate and describe the effects of the Earth rotating on its axis Make a model of the Earth rotating on it axis which shows the day and night cycle Research and compare features of environments on different planets and compare with Earth Illustrate patterns of change observable on Earth caused by the relationship between the Sun, Earth and Moon (e.g. demonstrate the passing of a day, year and month; report on evidence of the Earth’s revolution around the sun and the moon around the Earth; model the link between the tilt of the Earth’s axis and the seasons; and, describe how eclipses occur) Investigate the way people’s explanations of day and night and the seasons have changed over time, including differences between cultures 	<p>Earth</p> <ul style="list-style-type: none"> Relate changes in the physical environment to physical processes (e.g. the effects of wind, rain, sun, ice, and ocean waves on the landscape, and simulate these changes) Suggest ways to reduce or avoid the effects of weathering and erosion Identify landscapes in the environment that have been affected by weathering and erosion Illustrate ways that the use of the Earth’s resources changes the physical environment, for example, mining, logging, the use of water, farming Distinguish between the terms weathering and erosion Suggest ways to reduce or avoid the effects of weathering and erosion Describe human endeavors to limit the negative effects of using the Earth’s resources Record ways we monitor and use information about changes to the Earth

Grade 5 and 6	
<p>Space</p> <ul style="list-style-type: none"> • Examine ways scientists investigate the solar system and the universe (e.g. satellites, probes and telescopes) • Report on early attempts to send rockets and probes into space • Identify the planets of our solar system • Model the relative sizes of planets and their distances from the sun • Compare and contrast the conditions on Earth with those of other planets and our moon • Locate and describes features of our universe, including: stars, planets, moons, black holes, comets, meteors, galaxies and constellations • Chart the position of the stars in the night sky and compare at different times of the year • Explain the meaning of Light Years • Describe the ways in which scientists estimate quantities like distances to the stars 	<p>Earth</p> <ul style="list-style-type: none"> • Identify changes in the atmosphere and interior of the Earth that cause catastrophic events including earthquakes, volcanoes, drought, cyclones and tidal waves • Identify the layers within the Earth and atmosphere • Map the location of earthquake zones and explain their positions • Examines geological features of the Earth, including erosion, the rock cycle and plate tectonics • Describe the formation of metamorphic, igneous and sedimentary rocks • Chart the features of, and techniques used to describe, rocks • Identify the uses of metamorphic, igneous and sedimentary rocks
Grade 7 and 8	
<p>Space</p> <ul style="list-style-type: none"> • Explain scientific techniques used in monitoring space from the Earth • Describe early navigation techniques and the history of astronomy • Explain the observable effects of the relative movements of the planets, moon, sun and stars: <ul style="list-style-type: none"> - demonstrate the positions of the Earth, moon and sun in explaining the tides - account for the different phases of the moon in the lunar cycle - explain the phenomenon of the seasons in terms of relative positions of the Earth and sun - account for the apparent movement of the stars and constellations across the sky • Describe the features of other planets and examine possible scientific solutions to the problems of supporting life in space • Research human endeavors to support life in space • Explain the ways that space exploration and understanding has affected us here on Earth • Identify the stage our sun is in its evolution and predict the future of life on Earth • Explain what is meant by supernovae, red giants, white dwarfs, universes, stars, meteorites, nebulae, asteroids, galaxies and black holes 	<p>Earth</p> <ul style="list-style-type: none"> • List characteristics of the Earth, such as its atmosphere, temperatures, rotational speed and tilt of the axis, that are conducive to life on Earth and discuss why they are important • Explain theories on the formation and geological history of the Earth • Describe theories of the internal structure of the Earth • Identify the lithosphere as the region of the Earth where rocks are formed • Identify and name rocks according to their mode of formation • Describe the relationship between rocks, ores and minerals • Identify minerals and discuss formation and classification techniques • Describe, in general terms, how evidence is obtained for estimating the time of formation of rocks • Review sedimentary, igneous and metamorphic rocks, and apply properties such as composition, grain size, color, and texture in describing them • Describe the role of science in assessing the impact on the surface of the Earth of human intervention in particular places • Identify and describe the geological information needed in building such things as buildings, dams, roads, bridges and tunnels in Sumbawa • Analyze how scientific techniques are used to extract and process resources (e.g. gold/copper mining in Sumbawa)

APPENDIX B – Learning Resources

- The School will be equipped with a wide range of resources for the effective teaching of science
- Teachers and students utilize a variety of science-specific materials, including household as well as commercially produced materials to support the teaching of science
- Children will be taught the skills necessary to make effective use of computers

APPENDIX C - Assessment

- Is inseparable from the teaching process since its prime purpose is to improve student performance
- Should be a comprehensive and continuous process, making use of formative, summative and diagnostic approaches
- Should be firmly grounded in objective criteria
- Should provide opportunities for students to become active participants in the evaluation of their own performance and progress
- Should utilize an established, school-wide reporting system with open channels of communication between teachers, parents and students
- Is used to find out what students have and have not learned
- Helps to diagnose and demonstrate an individual student's strengths, weaknesses, and styles of learning and progress
- Assists teachers in the evaluation of their teaching strategies
- Helps teachers to evaluate how far their objectives are being met and to adjust them accordingly when planning the next stage of learning for individuals and groups
- Provides information for parents about their child's ability and progress
- Allows for the analysis of the effectiveness of the curriculum

APPENDIX D - Acknowledgements

Batu Hijau International School acknowledges that this curriculum has drawn heavily, and at times directly, from the following curriculum statements:

- Science – A Curriculum Profile for Australian Schools
Curriculum Corporation, Victoria, Australia
- National Science Education Standards
National Research Council, Washington, U.S.A
- Curriculum & Standards Framework
Board of Studies, Victoria, Australia