



**Science in**  
**The National Curriculum**  
**Key Stage 2- Grade 4**  
Revised



**NATIONAL  
INSTITUTE OF  
EDUCATION**

Science in the National Curriculum

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# Introduction

## Science in the National Curriculum

Science in the National Curriculum along with other subjects contributes to the development of the student in all aspects outlined in the National Curriculum. The following highlight briefly how the science curriculum paves the road in developing students in various aspects outline in the National Curriculum.

### The Vision

The Science curriculum is designed to facilitate to achieve the vision of the National Curriculum. Students are required to ask questions, explore, use and create knowledge in many concepts included in the syllabus. The syllabus gives ample opportunities where students are required to take actions relating to family, local community and contribute to global society with respect to sustainable use of resources, conserving and preserving the natural resources and other related aspects throughout. The syllabus also stresses upon skills, values and attitudes which enables students to become confident and competent citizens.

### The Principles

The Science syllabus emphasizes linking Science with eight fundamental principles identified in the National Curriculum. The skills, values and attitudes such as being fair, just, having Islamic faith, appreciating the culture, uphold the traditions are some of the aspects that are integrated in the content and skills in the syllabus.

Likewise, the syllabus design has taken considerations in taking into account, various learning styles and differentiation such that every student has the opportunity to reach to personal excellence.

Similarly, in-depth understanding of scientific concepts and processes ensures that students develop holistically, and relating these concepts and processes to their real-life context ensuring relevance to students and preparing them for life.

### Values

The science syllabus is designed to integrate values in the four categories mentioned in the National Curriculum. The content and processes facilitate and promote the development of values mentioned in the National Curriculum to greater extent. A special focus is sought out to develop the values relating environment stewardships in the syllabus.

## The Key Competencies

The Science curriculum provides a rich context in which the key competencies outlined in the National Curriculum can be developed. The eight key competencies included in the National Curriculum encompasses knowledge, skills, values and attitudes and dispositions to be explicitly taught in various key learning areas and through various school activities. The following highlights some of the opportunities where each key competency can be developed:

- **Creative and critical thinking**

The syllabus involves a lot of opportunities for students to explore their surroundings, ask questions, use high order thinking to analyse and solve issues. In addition, the curriculum allows students to design and invent new things based on their prior knowledge and using their creative thinking. It asks students to understand abstract concepts which require high level of cognition.

- **Using Sustainable Practices**

Using sustainable practices is very much part and parcel of the science curriculum. It encompasses many aspects to explore how human activities impact the environment and identify ways to take care of the environment. In addition, the syllabus includes many opportunities to understand issues from both developmental as well as environmental perspectives so that students are encouraged to develop stewardship towards the environment.

- **Using Media and Technology**

The science curriculum provides many opportunities for students to relate with the technological advancement in various fields and how science has contributed to these advancements. In addition, student need to use technology in their learning and identify best sources to gather information; question the authenticity of the information gathered and also analyses, synthesises and evaluates the information.

- **Relating to people**

The science curriculum requires students to carry out several investigations throughout the years and these investigations and other activities are required to do in a group. Hence, there would be many opportunities to develop the key competency, relating to people.

- **Understanding and managing self**

The science curriculum requires students to carry out several investigations throughout the years and these investigations give ample opportunities for students to develop the key competency, understanding and managing self as they have to be carried out in a systematic and organised manner.

- **Living a healthy life.**

Healthy life aspects are a big component in the science curriculum. Understanding of how the human body functions and how to take care of body etc. are some of the concepts covered which relates to human health. Taking care of equipment and precautionary measures in using chemicals and various equipment are some concepts explored in the curriculum. Hence opportunities are there in the science curriculum to develop the key competency, living a healthy life.

- **Making Meaning**

Science curriculum requires students to engage in collaborative action-based scientific inquires rooted in issues that are of great importance to the students. Science curriculum also offers opportunities for students to engage in various context relevant to the concepts that they study such that making meaning is made.

- **Practicing Islam**

The science curriculum provides a rich context to develop the key competency, practicing Islam. The process skills such as observation, inference, experimental knowledge are skills with which humanity can achieve goals laid out in the Quran and Sunnah. The modern Science has been developed by Muslims by highlighting the repeated calls of the Quran to observe and reflect upon the natural phenomena. The content, skills and values included in the science curriculum are very much aligned with this notion and hence many opportunities for developing the key competency.

## Considerations for Planning, Teaching and Assessing Science

### The Planning

#### Focus for Learning

The National Curriculum highly recommends that the focus for learning should promote a holistic approach to education, placing equal emphasis on the development of knowledge, understanding, skills, values and attitudes. Therefore, careful and systematic planning is essential for the success of Science teaching. To begin with, in order to ensure that children receive a rich learning experience, it is important that Science teachers become familiar with the outcomes and indicators at each level and have an understanding of how these are translated and implemented in the classroom. The following are some key features to consider in planning science education:

#### Content Selection

It is important to note that children should experience a broad and balanced programme. The science curriculum highly encourages to teach science concepts in content strand with the scientific processes. Thus, the strands 'Science and technology' and 'Scientific Inquiry Skills' need to be integrated with the content strands in order to maximize the learning of skills and values. Therefore, teachers should draw content from the four content areas and two process strands:

- Life and Living
- Earth and Beyond
- Matter and Materials
- Energy and Change
- Science and Technology
- Science Inquiry Skills

In situations, where the selected topic or theme can incorporate other content areas, it is advisable to do so.

*For example, teachers may select our surrounding as a unit topic, where outcomes from the content areas of Life and Living and Earth and Beyond can be taken together*

In selecting a theme or topic teachers should account for student needs, their local environment and familiarity. It should also ensure continuity and progression in student's learning. For smooth transition from each level requires teachers to be aware of the students past learning experiences.

Although it is encouraged that a thematic approach be used in teaching science, it needs to be understood that to achieve certain outcome may require specific teaching related to the selected outcomes and indicators.

In general, effective planning thus requires the teachers to initially identify the big ideas/concepts behind each of the outcomes and identify ways to collate outcomes and indicators together to ensure that students receive meaningful learning.

## **Development of Skills, Values and Attitudes**

The NCF places great emphasis on encouraging children and young people to adopt deeply held values shared within our society. It identifies four main categories of shared values and schools need to adopt an integrated approach that allows children to apply general skills across the curriculum. Opportunities must be provided for students to apply these skills in a variety of active learning experiences where they learn through various tasks that allow them to move from concrete to more abstract levels of learning.

## **Literacy and Numeracy**

Numeracy is about students having the confidence to choose and use mathematics skills they learn at school in everyday life, as well as the classroom and literacy is essential to a student's ability to learn and succeed in school and beyond.

Literacy capabilities need to be explicitly built as students' progress throughout the years in all the key learning areas. Teaching and learning in environment, Science and Technology, students may need to write science reports after undertaking investigations or experiments. This requires specialised text and language structures, vocabulary and graphics that are specific to constructing knowledge in Science and that may not be learnt in other areas of learning. If these literacy demands are not addressed in teaching and learning, it would hinder student learning in science.

In this regard, every classroom teacher needs to address in explicit teaching of numeracy skills in all the curriculum areas. In science class when students interpret a graph, in woodwork when they confidently measure a piece of wood, or in cooking when a student halves a recipe without being given specific instructions on what to do. So every classroom teacher has a role to play in helping students develop numeracy skills.

Consequently, all the teachers need to ensure that literacy and numeracy teaching and learning becomes part of their daily routine.

## **Integration**

The use of well-planned integrated approaches, both within Science and between Science and other curricular areas plays an important role in the teaching/learning of Science at all levels.

Systematically planned integrated topics can provide contexts in which knowledge and skills may be developed in a range of areas. In this regard, the environments of the child, particularly those of a local nature, provide ideal contexts and an effective ground for the integration of learning.

Likewise, many elements from the Social studies, Mathematics and Language curricula may be explored in parallel with Science, and much of the work involved will contribute to the development of the child's oral language, literacy, numeracy and communication skills. Science is best approached in a holistic manner with younger children as this respects the wholeness of their view of the world.

As children grow old they begin to recognise that there are different ways or modes of looking at the world and of organising human knowledge, so teaching strategies may vary to include a holistic approach, some cross-curricular integration and a subject-centered focus. Such an approach utilises teaching and learning time efficiently and acknowledges that the social, emotional, attitudinal and moral development of the child is interwoven with the acquisition of knowledge and skills. It needs to be understood that each subject offers a distinctive perspective on the world and equips children with a particular range of skills; however, these divisions must not reverse the effective implementation of an integrated curriculum.

## Teaching Approaches

The instructional approaches and learning activities need to be drawn in a way that reflects the five pedagogical dimensions mentioned in the National Curriculum:

- Creating a positive Learning Environment
- Connecting Prior Learning to New Learning
- Making Learning Meaningful
- Fostering Reflective Practices
- Catering to Individual differences

These dimensions are not stand-alone dimensions. They are interwoven in nature and teachers need to carefully develop the lessons in a manner that these dimensions are addressed. Some of the ways these dimensions can be addressed are highlighted below:

When the activities in the lesson plans

- Are drawn on students' prior knowledge, capture their interest, encourage meaningful practice in various contexts, allows for students to construct their own learning.
- Engage students in a way that they make the connection between the scientific and technological concepts they are learning and their application in the world around them and in real-life situations.
- Offer opportunity for students to make sense of the world around them by critically reflecting and making sense and meaning of their experiences.
- Address the growing diversity of students in classrooms. The use of the one-size-fits-all lessons no longer meets the needs of the majority of learners and teachers need to adopt differentiated learning activities.

Thus, the role of students would be active learners who construct their own learning and teacher in such teaching would act as facilitators in teaching. The teacher needs to:

- creating a classroom environment to support and challenge the learning and teaching of science
- designing effective learning experiences that help students to achieve designated outcomes
- stimulate and managing classroom discourse in support of student learning
- use student's motivations, interests, abilities and learning styles to improve learning and teaching

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- analyze student learning, the scientific tasks and activities involved, and the learning environment to make ongoing instructional decisions
- select teaching strategies from a wide repertoire.

In addition to the above, the science curriculum emphasizes the need to get involved in practical activities such as field outings, projects, experiments and investigations. One of the main purposes of these is to provide rich context for students to develop Science Inquiry skills.

Research on successful classroom practice have shown that an inquiry approach, with emphasis on learning through concrete, hands-on experiences, best enables students to develop the conceptual understanding required. In such instructional settings and strategies, learning occurs not by passive absorption, but rather as students actively constructs their own meaning and assimilates new information to develop new understandings in terms of knowledge, skills and values and attitudes

Likewise, the development of scientific literacy in students is a function of the kinds of tasks they engage in, the discussions in which they participate, and the settings in which these activities occur. Students' disposition towards science is also shaped by these factors.

Consequently, the aim of developing scientific literacy requires careful attention to all of these facets of curriculum and instruction. Learning experiences in science education should vary and include opportunities for group and individual work, discussion among students, as well as between teacher and students, and hands-on/minds-on activities that allow students to construct and evaluate explanations for the phenomena under investigation. Such investigations, and the evaluation of the evidence accumulated, provide opportunities for students to develop their understanding of the nature of science and the nature and status of scientific knowledge.

## **Environmental Awareness and Care**

The curriculum area of science is specifically founded on the student's relationship and interaction with the world around them. The environment, in its broadest sense, is the context for learning, and student's classroom experience will be deepened and extended by direct experience of their surroundings. The locality will provide the starting points for environmental education, and as student's knowledge and understanding grow and develop they will encompass other places and direct pupils to other global dimensions.

One of the key aims of Science education should be to inculcate the necessary skills and values to understand environmental vulnerabilities locally as well as globally, and be informed decision makers in deciding responsible actions in maintaining and protecting the environment.

The four content strands provide a rich context to include concepts related about the environment, and in the environment that provide a rich learning experiences in active manner and promote a love for learning and appreciation for the dynamic interactions. The positive and negative consequences, both intended and unintended, of the interactions between human-created and natural systems

The future of our country lies hand-in-hand with the future of our young people. They deserve a first-class education on the environmental challenges ahead, on the innovations and creativity where solutions can be found, and to understand the skills they will need to succeed in the low-impact and low-carbon industries of the future.

With an innovative and creative approach to sustainable development and environmental stewardship, schools can be a breeding ground of ideas and pathways to a sustainable future. This has become even more imperative in 2020.

## Assessment Practices

The Science Syllabus outcomes contribute to a developmental sequence in which students are challenged to acquire new knowledge, understanding and skills.

Assessment is an integral part of teaching and learning. Assessment is the ongoing systematic process of gathering and using evidence of student learning to make informed decisions regarding student achievement. Thus, the main purpose of assessment is to improve student learning.

Three major types of assessment used in conjunction can be used to support student achievement: The Key stage 1 Science Syllabus particularly promote Assessment for Learning as an important component of good teaching.

### **Assessment for Learning (Formative Assessment)**

It is used for purposes of greater achievement. Classroom assessment should provide opportunities for students to become actively involved in their learning and achievement. In this type of assessment student know what they need to do in order to be successful and know what is considered as ‘good work’.

Assessment for learning is criterion referenced where students compare their work with a criterion. The criteria are based on the outcomes and indicators mentioned in the Science Syllabi.

In addition to this, students, peers and teachers provide appropriate and ongoing feedback. Through feedback students identify their strengths and areas for improvement. This helps students to redirect their efforts and energy in making plans on ways to improve learning.

As for teachers, this provides the opportunity to change instruction in accordance with student’s needs.

### **Assessment as Learning (Formative Assessment)**

Assessment as learning is student driven whereby students actively involved in their own learning. This is done through continuous self-assessments whereby students identify areas to improve. Students are required to reflect and critically evaluate their work.

### **Assessment of Learning (Summative Assessment)**

This is usually addressed through summative assessment. This includes topic assessment at the end of a topic and term exams. (Note: for the foundation and key stage one there will be NO term exams or tests). However, students’ summative assessment can be done to check students’ level of understanding. The information gathered through the summative process should be used formatively to enhance student progress.

In order to gather evidence of student learning the following are some of the methods that can be used:

Informal assessment- student and teachers make judgments about their learning based on discussions.

Formal assessment- students and teachers making judgments based on success criteria that are shared by students and the teacher before the learning task is carried out.

- Observation – use of checklists, rating scales and rubrics
- Self and peer assessment
- Quizzes
- Tests
- Sample student work
- Projects
- Reports
- Journals/Logs
- Performance reviews
- Portfolios

Detailed guidance and advice on effective pedagogy and appropriate assessment practice is provided in the Pedagogy and Assessment Guide (PAG) available on the NIE website.

## Recommended Time

The following table shows the allocated time for teaching Science to Key Stage 2 (grades 4 ) students:

Key Stage	Contact Time/Weeks	Minimum Contact Time/year
2 (Grade 4)	180 min (4 periods /week)	109 hrs (145 periods of 35 mins)

## Place of the Science Syllabus in the K- 12 curriculum

<p style="text-align: center;"><b>Key stage 1-3</b></p> <p style="text-align: center;"><b>Science</b></p> <p style="text-align: center;"><b>Compulsory</b></p>
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<p><b>Key Stage 4</b></p> <p><b>Science Stream- Optional</b></p> <p><b>Core Subjects</b></p> <ul style="list-style-type: none"><li>• Biology</li><li>• Chemistry</li><li>• Physics</li></ul> <p><b>Elective</b></p> <ul style="list-style-type: none"><li>• Marine Science</li></ul>	<p><b>Key Stage 5</b></p> <p><b>Science Stream-Optional</b></p> <p><b>Core Subjects</b></p> <ul style="list-style-type: none"><li>• Biology</li><li>• Chemistry</li><li>• Physics</li></ul>
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## Rationale

The aim of Science Education in Maldives is to develop scientific literacy. Scientific, Environmental and technological literacy is an evolving combination of the science-related attitudes, skills, and knowledge students need to develop inquiry, problem-solving, and decision-making abilities; to become lifelong learners; and to maintain a sense of wonder about the world around them.

To develop scientific, environment and technological literacy, students require diverse learning experiences which provide opportunity to explore, analyze, evaluate, synthesize, appreciate, and understand the interrelationships among science, technology, society, and the environment that will affect their personal lives, their careers, and their futures.

## Aim

The purpose of this key learning area is for students to explore the natural world and its phenomena through systematic and organized inquiry. It provides the opportunity for students to question, investigate, predict and explain the events of the Earth and the universe.

The aims of Environment, Science and Technology are to:

- enable the student to acquire knowledge, skills and attitudes so as to develop an informed and critical understanding of, environment, science and technological issues
- reinforce and stimulate curiosity and imagination about local and wider environments
- enable the student to play a responsible role as an individual, as a family member and as a member of local, regional, national, global communities
- foster an understanding of, and concern for, the total interdependence of all humans, all living things and the Earth on which they live
- foster a sense of responsibility for the long-term care of the environment and a commitment to promote the sustainable use of the Earth's resources through personal life-style and participation in collective environmental decision-making
- Cultivate humane and responsible attitudes and an appreciation of the world in accordance with beliefs and values.

## Structure of the Syllabus

The content of the Science key stage 2 syllabus is based on the outcomes and indicators in two broad areas. They are

- Knowledge and Understanding
- Skills

### Outcomes

The outcomes are statements of knowledge, understanding, skills and values expected to be achieved by students at the end of a given stage. All outcomes are of equal importance. The presentation of the outcomes does not imply a sequence of teaching and learning activities.

### Indicators

An indicator is an example of the behavior that students may display as they work towards the achievement of syllabus outcomes. Indicators reflect and describe aspects of knowledge, understanding, skills and values.

The outcome and indicators together make up the content. The indicators describe in more detail how the outcomes are to be interpreted and used, and the intended learning appropriate for the Stage. In considering the intended learning, teachers will make decisions about the sequence, the emphasis to be given to particular areas of content, and any adjustments required based on the needs, interests and abilities of their students.

The knowledge, understanding and skills described in the outcomes and indicators are organized into grades so that it provides a sound basis for students to successfully move to the next stage of learning.

## Summaries of Strands

The knowledge and Understanding comprise of four content strands and Skills are presented in two process strands.

A summary of each strand included in the Syllabus is outlined below:

### **Strand 1: Life and Living**

Life and living strand explore the living things and their interactions. It looks in to structure, function of living things. It includes the importance of diversity of life and their interdependence. It also explores the impact of environment on life and the effects of human intervention on the environment.

### **Strand 2: Matter and Materials**

Matter and materials strand explore matter and its interactions. It looks into the composition and properties of matter. It also explores the changes that matter undergoes and the energy involved. This strand also includes the study of wide range of materials and substances which people use. It explores how uses are determined by the properties and structure of materials. Furthermore, it looks in to the use and management of materials and the influence of these uses on the environment.

### **Strand 3: Energy and Change**

Energy and change strand explore matter, energy their interactions and the changes associated with those interactions. It explores the movement of objects and forces acting on it. This strand also looks in to forms of energy, energy transformation, law of conservation of energy, harnessing and storing of energy. Furthermore, it looks in to social implications of energy use including the effects of use of natural resources, a range of alternative energy sources and the implications of their use.

### **Strand 4: Earth and Beyond**

Earth and beyond strand explore Earth's processes and features. It looks into understanding patterns in nature and natural cycles. It also includes a study of various parts of the solar system and the universe. In addition to this, it looks into the relationships of Earth's systems and their effects on living things. Furthermore, it highlights the uniqueness of the planet Earth, and the importance of protecting and preserving resources of Earth and its environment.

## **Strand 5: Science and Technology**

Science and technology strand provide students to develop inquiry, investigation skills and the ability to solve problems in students.

This strand will be integrated in to content strands to provide opportunities to apply thinking skills, seek solutions to problems through collaboration, investigation, critical thinking and creative problem-solving. Through this strand emphasis will be laid to develop skills in designing and making products, to develop an appreciation of the processes that can be applied to solve problems related to unfamiliar information and new ideas.

It will also enable students to participate responsibly in developing innovative ideas and solutions in response to questions and situations relevant to personal, social and environmental issues. Hence providing opportunities to make meaningful connections with the broader learnings through authentic application of relevant knowledge and acquired skills. Furthermore, this will also help to appreciate how science has contributed to the advancements in this world and to use technology wisely.

## **Strand 6: Science Inquiry Skills**

Science Inquiry Skills Strand provide opportunities for applications of the processes, that are practised by the scientific community. It looks into ways of creating and nurturing students' natural curiosity and sense of wonder about their world.

This strand provides opportunities to pose questions, plan, conduct and critique investigations, collect, analyse and interpret evidence and communicate findings. Through this strand student will use evidence to make decisions and solve problems and recognise that scientific explanations change as new or different evidence becomes available.

Additionally, this strand gives ample opportunities for students to participate in discussions, inculcate intellectual honesty and skills to critically evaluate data. As students conduct scientific inquiries, through collaborative and individual work they learn to question, solve problems, draw logical, evidence-based conclusions, articulate ideas and work in ways that are ethical, fair and respectful.

Furthermore, this will also help students to appreciate the complexities of the world as they compare their current ideas and beliefs with those of scientists, and construct new understanding based on scientific thinking.

## The Science Syllabus Key

The following codes are used in the Science KS 1-3 Syllabus.

### Outcome Coding

Syllabus outcomes are coded in a consistent way. The code identifies the strand, grade, outcome number and the way the content is organized.

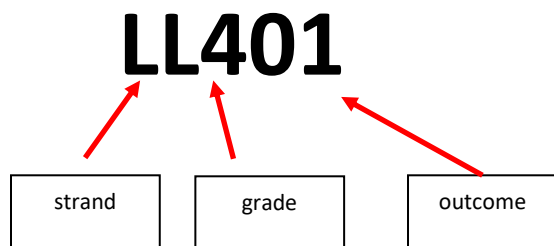
Strands are represented by the following codes:

Strands	Code
Life and Living	LL
Earth and Beyond	EB
Matter and Material	MM
Energy and Change	EC
Science Inquiry Skill	SIS
Science and technology	ST

Grade 1-3 outcomes are represented by the following codes:

Stage	Code
Grade 4	4
Grade 5	5
Grade6	6

In the *Science KS1-3 Syllabus*, outcome codes indicate subject, strand, grade and outcome number, skill. For example:



Outcome code	Interpretation
LL401	Life and Living, Grade 4, Outcome 1

## Scope and Sequence of content outcomes of each strand

Strands/Sub-strand	Grade 4	Grade 5	Grade 6
<b>Life and Living</b>			
<b>Structure and function</b>	Observe the characteristics of life and use scientific terms to describe the life processes	Explore and identify that complex living things are made up of organ systems	-
		Observe a variety of living things to identify how external structures and behaviours helps living things to survive.	-
	Observe and identify the patterns in the development of living things	Observe the growth and development of a variety of living things	-
<b>Interactions</b>	Observe and identify how plants and animals depend on each other and their environment	-	Observe and identify how plants and animals within specific habitats and communities depend on each other and their environment
	Identify and assess the natural human and impacts on the environment.	-	
<b>Earth and Beyond</b>			
<b>Physical features of the Earth</b>	Observe to identify weather changes occur over time	Identify that Earth is a part of solar system and it has special physical features.	Identify that weather patterns, change overtime and it affects lives.
	Observe to identify that weather changes occur in predictable patterns and changes in the weather patterns.	Explore weathering and how weathering and erosion causes changes to the Earth's surface.	
<b>Resources of the Earth</b>	Identify Earth as a system and air and water are essential components of earth	Investigate the characteristics of soil (soil composition, ability to absorb water and how living things use soil).	Identify atmosphere as an essential component of Earth's system and explore properties of atmosphere
	Identify that Earth's resources are used by living	Investigate that Earth's resources are affected by natural process and human activities	Investigate the properties of water that makes it an essential component of Earth's system.
	Explore the importance taking care of the Earth by using Earth's resources sustainably		Study the human impact on the atmosphere and the quality of air in our environment
<b>Matter and Materials</b>			
<b>Matter and Materials</b>	Explore the properties of natural and processed materials		Explore physical and chemical properties of matter and materials are distinguished from

			each other based on their properties.
	Identify and assess the link between the physical properties of materials to their use.		Identify magnetic and non-magnetic properties of materials and how magnetic materials are used in daily purposes
	Investigate the impact of using natural and processed material to the environment		
<b>Changes in Matter</b>	-	Explore physical properties of matter and identify that they can change in different temperatures (cooling or heating)	Observe physical changes and chemical changes in the state of matter.
<b>Energy and change</b>			
<b>Force and Motion</b>	Explore the effects of contact and non-contact forces on an object		Explore and investigate that simple machines can be used to solve problems in daily life
<b>Energy</b>	Explore the different sources of heat and identify the heat can be transferred form one object to other.	Describe basic properties of light (travels from a source in a straight line) and can be absorbed, reflected and refracted )	describe various forms of energy and identify that energy can be transformed from one form to another
		Investigate to describe how sound is produced	

## Scope and Sequence of process skills outcomes of each strand

<b>Strands/Sub-strand</b>	<b>Grade 4</b>	<b>Grade 5</b>	<b>Grade 6</b>
<b>Science Inquiry Skills</b>			
<b>Formulating questions and making predictions</b>	With guidance formulate questions in familiar contexts	Formulate investigative questions, make predictions and identify key questions to gain clarity.	With guidance formulate investigative questions, make predictions and identify key questions to gain clarity.
<b>Planning and conducting Investigations</b>	Plan and carryout scientific investigations with guidance focusing on fair test and safety.	Plan and carryout scientific investigations with guidance focusing on use of formal measurements safety.	Plan and carryout scientific investigations with guidance focusing on use of formal measurements safety.
<b>Recording and interpreting data and information</b>	Use a range of methods to record observations and data	Use a range of methods to record and represent observations and data	Construct tables and graphs to record and represent observations and data
	Makes precise measurements using standard units	Makes precise measurements using standard units	Makes precise measurements using standard units

	Describes results, identify patterns/trends in data/observations	Interpret data, find patterns/relationships in data and observations	Interpret data from primary and secondary sources to identify patterns/ relationships in data and observations
		Compare results with the prediction and suggest possible explanation	
<b>Evaluating and communicating</b>	Share observations, results and Reflects on investigation plan, results and conclusions.	Share observations , results and Reflects on investigation plan, results and conclusions to identify was to improve	Share ideas and reflect on different aspects of an investigation
<b>Science and Technology</b>			
<b>Science as a human endeavour</b>	Identify that science involves making predictions, identifying and describing patterns	Identify that science involves making predictions, identifying and describing patterns	Identify that science involves testing ideas making predictions and using data to give explanations.
	Explore the impact of scientific knowledge on their daily life and actions	Explore how scientific knowledge helps communities to make the right choices in decision making	Explore how scientific knowledge helps communities to make decisions and contribute to quality of life.
<b>Design and making</b>	Share and discuss design ideas	Share and discuss design ideas	Discuss and generate design ideas to develop and implement the design
	Select suitable materials to make a product and evaluate the product	Select suitable materials to make a product and evaluate the product	Select suitable materials to make a product and evaluate the product

## **Grade 4 - Syllabus Details**

**Strand: Life and Living**  
**Sub-strand: Structure and Function**

<b>Outcome</b>	<b>Indicators:</b>
<b>SLL401 Observe and identify the life processes in living things</b>	a <i>Observing to identify the characteristics of life as “Movement, Reproduction, Sensitivity, Growth, Respiration, Excretion and Nutrition”.</i>
	b <i>Observing to identify similarities in life processes between themselves and other living things.</i>
	c <i>Comparing features and characteristics of living, non-living things and once lived</i>
<b>Outcome</b>	<b>Indicators:</b>
<b>SLL402 Observe that living things have life cycles and have offspring similar to themselves</b>	a <i>Observing to identify that all Living things have offspring’s similar to parents and are usually with two parents</i>
	b <i>Exploring to identify that plants and animals have life cycles that include a predictable sequence of stages: (birth, growth, reproduction and death) and they have predictable characteristics at different stages of development in the life cycle.</i>
	c <i>Observing the life cycle of a variety of living things (e.g., butterflies, frogs, chickens, flowering plants) to identify the patterns in growth and development in their life cycle.</i>
	d <i>Observing to identify animals that are born alive (e.g., humans, dogs, cows) and those that hatch from eggs (e.g., chickens, sea turtles, crocodiles).</i>
<b>Sub-strand: Interaction</b>	
<b>Outcome</b>	<b>Indicators</b>
<b>403 Investigate how plants and animals depend on, each other, the habitat and the environment</b>	a <i>Investigating the populations of plants and animals that exist in various habitats (e.g., reef, desert seashore, river, tropical forest and tundra,).</i>
	b <i>Observing to identify factors (e.g., availability of water or food, amount of light, type of weather) that affect the ability of plants and animals to survive in a specific habitat</i>
	c <i>Observing to identify a specific food chain that exists within a habitat and construct a visual representation of the food chain</i>
	d <i>Assessing and describing consequences of natural and human-caused changes to specific habitats and relating habitat loss to the endangerment and extinction of plants and animals within habitats.</i>
	e <i>Discussing to identify how natural environment are protected for wellbeing of humans and other living things.</i>

**Strand: Earth and Beyond**  
**Sub-strand: Physical features of Earth**

<b>Outcome</b>	<b>Indicators:</b>
<b>404 Observe to identify that weather changes occur overtime.</b>	a <i>Describing the role of the sun in the Earth's weather systems.</i>
	b <i>Identifying various weather elements and the instruments used to measure them</i>
	c <i>Using local weather data to predict and describe typical weather during a particular season in an area</i>
	d <i>Identifying that the changes in weather elements (temperature, light, and precipitation) can be observed and recorded over time.</i>
	e <i>Identifying a trend and draw conclusions from collected data and summarize results.</i>
	f <i>Making links that there are relationships between daily and seasonal changes</i>
	g <i>Identifying what climate change means and discussing how it affects the local community</i>
<b>Sub-strand: Resources of the Earth</b>	
<b>Outcome</b>	<b>Indicators:</b>
<b>405 Explore that air and water are essential components of the Earth system</b>	a <i>Exploring the major parts, or components, of the Earth system and make connections among those components</i>
	b <i>Identifying the major components of the Earth system (the geosphere, atmosphere, hydrosphere, biosphere and pedosphere).</i>
	c <i>Describing connections among the components of the Earths systems (e.g. components (air: atmosphere, water: hydrosphere, Soil: pedosphere, living things: biosphere)</i>
	d <i>Making predictions about how some changes in one component of the system might affect the other components.</i>
	e <i>Identifying sources of water in the natural and built environment</i>
	f <i>Describing ways in which living things, including humans, depend on air and water.</i>
	g <i>Assessing personal and family uses of water as responsible/efficient or wasteful, and create and plan to reduce the amount of water used, where possible</i>
<b>Outcome</b>	<b>Indicators:</b>
<b>406 Explore and investigate about ways communities and individuals can protect the Earth's resources and environment</b>	a <i>Describing ways in which living things, including humans, depend on air and water.</i>

	b	<i>Assessing personal and family uses of water as responsible/efficient or wasteful</i>
	c	<i>Reflecting on human activities that affect the quality of air and water, and its ability to sustain life and identifying ways to combat water and air pollution</i>
	d	<i>Exploring actions taken by the communities and individuals to conserve and protect the environment and natural resources</i>

<b>Strand: Matter Materials</b>		
<b>Sub- Strand: Materials and their Properties</b>		
<b>Outcome</b>		<b>Indicators:</b>
<b>407 Explore the properties of natural and processed materials and identify that certain physical properties are linked to their use.</b>	a	<i>Observing to identify the link between the property of materials and their use</i>
	b	<i>Investigating how the properties of natural and processed materials influence their suitability and use in various products, (elasticity, biodegradability ,sustainability)</i>
	c	<i>Investigating the impact of using natural and processed can have on the earth (e.g. waste management, pollution control) (single use plastic)</i>
	d	<i>Designing a product considering the sustainability that can be used to solve an everyday problem</i>
	e	<i>Identify the roles of people working as material scientists</i>
<b>Sub-Strand: Changes in Matter</b>		
<b>Outcome</b>		<b>Indicators</b>
<i>Not applicable at this grade</i>		<i>Not applicable at this grade</i>
<b>Sub- Strand: Use of materials and their impact on the environment</b>		
<b>Outcome</b>		<b>Indicators</b>
<i>Not applicable at this grade</i>		<i>Not applicable at this grade</i>

**Strand: Energy and Change**  
**Sub-strand: Force and Motion**

<b>Outcome</b>	<b>Indicators</b>
<b>408 Explore and investigate the effect of forces (contact and non-contact) on objects</b>	a <i>Describing friction as a force that impedes motion and generates heat</i>
	b <i>Describing common occurrences of friction, including those in which friction can be used to advantage in everyday life.</i>
	c <i>Comparing and contrasting the effect of friction on different surfaces, such as tyres and shoes on a range of surfaces</i>
	d <i>Investigating the effect of forces on the behaviour of an object through actions such as throwing, dropping, bouncing and rolling on different surfaces</i>
	e <i>Exploring the forces of attraction and repulsion between magnets</i>
	f <i>Identifying through observation, the effect of different conditions on the strength of magnets in materials (e.g., the effect of distance between magnets)</i>
	g <i>Designing and construct a system that uses magnetic force to move an object (e.g., create a boat that holds paper clips and move it through water using a magnet);</i>
<b>Sub-strand: Energy</b>	
<b>Outcome</b>	<b>Indicators:</b>
<b>409 Explore that variety of sources of heat exist and heat can be transferred from one object to another</b>	a <i>Identifying different sources of heat and describe how heat can be produced</i>
	b <i>Identifying that heat can be felt and measure its effect using a thermometer.</i>
	c <i>Investigating to identify heat transfer in various materials through conduction</i>
	d <i>Exploring to identify how insulation can keep heat in or out.</i>
	e <i>Exploring to design, build and test a device that insulates the heat in an object/device.</i>

**Strand: Science inquiry skills**  
**Sub-strand: Formulating questions and making predictions**

<b>Outcome</b>	<b>Indicators:</b>
<b>410 With guidance formulate questions relating to familiar contexts that can be investigated and make predictions</b>	a <i>Asking questions to identify problems based on prior experiences (familiar event or phenomenon) and with guidance formulating questions that can be tested</i>
	b <i>Making predictions regarding familiar events and questions that needs to be tested</i>
	c <i>Reflecting on shared experiences as a whole class and identifying possible investigations questions</i>

**Sub-strand: Planning and conducting investigations**

<b>Outcome</b>	<b>Indicators:</b>
<b>411 Plan and carry out scientific investigations with guidance, considering fair testing and safe use of equipment and materials,</b>	a <i>Discussing and Planning with guidance to identify, procedures that needs to be followed while conducting an investigation considering ways to make it a fair test.</i>
	b <i>Making prediction, observations and safely using the senses and using appropriate equipment/tools to enhance the observations</i>
	c <i>Identifying safety skills and procedures when using materials and equipment</i>
	d <i>Participating in guided scientific investigations to answer questions</i>

**Sub-strand: Recording and interpreting data and information**

<b>Outcome</b>	<b>Indicators:</b>
<b>412 Use a range of methods to record observations / data including charts, tables and drawings and make precise measurements using standard units</b>	a <i>Discussing and suggesting observations that could be made to collect data and/or information about the questions and predictions.</i>
	b <i>Estimating and making precise measurements and recording them using familiar standards units and abbreviations.</i>
	c <i>Using a variety of recording devices for recording observations and data e.g., writings, drawings using video cameras and voice recorders</i>
	d <i>Using bar graphs, graphic organisers, tables charts drawing and writings to record observations and represent data</i>

	e	<i>Discussing with guidance which organizing tool e.g. graphic organizer will be most useful in sorting and organizing data in an investigation.</i>
<b>413 Describe observations, results and identify patterns/trends or relationships in data</b>	a	<i>Discussing predictions observations/ results and compare with predictions, and discuss possible reasons for predictions being correct/ incorrect</i>
	b	<i>Interpreting data with guidance to identify numerical and visual patterns in the collected data.</i>
	c	<i>With guidance discussing patterns and trends to develop explanations that fit the patterns and trends identified.</i>

### Sub-strand: Evaluating and Communicating

<b>Outcome</b>		<b>Indicators:</b>
<b>414 Reflect on procedures and results obtained in an investigation and share observations and results.</b>	a	<i>Discussing the procedure and results to identify what went well and ways to improve the investigation.</i>
	b	<i>Discussing and sharing ideas about the investigations (comparing similarities and differences).</i>
	c	<i>Listens and respects the view of others, and justifies one's own ideas.</i>

### Strand: Science and Technology Sub-strand: Science as a human endeavour

<b>Outcome</b>		<b>Indicators:</b>
<b>SST 415 Recognise that science involves making predictions, identifying and describing patterns</b>	a	<i>Discussing to recognise ways in which scientists gather evidence for their ideas and develop explanations</i>
	b	<i>Identifying ways how scientific practices such as sorting, classification and estimation are used by people in everyday life</i>
<b>ST 416 Explore the impact of scientific knowledge on their daily life and actions.</b>	a	<i>Investigating a range of jobs related to use of materials and identifying how science knowledge is used</i>
	b	<i>Exploring ways how quality of water- in the environment are affected by human actions and Identifying ways to minimize the impact</i>

	c	<i>Recognising that changes on the temperature of the Earth is happening due to human actions and that science knowledge can contribute to minimize the impact</i>
	d	<i>Exploring ways how forces of magnetism and friction are used in various fields in for quality of life such as transport (e.g., MagLev Trains) and medical industry (e.g MRI)</i>

**Sub-strand: Design and Making**

<b>Outcome</b>	<b>Indicators: This is evident when the student</b>	
<b>ST417 Discuss ideas and present the design idea, select materials to make a product and evaluate the product</b>	a	<i>Discussing and collecting ideas for making designed solutions</i>
	b	<i>Selecting and using materials and tools to make a product and evaluates own work</i>
	c	<i>Using and manipulating variety of tools</i>
	d	<i>Collaborate to produce a designed solution with clear roles in a group to solve a problem</i>
	e	<i>Identifying positive aspects and areas to improve in the designed product as per personal preference</i>
	f	<i>Designing and construct a system that uses magnetic force to move an object (e.g., create a boat that holds paper clips and move it through water using a magnet)</i>

## Planning, Teaching and Assessment Example

### Sample Lesson Plan

Subject: Science	Grade 3	Duration: 5-6 lessons of 35 mins.
Strand <b>(Energy and Change)</b>	Sub-strand	
<b>Key competencies</b> Thinking critically and creatively Relating to people Using technology and media	<b>Shared Values</b> Values related to self and others	
Prior Knowledge	Materials needed	

**The following lesson is an introductory lesson for the series of lessons which needs to be planned to achieve the following outcomes. This introductory lesson will take approximately 3 x35 minutes**

#### Content Strand (Energy and Change)

**SEC301 Investigate that push and pull can change the movement of objects and their shape.**

- Exploring objects in the home and community to identify pull and push movements
- Identifying and describing the effects of pull and push movements on the objects
- Investigating how different strengths of push and pull affect the movement and shape of objects

#### The Process Strands (The Scientific Inquiry Skill and Science and Technology)

**SSIS301 Formulate questions with guidance in familiar contexts that can be investigated and make predictions.**

- Consulting with and using existing knowledge of the community people to formulate questions that can be investigated
- Formulating questions in familiar context with guidance and making predictions

**SSIS204 Reflect on the procedure and discuss measures taken to make it a fair test.**

- Discussing and sharing the experiences of carrying out investigations
- Discussing and sharing the steps taken to make it a fair test

**SST301 Recognise that science involves predictions, identifying and describing patterns.**

- Making predictions in relation to events in local environment, such as occurrence of monsoons and harvesting
- Identifying and describing patterns and relationships in local environment, such as phases of the Moon and living things depend on other living things for food

**SST302 Recognise that scientific knowledge helps community to make the right decisions.**

- Discussing to identify various scientific knowledge that helps us to make right choices, such as public health issues, transport and infrastructure
- Recognising the importance of using the scientific knowledge in a responsible way for betterment of the whole community, such as dealing with epidemics and construction of infrastructure


**SST303 Discuss ideas and present the design idea, select materials to make a product and evaluate the product.**

- Discussing ideas to present the design idea and compare them
- Selecting tools and materials to make a product
- Presenting the product to identify ways to improve

**Suggested Sequence of Teaching Ideas**

	Learning Intention		
<b>Duration</b>	<b>Teaching and Learning</b> <b>I will be successful if I am able to</b> <ul style="list-style-type: none"> <li>• identify pull and push movements</li> <li>• describe at least two effects of pull and push movements on the objects</li> <li>• listen and follow instructions</li> <li>• contribute to group work</li> </ul>	<b>Resources and Materials Needed</b>	<b>Differentiated Teaching</b>
15 mins	<b>Minds on</b> <b>Introductory</b> Allow students play a simple game of tug of war. Divide the class in to two groups and take the students to an open playground. Show them the rope and ask the following questions. Is the rope moving? How can we make the rope move? Let the groups hold on to the opposite sides of the rope. Ask them to perform an action so that one of the groups will have the rope towards them. Explain to them that the group that manages to pull the rope towards their side will be the winner. After the end of the game, ask following questions to the students. What was the action performed by the winning group? Why do you think one of the groups won?	Rope Videos	Optional activity on page on page 128

	<p>Let students explain in their own words.</p> <p>After their explanation, (If students have not mentioned the terms: force/push/pull, teacher can introduce the terms, connect with their choice of words and explain that we were applying a force when we pull or a push</p> <p>A pull is when we move something towards us and a push is when we move something away from us.</p> <p>Conduct a discussion focusing on the movement of the rope in the direction that had the largest force upon it (greater pull).</p> <p>Discuss about the ways we can move the rope. Identify the action performed by the winning team as a pull. Winning team pulled harder, so we can say that a greater force was applied by them.</p>		
20 minutes	<p>Ask them to observe the picture on page 90 in their text book</p> <p>Carry out a think pair share activity</p> <p>Ask them to think about the things which needs to be considered when building mega structures like this</p> <p>Share some of the ideas with the whole class.</p> <p>Let the students brainstorm about engineers in whole group discussion. Ask the students if they know an engineer and what he does. Write the ideas students share on the board and work towards their understanding of an engineer as a person who designs, tests and builds structures.</p> <p>Let the students work in groups of three</p> <p>Ask the students to imagine that they are engineers, and they are being approached by the city and need to build a strong bridge that can hold the weight of large trucks that transports very heavy materials.</p> <p>Ask them to think about the things they will consider.</p>		Students are provided with opportunity to express their ideas orally.

	<p>Ask them to write them down</p> <p>Select a few ideas from students and write it down on the board and discuss their ideas; while guiding the discussion, try to show them that a lot of forces will act on a bridge. Make them discuss why bridges have to be sturdy and in stable shapes.</p> <p>Use the link below to show some videos on building mega structures like bridges highlight the important points on the forces involved</p> <p><a href="https://www.youtube.com/watch?v=oVOnRPefcno">https://www.youtube.com/watch?v=oVOnRPefcno</a></p>		
35 mins	<p><b>Action</b> <b>Developmental Activity 1</b></p> <p>Get the students to do Get Busy 8a. Ask the students to look at the pictures and sort them into push and pull forces. Probe students with following questions.</p> <p>Identify the type of force applied here. What happens when the force is being applied? What are changes that have taken place in the position of the object in the pictures?</p> <p>Play a video on push and pull movements and their impact on objects. Discuss all the important points in the video. Ask students to give examples of push and pull movements. Demonstrate the effects of throwing a ball. Ask three students to come forward.</p> <p>Discuss the rules with them Tell them they cannot touch each other. For example, when A throws the ball to B, C needs to act on the ball so that B is unable to catch the ball</p> <p>Let them take positions as shown in the diagram</p> 	A ball Resource sheet Appendix 8-Ai Appendix 8-Aii	

	<p>After they throw the ball for a few times and are unable to catch it, ask the students the following:          What happened?          What makes it difficult?          Write down their responses on the board and discuss them.</p> <p>Using the ball, show and explain how a force can change the direction of a moving object.          Ask one student to throw the ball and other to hit it so that it changes the direction.</p> <p>Take the example of a basket ball match          Discuss what players do and relate it to force applied to change the direction of the ball          Explain the strength of the force and the direction of movement, and how we are able to predict the patterns in movement.</p> <p>Share the resource sheet Appendix 8-Ai          Ask them to think about how forces can help us explain what is happening in the pictures given in resource sheet (Appendix 8-Ai).          Conduct a discussion by using key ideas (force can change the direction, change the shape and can make a moving object to slow down or stop) to describe the forces acting on in each real-life scenario.</p>		
15 mins	<p><b>Closure</b>          Ask students to write down at least three real life examples of effects of forces          Discuss their responses          Distribute resource sheet at appendix 8-Aii          Let students complete the resource sheet and discuss the answers</p>		

## Assessment

The introductory ‘Minds-on’ activities are to elicit students’ prior knowledge so that the teacher can take account of this when planning how the developmental activities in the lessons will be implemented. So, in this stage mostly diagnostic assessment takes place. So, the Think, Pair and Share activity done to check on prior knowledge would show students’ understanding and their level of understanding and readiness.

Formative assessment takes place in the developmental activities. This enables the teacher to monitor students’ understanding and provide feedback that can extend and deepen students’ learning through various Get Busy activities. The above lesson is an introductory lesson with 1 developmental activity. The resource sheets attached as Appendix 8Ai and 8Aii can be used identify the level of understanding and feedback can be given accordingly.

## PROCESS SKILLS, KEY COMPETENCIES, VALUES AND ATTITUDES

The activities can be used to identify the ability to ask questions and making predictions. Since the above lesson is an introductory lesson detail development of process skills, values and attitudes are not included.

### Key Competency and values addressed in the lesson

	<b>Beginning</b>	<b>Progressing</b>	<b>Meets expectations</b>
<p><b>Relating to people</b></p> <p>This can be assessed while students are involved in carrying out the activity</p> <p>Two aspect can be assessed: the ability to work in collaboration with their peers and contribute to group work</p>	<p>With guidance follows instructions</p> <p>Participates in activity Seldomly cooperative. Rarely offers useful ideas.</p>	<p>Listens and follows instructions with the help of the teacher</p> <p>Accepts others ideas while carrying out the activity, rarely offers useful ideas</p>	<p>Listens carefully and follows instructions precisely</p> <p>Shares ideas and gives suggestion to peer’s while carrying out the activity.</p>
<p><b>Making meaning</b></p> <p>This can be assessed through the closure activity, student’s ability to identify effects of push or pull in daily life</p>	<p>Shares at least one real life examples of effects of push and pull on objects</p>	<p>Shares at least two real life examples of effects of push and pull on objects</p>	<p>Shares three real life examples of effects of push and pull on objects</p>
<p><b>values</b></p> <p><b>Values related to self and others</b></p>	<p>Rarely displays positive attitude.</p>	<p>Listens to others opinions</p>	<p>Listens to others opinions and responds positively</p>

## **Links to Other Key Learning Areas**

Health and PE, English, Dhivehi

## **Reflection**