

Introduction

Science plays an important role in every aspect of our lives. The progress of the world is being increasingly determined by science and technology. It is certain that every individual needs some understanding of science to comprehend the world and make best use of available resources.

The progress of Maldives depends on its citizens. Our role as educationists is to provide powerful contexts within which students can develop general competencies considered essential for the acquisition of effective skills, necessary for continued education, work and everyday life. Science is crucial in providing this context and it is important that children have a good foundation in science at the primary level irrespective of their specialization at higher levels.

This syllabus is a revision of the former grade six and seven general science syllabus. The revisions are based on the changes brought to the National Curriculum in 2000.

The syllabus emphasizes the need for the development of planning and conducting investigations, gathering and processing of data and using appropriate technologies with safety.

During the two years of teaching science at this level, it is expected that practical experiences would occupy a minimum of 40 per cent of allocated classroom contact time for each year. The nature and variety of the learning experiences should continuously develop students' expertise in each of the skill areas identified in the syllabus.

Practical work should **emphasize hands on activities**. Each type of practical work provides opportunities for different types of learning outcomes. It is important to match the type of practical work to the intended learning outcome and to provide a range of practical experiences so that students have the opportunity to develop the wide range of learning outcomes specified in the syllabus.

Practical work should also include series of **open investigations** each year in a **selected content** area prescribed in the syllabus for that year. The reason being that students need the opportunity to do open investigations if they are to develop the investigation and problem solving skills that are at the heart of scientific literacy.

The contents of the science syllabus are interrelated. Some of them e.g. History of science and scientists are introduced in grade six and revisited in grade seven. Although other topics may not be repeated in both grades, it is expected that teachers will build on the prior learning of students at all stage.

Aims of teaching science at grades six and seven

Provide learning experiences through which students will:

- Acquire scientific knowledge and skills and develop an understanding of the physical world and biological environment.
- Develop the ability to apply their understandings and skills learnt in real life situations.
- Develop positive values and attitudes towards science, logic, themselves, others and the environment.

General objectives

Knowledge and Understanding: Students will develop knowledge and understanding of

- The history of science and some scientists
- Some implications of science for society and the environment and in everyday life
- Using various kinds of instruments to measure different entities
- Some models theories and laws and structures and systems related to physical world, matter and the living world
- Interactions within the living and physical world

Skills: Students will develop skills in:

- Planning investigations
- Conducting investigations/recording observations/data analyzing and learning from them
- Communicating information and understanding
- Developing problem solving techniques
- Working in groups and individually

Values and Attitudes: Students will develop positive values about and attitudes towards:

- Science and technology
- Themselves and others
- The environment (local and global)

Assessment

The science syllabus for grade 6 and 7 encompasses a variety of outcomes in the cognitive, psychomotor and affective domains. All of these domains need to be equally and continuously assessed to monitor student achievements in learning and teaching process. Assessment of students achievements play a prominent role in any education system and it is very important that the tools used to evaluate students are effective and well constructed to serve a pre-defined purpose. Whether the assessment is formative or summative, the tests should be administered objectively. The characteristics of content validity, reliability, objectivity and usability should be invariably present in any achievement test.

End of term examinations alone, is not adequate for assessing the progress of a student in acquiring knowledge, skills, and a large number of characteristics such as motivation, leadership, interest, attitude etc. which are difficult to be measured by a terminal examination.

Hence, to assess the wide variety of objectives defined in the syllabus in all the three domains, several types of tools and techniques should be used for continuous assessment of the learning outcomes defined in the science curriculum.

Some of the techniques and instruments appropriate for assessing student learning in science include the following:

Objective items	Multiple choice, true/false, matching, one word/phrase Response
Short response items	Short written answers, construction and or interpretation of graphs, tables, diagrams
Extended response items	Comprehension exercises, long answer questions based on factual information and understanding Not only memory recall and rote learning
Practical techniques	Observation of manipulative skills, practical reports, experimental activities, model making
Research assignments	Project reports, presentations etc.
Oral questions	Questions and answer sessions, questioning during class work, students required to ask as many questions on a given topic
Games	Crossword puzzles, matching etc.
Field trips	Observation of investigative skills, reports, etc.

Period Allocation: Science should be taught at least six periods per week in grade 6 and 7. Duration of a period should not be less than 35 minutes.

Focused Content Areas for

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Objectives, outcomes and content

Objective: Students will gain knowledge of the history of science and scientists.

Outcomes: Students will

- 1.1 Identify some historical examples of how scientific knowledge has changed.
- 1.2 Identify some scientists who have contributed towards scientific knowledge.

Content outline

History of science

- a) Describe what is science and a scientist.
- b) Recall historical cases where developments in science have led to the development of new technology.
- c) Describe some of the findings scientists have discovered.

Objective: Students will gain knowledge and understanding of the implications of science for society and the environment

Outcomes: Students will

- 2.1 Become familiar with options available to the people with regard to scientific developments.

Content outline

Implications of science

Identify different options made available due to scientific developments.

Objective: Students will gain knowledge and understanding of using various kinds of instruments to measure different entities.

Outcomes: Students will

3.1 Use various measuring instruments such as ruler, thermometer, stopwatch balance, measuring cylinder.

Content outline

Standards

- a) Describe and measure different physical quantities such as length, volume, mass, time, temperature etc. and identify appropriate units of measurement.

Measurements I

- a) Measure a short distance by non-standard unit.
- b) Measure a short distance using a centimeter ruler.
- c) Discuss why it is better to measure lengths with a ruler than with a non standard object.
- d) Use a timer such as stopwatch.
- e) Find out area of regular objects.
- f) Find out volume of regular objects.
- g) Use balance for measuring mass.
- h) Measure temperature.

Measurements II

- a) Measure the length using a meter ruler and any other instrument for measuring length.
- b) Estimate various lengths in metres and centimeters.
- c) Interpret the prefixes milli-, centi- and kilo.
- d) Discuss why short distances are measured in centimeters (cm) or millimeters (mm) and long distances are measured in kilometers.
- e) Find out area of regular and irregular object.
- f) Find out volume of regular and irregular objects.
- g) Use balance for measuring mass.
- h) Measure temperature.

Objective: Students will gain knowledge and understanding of models, structures and systems related to physical world, matter and the living world.

Outcomes: Students will

- 4.1 Identify and describe forms of energy such as sound, light and the action of force in common situations.

Content outline

Forces and motion I

- a) List and explore different things, which provide force including gravity, magnetism, buoyancy and friction.
- b) Describe different kinds of motion such as acceleration, deceleration.
- c) Identify forces acting on still things such as gravity, reaction forces.
- d) Investigate forces acting on moving things such as friction.

Forces and motion II

- a) Describe how friction (including air and water resistance) is able to prevent or slow down motion.
- b) Explain how simple mechanisms such as levers, pulleys and gears make it easier to do work.

Light

- a) Describe light as a form of energy that does not require a medium for propagation.
- b) Investigate how shadows are formed.
- c) Do simple experiments on how light is reflected and scattered.
- d) Investigate that white light is made up of the colours of the spectrum.

Sound

- a) Describe sound as a form of energy that requires a medium for propagation.
- b) Recognize how sound travels by waves through a medium.
- c) Do simple practical activities on how frequency of vibrations affects pitch.
- d) Do experiments on how the amplitude of vibrations affects loudness.

Objective: Students will gain knowledge and understanding of models, structures and systems related to physical world, matter and the living world.

Outcomes: Students will

- 5.1 Investigate heat as a form of energy which can travel by conduction, convection and radiation.

Outcomes: Students will

- 6.1 Identify conductors and insulators, draw and construct simple series and parallel circuits.
- 6.2 Draw and construct simple series and parallel circuits.

Content outline

Energy

- a) Use models to describe different forms of energy.
- b) Recognise that heat is a form of energy and that it can travel by conduction, convection or radiation
- c) Describe how the world's energy resources can be conserved.

Electricity

- a) Outline ways in which electricity can be used safely.
- b) Identify and investigate materials that conduct electricity and materials that do not conduct.
- c) Construct simple circuits using batteries, switches and bulbs and relate these to circuit diagrams.
- d) Construct series and parallel circuits and describe their properties.
- e) Investigate simple models for the flow of electricity in a circuit.

Objective: Students will gain knowledge and Understanding of models, structures and systems related to physical world, matter and the living world.

Outcomes: Students will

6.1 Describe features of living things.

Content outline

Cell theory

- a) Recognise that living things are made of cells.
- b) Draw and label parts of an animal cell and plant cell.
- c) Identify at least three differences between plant cells and animal cells.
- d) Examine some cells under a microscope.
- e) Identify and describe the basic functions of nucleus, cytoplasm, cell membrane, cell wall and chloroplast.
- f) Describe common characteristics of living things.
- g) Distinguish between unicellular and multi cellular organisms.

Classification

- a) Explain the structure of organization of organisms.
- b) Classify living things into vertebrates and invertebrates.
- c) Group a range of animals and plants using simple keys.
- d) Recognize 3-4 endangered local animals (in Maldives) and 3-4 such global animals due to various reasons including human activities.
- e) Recognise ways in which the endangered species are protected.

Unicellular organisms

- a) Discuss the beneficial and harmful effects of unicellular organisms on living things and the environment.
- b) Describe three main types of organisms,(virus, bacteria and fungi) which cause diseases to humans.
- c) Identify how diseases can spread in general.
- d) Identify ways in which diseases can be prevented including vaccination.

Multi-cellular organisms

- a) Identify various multi-cellular organisms including plants.
- b) State the role of different parts of plants in maintaining the plants as a whole.
- c) Define germination.
- d) Examine the conditions necessary for germination.
- e) Define the term photosynthesis.
- f) Describe the conditions necessary for photosynthesis.
- g) Conduct an experiment to see whether photosynthesis has occurred.
- h) Define respiration.
- i) Conduct an experiment to see that living organisms respire giving out carbon dioxide.
- j) Explain the relationship between photosynthesis and respiration.

Humans

- a) State the function of reproductive system, digestive system, circulatory, and respiratory system of humans.
- b) List and describe the role of nutrients in humans.
- c) List the sources of nutrients.
- d) Explain the importance of a balanced diet.
- e) Describe some vitamin deficiency diseases of humans such as vit. A, C and D.
- f) Recognize ways in which people can stay healthy.
- g) Recognize ways of how people can keep themselves fit and measure their fitness.
- h) List poisons in tobacco smoke and describe diseases caused by smoking such as lung cancer, bronchitis and emphysema.
- i) Explain ways that people can take care of their bodies especially skin care and dental care.

Objective: Students will gain knowledge and understanding of models, structures and systems

Outcomes: Students will

- 7.1 Identify the three basic components (air, water and soil) of the physical world and describe features of them.

Content outline

Air around us

- a) Describe the composition of air and the percentage composition of gases.
- b) Explain why air is considered a mixture.
- c) Carry out activities to show that air has mass, pressure and occupies space.
- d) Investigate the general properties of gases present in the air such as carbon dioxide, oxygen, nitrogen and water vapour.
- e) Design simple experiments to prepare and collect some samples of carbon dioxide and oxygen and do simple gas identification tests.

Soil

- a) Describe the formation of soil.
- b) Collect different types of soil and describe the components of soil.
- c) Investigate the components of soil by a simple method.
- d) Discuss the causes of soil erosion and preventive measures that can be taken.

Water

- a) Discuss the importance of water for life and living things.
- b) Demonstrate properties of water.
- c) Describe the water cycle.
- d) Discuss the causes of water pollution and their effects on the marine environment.
- e) Describe how water pollution can be prevented.
- f) Demonstrate simple purification methods.
- g) Carry out activities to show the effects of hard and soft water.
- h) Demonstrate how hard water can be turned into soft water by a simple method such as boiling.

Objective: Students will gain knowledge and understanding of models, theories and laws and structures and systems related to physical world, matter and the living world.

Outcomes: Students will

8.1 Describe matter and their physical properties.

8.2 Identify an element as the simplest kind of matter.

Content outline

Matter

- a) Describe the three states of matter.
- b) Investigate different physical properties such as elasticity, strength, hardness, solubility, melting point, electrical conductivity and heat conductivity of a collection of materials.
- c) Identify similarities and differences among different materials in their properties.
- d) Relate physical properties to their every day uses.

An element

- a) Describe an element as the simplest form of matter.
- b) Understand that an element is composed of tiny particles called atoms.
- c) Explain the basic structure of an atom.
- d) Distinguish between an atom and a molecule.
- e) Compare models representing elements.
- f) Classify elements into metals and non-metals according to their characteristics.
- g) Explain some common uses of metals and non-metals.
- h) Identify internationally recognized symbols for some common elements. (Silicon, gold, silver, copper, aluminum, iron, hydrogen, nitrogen and carbon).

Objective: Students will gain knowledge and understanding of models, theories and laws and structures and systems related to physical world, matter and the living world.

Outcomes: Students will

- 8.3 Identify some common mixtures and describe them and identify some common appropriate techniques for separating components in a mixture.

Content outline

Mixtures

- Identify some common mixtures.
- Describe aqueous mixtures in terms of solute, solvent and solution.
- Identify situations where the process of filtration, sedimentation, sieving, chromatography, evaporation, crystallization and magnetic attraction are appropriate to separate components of mixtures.

Outcomes: Students will

- 9.1 Identify and describe how compounds are made and distinguish between compounds and mixtures.

Content outline

Compounds

- Explain that compounds have different properties from elements from which they are made.
- Discuss and make a simple compound.
- Identify and distinguish between mixtures and compounds.

- 9.2 Identify and describe characteristics of acids and alkalis, their properties and uses.

Acids and alkalis

- Identify acids and alkalis used in everyday life and in the laboratory.
- Describe a characteristic of an acid and a characteristic of an alkali.
- Describe two uses of acids and two uses of alkalis.
- Identify and distinguish acids and alkalis using two simple tests including both laboratory and non-laboratory tests.
- Make a salt using an acid and an alkali.

Objective: Students will gain knowledge and understanding of models, theories and laws and structures and systems related to physical world, matter and the living world.

Outcomes: Students will

10.1 Identify different materials and classify them according to their use.

10.2 Describe some observable changes in our environment.

Content outline

Materials

- a) Identify various ways everyday objects can be classified.
- b) Identify differences among various everyday objects in terms of physical properties.
- c) Identify the uses of various materials according to their properties.

Changes

- a) Explain how heat, light, mixing and electricity change matter.
- b) Discuss and do simple experiments on how heat changes the state of matter, combines matter, splits up matter.
- c) Explain that changes can be physical or chemical.
- d) Explain some common examples of physical and chemical changes.

Objective: Students will gain knowledge and understanding of interactions within the living and the physical world.

Outcomes: Students will

11.1 Describe how corals are formed.

11.2 Identify and describe the human impact on some of natural resources of the earth.

12.1 Identify ways in which humans contribute to air pollution.

Content outline

Corals

- a) Observe different types of corals.
- b) Recognize the condition necessary for the growth of coral.

Coral reefs

- a) Explain how coral reefs are formed.
- b) Describe some impact of human activities on coral reefs.
- c) Identify some examples of marine life in the reef, lagoon and deep sea.
- d) Identify some adaptive features of marine organism.
- e) Identify organisms in Maldives and world that are endangered due to human activities.
- f) Describe ways of reducing harmful effects on coral reefs.

Air pollution

- a) Recognize the sources of common air pollutants.
- b) Describe the harmful effects of the pollutants to living things and the environment.
- c) Recognize the measures to control air pollution.
- d) Describe the greenhouse effect and global warming, thinning of the ozone layer and acid rain.
- e) Identify measures to control air pollution.

Outcomes: Students will

- 13.1 Identify the links between science and technology.

Content outline

Technology

- a) Discuss some technological developments that have made it easier for us to carry out our work in the natural and physical world.
 - b) Explain the differences between science and technology.
 - c) Discuss ways in which science has contributed to technology and world progress.
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Objective: Students will develop skills in planning investigation.

Outcomes: Students will

14.1 Produce a plan to investigate a problem with guidance.

Content outline

Planning an investigation to

- a) Make initial observations within a specified context, including taking appropriate measurements.
- b) Describe a problem or question that might lead to scientific investigations.
- c) Identify the variables that should be kept the same in order to make the investigation valid (control variable).
- d) Identify what is to be measured (dependent variable).
- e) Identify what is to be changed (independent variable).
- f) Formulate an appropriate way to record the data or information.
- g) Plan how to proceed with the investigation with appropriate safety.

Objective: Students will develop skills in conducting investigations.

Outcomes: Students will

15.1 Students conduct their own investigation with guidance.

Content outline

Conduct investigation

- a) Carry out a science investigation.
- b) Make accurate observations and collect data.
- c) Record data accurately using appropriate units.
- d) Demonstrate the use of safe and hygienic work practices.

Objective: Students will develop skills in analyzing, communicating information and understanding.

Outcomes: Students will

- 16.1 Present the data and information in a systematic manner.

Content outline

Processing information

- a) Organise data using a variety of methods including diagrams, tables, bar charts, and pie charts.
- b) Identify trends and patterns in the data.

Objective: Students will gain skills in developing scientific thinking and problem solving techniques.

Outcomes: Students will

- 17.1 Process the information gained in their investigation in a systematic manner.
17.2 Draw conclusions based on the information available.
17.3 Communicate their findings.

Content outline

Think critically

- a) Justify inferences in light of gathered information.
- b) Identify data, which support or discount a hypothesis or a question investigated.
- c) Communicate the findings of their science investigation.

Objective: Students will gain skills in working individually and in groups.

Outcomes: Students will

18.1 Complete a variety of individual and group tasks with guidance.

Content outline

Work individually

- a) Independently plan, conduct and communicate information and solve problems.
- b) Accept responsibility of maintaining a safe environment for themselves and others.

Work in teams

- a) Negotiate and allocate individual roles to members of the team.
 - b) Identify the task given.
 - c) Accept personal responsibility for maintaining the safe working environment for the group.
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Objective: Students will develop positive values about and attitudes towards, science, themselves, others and the environment.

Outcomes: Students will

19.1 Demonstrate confidence and a willingness to make decisions and to take responsible actions.

Content outline

Values

- a) Develop a positive view of themselves and their capabilities.
- b) Demonstrate a willingness to make decisions and to take responsibility for their actions.

19.2 Respect truthfulness and integrity

- a) Be honest and open in their dealing with others, data collection and analysis.
- b) Respect the rights and properties of others.

19.3 Recognize the role of science in providing information and increase an understanding of the world around them.

- a) Show awareness that scientific information can only be judged on the basis of scientific evidence.

19.4 Become aware of their responsibilities to conserve, protect and maintain the environment for future generations.

- a) Appreciate and be curious about nature and environment.
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