Primary School Curriculum

Science (SC)

MINISTRY OF EDUCATION
Bermuda
2001

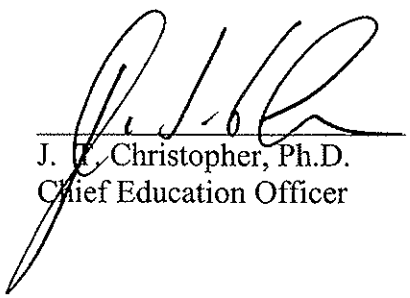
FOREWORD

Quality curriculum is basic to any educational programme. The written curriculum must provide the structure and substance of what is taught to all students. The written curriculum is a guide to teachers to ensure that the knowledge, skills, competencies and resources students need in order to learn are provided during instruction.

In particular, it is acknowledged that knowledge is virtually infinite in that it is continually changing and expanding as "new" knowledge is developed and "old" knowledge is refined. In addition the skills and competencies that students need change as the environment in the total community changes. It is important therefore that a school system has a structure for the instructional programme that provides direction, focus, flexibility and state-of-the-art thinking about each content area.

Because of its strategic geographical position, Bermuda has been influenced continuously by the changes in the relationship between the continents bordering the Atlantic -- North and South America, Africa and Europe. The current interest in the globalization of the world community allows Bermuda to build on its strength in international relations. It is essential that our students become accustomed to viewing the entire world as the area in which they must live and grow. They must integrate knowledge across all subjects in preparation for their adult life. Our curriculum guides must be viewed from this perspective.

A team of teachers, education officers and other persons within the school system and community, drawing from their collective experience in working with young people, has developed this curriculum guide. Input from community representatives on each Curriculum Advisory Committee has assisted us in Bermudianizing the curriculum. All of the contributors share both the pride and the responsibilities of authorship. This guide represents the essential elements of education in Bermuda's primary schools.



J. D. Christopher, Ph.D.
Chief Education Officer

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Kalley Baxter-Williams
Karen Bramlett
Kenneth Cobham
Kim Creighton
Uneaka Daniels
Marion Dyer
Mary Winchell
Emma Saunders

The restructured curriculum development process began in 1994 under the leadership of Dr. Helen Stemler, Restructuring Curriculum Coordinator. During 1994-1995, the writing teams in the various content areas developed the frameworks for the entire curriculum development process. From 1995-1997 the curricula for the middle level were created. Thanks also to Dr. Gina Tucker, Curriculum Coordinator 1998-1999. Special thanks to Mrs. Kalreta Conyers-Steede, Education Officer, Business Studies, who coordinated the final production of these curriculum documents 1999-2001.

These documents would not have been completed without the support of a very hardworking, dedicated group of people - the secretarial/support staff who typed and assisted with numerous tasks associated with completing these documents. This group includes the following persons:

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Lavern Furbert
Raquel Furbert
Terrylynn Gibbons
Donna Jacobs
Judy Lawrence
Kim Simons
Theresa Simons
Wanda Stuhlpfarrer
Deshan Thompson
Rochelle Trott

Diana Madeiros – Professional Editor

CONTENTS

OVERVIEW

The aim of the primary school is to provide for the academic achievement, personal development and group citizenship of early adolescents. In keeping with this aim, the organizational patterns appropriate to the developmental needs of five to twelve year-old students need to be provided.

The curriculum is composed of a common body of knowledge with emphasis placed on mastery skills and achievement measured according to each student's abilities. The development of positive attitudes toward learning, self and others is a basic component of Bermuda's primary school programme. The programme is based on the belief that all students make every effort to succeed when in an environment that fosters and encourages success, regardless of their background or previous level of achievement. Educational development at the primary level should provide adequate preparation for continued experiences. To create an atmosphere of accomplishment in which each student has opportunities for growth, emphasis is placed on:

- opportunities for sharing enriching experiences, creative expressions and exposure to ideas
- enhancement of personal abilities with opportunities to pursue and express them through diversity and supportive activities
- development of a growing sense of responsibility, integrity, self-discipline, reliable judgement and self-respect in each student
- encouragement of acceptance of their roles and responsibilities in the educational process with confidence, enthusiasm and appropriate social and academic behaviours
- provisions of time and opportunity for ethical growth and for the development of responsible values and character

The curriculum guide contains three (3) sections beginning with the Introduction. The cited twelve goals of education direct instructional outcomes in all primary school subjects. Specifically, a curriculum framework has been approved for each subject and is to be used as the basis for the subject specific philosophy, goals and subgoals, performance indicators and scope and sequence. Effective utilization of this framework will establish continuity and progression of instruction throughout all year levels.

The second section of this guide delineates the primary school programme of instruction and contains an overview for Phase A and B that includes: primary rationale, year level requirements, adopted materials of instruction, phase outline, correlation matrix and modules. It is expected that all teachers will focus instruction on the established curriculum objectives outlined in the modules. The final section of this guide contains resources of valuable support for teachers.

GOALS OF EDUCATION

In Bermuda, the Goals of Education provide the direction for primary level education. These twelve (12) goals enable primary level students to:

- develop responsiveness to the dynamic process of learning
- develop resourcefulness, adaptability and creativity in learning and living
- acquire the basic knowledge and skills needed to comprehend and express ideas through words, numbers and other symbols
- develop a wellness approach to life
- gain satisfaction from participating in and appreciating the various forms of artistic expression
- develop a feeling of self-worth
- develop values related to personal and ethical beliefs and to the common welfare of society
- develop an understanding of the role of the individual within a family unit, the role of the family within society and the role of our society in a global context
- develop a sense of personal responsibility in society at the national and international levels
- acquire skills that contribute to self-reliance in solving practical problems in everyday life
- acquire skills and attitudes that will lead to satisfaction and productivity in a career
- develop respect for the environment and a commitment to the wise use of resources.

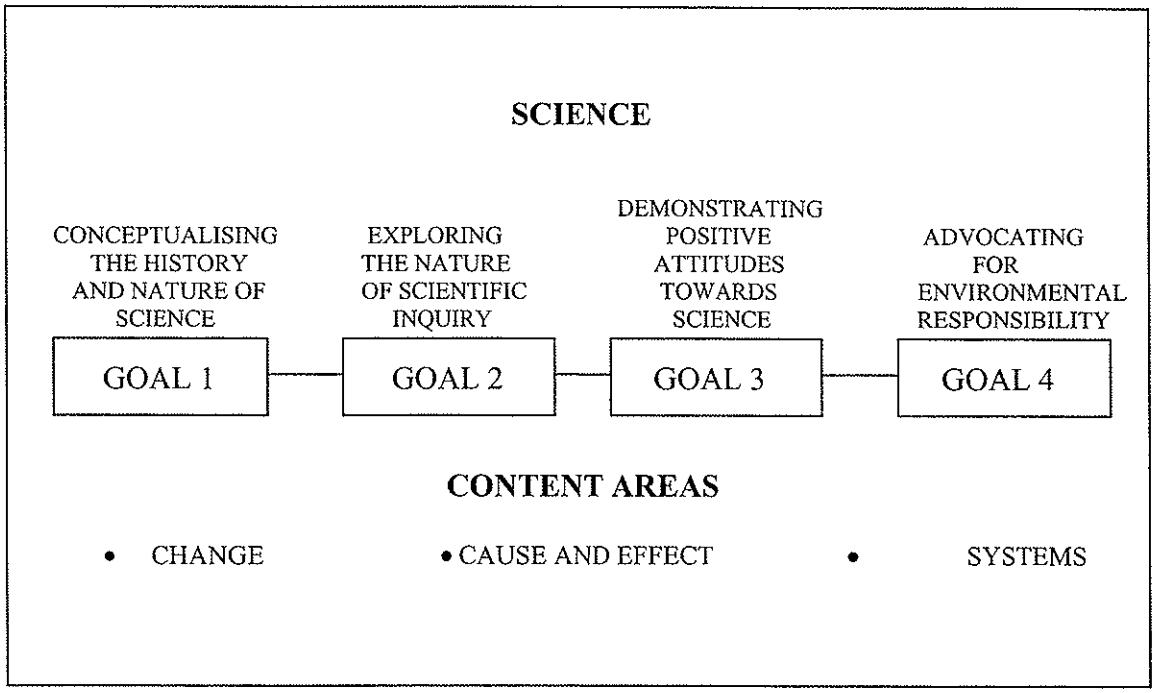
CURRICULUM AND INSTRUCTION FOR ALL STUDENTS

All primary schools will have common programmes designed to offer nine subjects to all students and to give them a knowledge base which will equip them with a foundation that will prepare them to move to the middle school level. There will be a basic core curriculum that will include English language arts, mathematics, science and social studies. These subjects will be supported by a variety of encore subjects, such as health education, physical education, information technology, music and visual arts. Information technology will also be integrated into all subject areas. An integrated curriculum is a meaningful approach to primary instruction that assists students to transfer knowledge within and across all subjects and apply skills and processes developed in subjects to real life Bermuda issues.

It is expected that the implemented curriculum will be based on the premise that all students can learn and that instruction should be differentiated to meet the unique needs of the learner. Further, it is expected that the primary school curriculum will be implemented from a Bermudianized and multicultural perspective as much as is feasible.

SCIENCE PHILOSOPHY

Science Education is a process by which students are provided with the opportunity to explore and investigate our world through instructional approaches which will not only meet the need and learning style of each student but also be linked to other areas of learning. The fundamental goal is to prepare all students to be scientifically literate and be empowered to make informed choices concerning personal, societal, environmental and technological issues. Science Education should foster an appreciation and a sense of responsibility for our future.



SCIENCE EDUCATION
GOALS AND SUBGOALS

GOAL 1 **CONCEPTUALISING THE HISTORY AND NATURE OF SCIENCE**

STUDENTS WILL CONCEPTUALISE THE HISTORY AND NATURE OF SCIENCE.

Subgoal 1.1 Evaluate how science has evolved over time through contributions of persons from diverse cultures.

Subgoal 1.2 Use scientific knowledge to explain common themes in science and to show the connections between sciences and other disciplines.

Subgoal 1.3 Evaluate the impact of scientific knowledge on personal health and health technologies.

Subgoal 1.4 Conceptualise the interdependence of mathematics, science and technology.

Subgoal 1.5 Analyse how scientists use a variety of methods to investigate nature and solve problems.

GOAL 2 **EXPLORING THE NATURE OF SCIENTIFIC INQUIRY**

STUDENTS WILL EXPLORE THE NATURE OF SCIENTIFIC INQUIRY.

Subgoal 2.1 Formulate questions and develop hypotheses to explain behaviour of objects and events.

Subgoal 2.2 Design and conduct a scientific inquiry to collect valid and reliable data to test a law, theory or hypothesis.

Subgoal 2.3 Make precise observations and measurements; present data and results clearly, appropriately, accurately in multiple ways.

Subgoal 2.4 Use technology to improve investigations and communication of outcomes.

Subgoal 2.5 Construct explanations using logic and data, recognizing the limitations of scientific knowledge.

Subgoal 2.6 Evaluate alternative explanations about scientific claims.

Subgoal 2.7 Defend a scientific argument and the results of a scientific inquiry.

Subgoal 2.8 Evaluate information selected from multiple sources: investigations, computer data bases, print, the Internet, video and other non print media.

GOAL 3 DEMONSTRATING POSITIVE ATTITUDES TOWARDS SCIENCE

STUDENTS WILL DEMONSTRATE POSITIVE ATTITUDES TOWARDS SCIENCE.

Subgoal 3.1 Formulate a plan to use science in home, school and community life.

Subgoal 3.2 Recognise pattern and aesthetics in the environment.

Subgoal 3.3 Analyse the application of ethical principles to science.

Subgoal 3.4 Evaluate career options that relate to science.

GOAL 4 ADVOCATING FOR ENVIRONMENTAL RESPONSIBILITY

STUDENTS WILL ADVOCATE FOR ENVIRONMENTAL RESPONSIBILITY.

Subgoal 4.1 Advocate for environmental stewardship.

Subgoal 4.2 Evaluate the use of scientific information to make judgments on environmental issues.

GOAL 1	Students will conceptualise the history and nature of science.			
SCIENCE	**PERFORMANCE INDICATORS**			
Sub Goals	**PS - P2 Learning Phase A**	**P3 - P6 Learning Phase B**	**M1 - M3 Learning Phase C**	**S1 - S4 Learning Phase D**
1.1 Evaluate how science has evolved over time through contributions of persons from diverse cultures.	recognise the difference between science today and early science knowledge	compare science knowledge and techniques used by early scientists with those used by today's scientists	analyse the impact of scientific theories and knowledge on humans and the contributions of scientists over time	evaluate how science has evolved over time through contributions of persons from diverse cultures
1.2 Use scientific knowledge to explain common themes in science and to show the connections between sciences and other disciplines.	acquire scientific knowledge during investigations of nature, toys and technology	use scientific knowledge to solve problems, to explain patterns in nature and to examine how things work	use scientific information to show connections among different sciences, mathematics and other disciplines	use scientific knowledge to explain common themes in science and to show the connections between sciences and other disciplines
1.3 Evaluate the impact of scientific knowledge on personal health and health technologies.	describe how to keep healthy, common health problems and actions which cause them	relate the understanding of science to personal health	relate the increase in scientific knowledge to the improvement of personal health and development of health technologies	evaluate the impact of scientific knowledge on personal health and health technologies
1.4 Conceptualise the interdependence of mathematics, science and technology.	recognise how mathematics and technology are used in science investigation	describe how science methods and knowledge are used to make new things and to improve the way we live and work	show how mathematics is a tool of science and how science is applied through technology	conceptualise the interdependence of mathematics, science and technology
1.5 analyse how scientists use a variety of methods to investigate nature and solve problems.	know that scientists investigate problems or puzzles of nature	recognise the approaches that scientists use to solve problems and investigate nature	differentiate among methods that scientists use to solve problems and investigate nature	analyse how scientists use a variety of methods to investigate nature and solve problems

GOAL 2	Students will explore the nature of scientific inquiry.			
SCIENCE	**PERFORMANCE INDICATORS**			
Sub Goals	**PS - P2 Learning Phase A**	**P3 - P6 Learning Phase B**	**M1 - M3 Learning Phase C**	**S1 - S4 Learning Phase D**
2.1 Formulate questions and develop hypotheses to explain behaviour of objects and events.	pose simple questions about the environment and suggest answers	refine questions so that they can be investigated and develop possible solutions	develop problems and use prior knowledge to make predictions about an investigation	formulate questions and develop hypotheses to explain behaviour of objects and events
2.2 Design and conduct a scientific inquiry to collect valid and reliable data to test a law, theory or hypothesis.	follow simple instructions in written, graphic or pictorial form and make careful observations and measurements	choose a range of variables to use and make careful observations and measurements	identify and make sufficient measurements of key variables	design and conduct a scientific inquiry to collect valid and reliable data to test a law, theory or hypothesis
2.3 Make precise observations and measurements; present data and results clearly, appropriately, accurately in multiple ways.	report observations made during an investigation orally or in written, or pictorial form	report observations, measurements and results without bias and in alternative ways	record observations, measurements and results clearly, appropriately and in multiple ways	make precise observations and measurements; present data and results clearly, appropriately, accurately in multiple ways
2.4 Use technology to improve investigations and communication of outcomes.	use simple tools safely to measure and observe	select appropriate instruments and use them safely and correctly to carry out a fair test	use technological tools and scientific instruments to improve investigation and reporting of outcomes	use technology to improve investigations and communication of outcomes

GOAL 2 Cont'd.	Students will explore the nature of scientific inquiry.			
SCIENCE	**PERFORMANCE INDICATORS**			
Sub Goals	**PS - P2 Learning Phase A**	**P3 - P6 Learning Phase B**	**M1 - M3 Learning Phase C**	**S1 - S4 Learning Phase D**
2.5 Construct explanations using logic and data, recognising the limitations of scientific knowledge.	use data to answer questions	make explanations based on observations or data	draw conclusions based on prior knowledge and data gathered from an investigation	construct explanations using logic and data, recognising the limitations of scientific knowledge
2.6 Evaluate alternative explanations about scientific claims.	compare data and explanations about objects and events and distinguish between fact and opinion	explore explanations based on data gathered, make more observations and look for better reasons if necessary; distinguish between fact and opinion	critique scientific arguments by examining data and results of an investigation and noting sources of inconsistencies and bias	evaluate alternative explanations about scientific claims
2.7 Defend a scientific argument and the results of a scientific inquiry.	explain observations by a suitable communications medium	explain observations, procedures and results by a suitable communications medium	report processes, summarise data in various forms and form a logical argument about relationships in an investigation	defend a scientific argument and the results of a scientific inquiry
2.8 Evaluate information selected from multiple sources: investigations, computer data bases, print, the Internet, video and other non-print media.	obtain information from print and non-print sources and investigations	obtain information from investigations, print, multimedia and the Internet	select information from multiple sources: investigations, computer data bases, print, the Internet, video and other non-print media	evaluate information selected from multiple sources: investigations, computer data bases, print, the Internet, video and other non-print media

GOAL 3	Students will demonstrate positive attitudes towards science.			
SCIENCE	**PERFORMANCE INDICATORS**			
Sub Goals	**PS - P2 Learning Phase A**	**P3 - P6 Learning Phase B**	**M1 - M3 Learning Phase C**	**S1 - S4 Learning Phase D**
3.1 Formulate a plan to use science in home, school and community life.	describe how science relates to home, school and community life	show interest in the use of science in home, school and community life	value science in home, school and community life	formulate a plan to use science in home, school and community life
3.2 Recognise pattern and aesthetics in the environment.	observe patterns in nature	appreciate the pattern and aesthetics of nature	cherish the patterns and aesthetics of nature	recognise pattern and aesthetics in the environment
3.3 Analyse the application of ethical principles to science.	choose safe practices	appreciate how ethical principles apply to science in everyday life	integrate ethical principles and behaviours to science related issues in everyday life	analyse the application of ethical principles to science
3.4 Evaluate career options that relate to science.	identify careers in science	explore local science careers and their value to Bermudian society	assess skills that are involved in science careers	evaluate career options that relate to science

GOAL 4	Students will advocate for environmental responsibility.			
SCIENCE	**PERFORMANCE INDICATORS**			
Sub Goals	**PS - P2 Learning Phase A**	**P3 - P6 Learning Phase B**	**M1 - M3 Learning Phase C**	**S1 - S4 Learning Phase D**
4.1 Advocate for environmental stewardship.	show respect for themselves and others and their properties	participate in school and community environmental projects	choose a project which fosters environmental stewardship	advocate for environmental stewardship
4.2 Evaluate the use of scientific information to make judgements on environmental issues.	displays a good environmental practice at home and school	investigate local and global environmental issues to formulate a balanced viewpoint	analyse local and global issues to formulate a balanced point of view	evaluate the use of scientific information to make judgements on environmental issues

SYSTEMS (1 of 2)	SCIENCE SCOPE AND SEQUENCE			
	PS - P2 Learning Phase A	**P3 - P6 Learning Phase B**	**M1 - M3 Learning Phase C**	**S1 - S4 Learning Phase D**
Life Science	• plant and animal diversity • needs of living things	• life cycles • classification • cells in living things	• cells and multicellular organisms • human systems • land and marine ecology	• cells • molecular basis of heredity • anatomy • physiology • human systems • taxonomy of organisms • ecology
Physical Science	• describing matter • sorting of objects • measuring matter	• forms of energy: - heat - light - electricity - magnetism • measuring properties of materials • conservation of weight	• particulate theory of matter • force and motion: - buoyancy - balance - weight distribution • physical, chemical, biological properties of matter • forms of energy • energy systems: - engines - fuels - hydroelectric - geothermal	• structure of atoms • properties of atoms • forces and motion • law of conservation of energy • chemical reactions • solution chemistry • electric circuitry • thermodynamics • periodic table of elements

SYSTEMS (2 of 2)	SCIENCE SCOPE AND SEQUENCE			
	PS - P2 Learning Phase A	**P3 - P6 Learning Phase B**	**M1 - M3 Learning Phase C**	**S1 - S4 Learning Phase D**
Earth and Space Science	• objects in the sky: - sun - moon - stars	• structure of earth and solar systems • geothermal systems: - volcanoes - hot springs - geysers • the atmosphere • earth's water	• solar system • earth's systems • water cycle • rock cycle	• stars and galaxies

CHANGE	SCIENCE SCOPE AND SEQUENCE			
	PS - P2 **Learning Phase A**	**P3 - P6** **Learning Phase B**	**M1 - M3** **Learning Phase C**	**S1 - S4** **Learning Phase D**
Life Science	• animals and plants • changing the environments of animals and plants	• adaptation • food chains	• biodiversity	• biological evolution • behaviour of organisms • genetics adaptations/ mutation
Physical Science	• liquid and solid states of water • changes in materials • recycling materials	• energy uses • interconversions of states of water • air as a gas • making of new materials	• changes in properties of matter • properties of matter • interactions of energy and matter • energy transformation	• interactions of energy and matter • energy and matter • periodicity • endothermic and exothermic reactions
Earth and Space Science	• weather • seasons • composition of earth's materials (soil, water, air)	• earth's origin • bio-geography: population distribution • Bermuda's topography	• earth's oceans • plate tectonics • climate changes • erosion	• space and earth origin theories

CAUSE AND EFFECT (1 of 2)	SCIENCE SCOPE AND SEQUENCE			
	PS - P2 Learning Phase A	**P3 - P6 Learning Phase B**	**M1 - M3 Learning Phase C**	**S1 - S4 Learning Phase D**
Life Science	• plants and animals • effects of environments and conservation	• adaptation and survival • senses • life cycles	• interdependence of organisms • life cycles • migration and behaviour • nutrient cycles • senses	• interdependence of organisms • matter and energy in a living system • chemical and energy interactions in cells and organisms • life cycles
Physical Science	• constructing materials • making things go • pushes and pulls • sound and vibration	• simple machines • how things move • conduction (heat) • earth's gravity	• chemical changes • conservation and use of energy • electrical and magnetic forces • consumer chemistry	• chemical changes • conservation of energy • increase in disorder • bonding: - ionic crystals - molecular crystals • sound • forces • electromagnetic waves

CAUSE AND EFFECT (2 of 2)	SCIENCE SCOPE AND SEQUENCE			
	PS – P3 Learning Phase A	**P4- P6 Learning Phase B**	**M1 - M3 Learning Phase C**	**S1 - S4 Learning Phase D**
Earth and Space Science	• weather • seasons • sun warming: - land - air - water	• measuring weather • predicting weather • climate • atmosphere	• the earth • energy in earth's systems • geochemical cycles • conservation of natural resources: - waste management • geophysical cycles: - earthquakes - hurricanes - tornadoes • weather atmosphere, climate • space time relationships	• the earth • energy in earth's systems • geochemical cycles

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INTRODUCTION TO PRIMARY SCHOOL CURRICULUM

The primary school level continues to provide learning experiences that satisfy the natural curiosity of young children, stimulate their imagination and enhance their appetite for learning. The most important function of the primary level of education is the mastery of the fundamental skills necessary for the continued pursuit of learning.

Primary school education helps all children to:

- acquire permanent literacy and numeracy skills
- communicate effectively
- think scientifically and logically
- develop manipulative skills, artistic talents and physical skills
- cultivate good health habits
- develop spiritual, ethical and social values

The primary school curriculum is a written guide that identifies the goals and curriculum objectives that teachers establish for students to achieve. It makes visible the articulation necessary for preschool through senior level programmes so that students do not have large gaps in their understanding, skills and competencies. Its scope and sequence also allows teachers to plan linkages across the curriculum so those cross-curricular connections can be made more easily between and among various subjects.

Given the above characteristics, the primary school curriculum is intended to provide students opportunities to:

- discuss, explore, investigate and hypothesize
- find solutions to real problems
- utilize both concrete and abstract reasoning skills
- process information at formal operations level

The following section outlines the curriculum to be taught in the following areas in Bermuda's primary schools.

- English Language Arts
- Mathematics
- Science
- Social Studies
- Health Education
- Information Technology
- Physical Education
- Music
- Visual Arts

BELIEFS ABOUT STUDENT LEARNING

Where we Were	Where we want to Go
CAUSES	
External Luck Task	Internal Ability Effort
BELIEFS	
Ability defines achievements Ability is limited Intelligence cannot change Intelligence has one dimension Teachers transmit knowledge	Effort improves performance Ability can be acquired Intelligence can be learned There are many intelligent behaviours Learners construct their knowledge
SELF-EFFICACY	
I can not do that I can not learn that	I can learn to do it I can learn the things that I need to know to enable me to do it
CONCEPTS	
Other – referenced They are better than me	Self-referenced I am good at Mathematics
EMOTION	
Negative or Neutral I hate school I do not care	Positive I like to do this Learning makes me happy

OUTCOME

CURRICULUM TIME ALLOTMENTS

Caroll's (1989) definition of instruction time is "opportunity to learn."

"The amount of time spent on schoolwork influences school learning."
(Evans-Ardriss, 2000; Berliner, 1990)

Instructional time and quality together are one of the three main factors that influences students' educational outcomes.
(Young et. al., 1996)

The Ministry of Education recognizes the importance of learning time and specifies the number of instructional days that government schools must provide. In addition to the number of days the Ministry also specifies the number of hours of instruction that should occur each school day. In order to determine the best way to apportion these hours, a review of literature was conducted to find exemplars, instances of learning times during school weeks in quality school systems. An assessment of current practices was also taken into consideration.

The Ministry of Education has four goals: literacy, numeracy, infusion of technology and staff development. As the Bermuda government schools introduce new curricula for primary education to support these goals, the curriculum allotment chart will provide guidance as to the optimum time that should be spent delivering each area of learning and also the optimum number of instructional hours that will best promote student literacy and numeracy.

The curriculum time allotment chart outlines the total of contact time between teachers and students at Learning Phase A summing to 1335. This figure is composed of 1300 contact minutes and 35 transition minutes. At Learning Phase B 1465 contact minutes plus 35 transition minutes sums to 1500 minutes per week.

Transition time is defined as the non-instructional time before and after some learning activity (Berliner, 1990). Recess and lunch allow for transitions that do not cut into instructional time. Other transitions occurs between subjects. The allocation of transitional time has been included to provide practical expectations.

It is important to note that transition minutes do not constitute lost time. The best-run classrooms require a short period of time to allow students to conclude their work, change their mind sets, put materials away and to prepare for the coming activity.

CURRICULUM TIME ALLOTMENT CHART

LEARNING PHASE A: PRESCHOOL- PRIMARY TWO*
AND
LEARNING PHASE B: PRIMARY THREE-PRIMARY SIX**

Subject	Learning Phase A PS-P2*		Learning Phase B P3-P6**	
	Minutes/Week (min/wk)	% Percentage of Time/Week	Minutes/Week (min/wk)	% Percentage of Time/Week
English Language Arts	450	34	450	30
Mathematics	330	24	330	22
Science	120	9	150	10
Social Studies	120	9	150	10
Health Education	60	4.5	60	4
Information Technology	60	4.5	90	6
Physical Education	90	7	120	8
Music / Visual Arts	90/2	7	120/2	8
Transition Time	15	1	30	2
Totals	**1335**	**100%**	**1500**	**100%**

All subjects have been written with consideration of the allocated time for each discipline. Each subject is to be delivered as specified for the following duration:

Delivery Weeks/year: ..... 34 weeks
Optional Weeks: ..... 4 weeks (school events and special projects)
Total Weeks/year: ..... 38 weeks
=======

NB: For the purpose of this document, time allocations have not been assigned to subjects at the PreSchool level.

Science - PS
Level Code: PS SC

MINISTRY OF EDUCATION
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PRIMARY SCHOOL
PHASE A OVERVIEW

Subject Title: Science **Subject Code:** PS SC

Time Allotted: 120 min/wk

RATIONALE

Children from their earliest years are curious about their world; they explore, they ask questions and they enjoy the process of discovery. They develop wonderful ideas to explain phenomena that they observe. The science programme at the preschool and primary levels will use rich learning experiences to help the way that these ideas are formed, tested and modified. All children can then discover that science is part of their world, a fascinating world that they can interact with and understand.

The preschool and primary science programme will not only provide a sound foundation for middle level science, but also foster the development of a lifelong appreciation for learning in a world increasingly influenced by science, technology and challenges to the environment.

PRESCHOOL (PS) REQUIREMENTS

The requirements for this level are as follows:

• **Performance Assessment** - Science investigations and other activities, skills tests, teacher observations, oral questioning, creative movements, interviews	**100%**
• **Product Assessment** - Drawings, models, fill in a chart, graphs	
• **Written Assessment**	**N/A**
Total	**100%**

MATERIALS OF INSTRUCTION (Adopted Text)

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PHASE A OUTLINE

PS Module Titles A - D	P1 Modules Titles A - D	P2 Modules Titles A - E
A. All About Us ..... - our bodies - differences and similarities - using our senses - identifying materials	**A. All About Science ..... 2** - reading about science - science as a human endeavour - science process skills - tools of science - scientific investigation	**A. All About Science ..... 2** - reading about science - science as a human endeavour - science process skills - tools of science - scientific investigation
B. All About Living Things ..... - living and non-living things - animal characteristics and needs - animal and plant life cycles - care of our animals	**B. Alive and Well ..... 12** - living and non- living things - life processes - plants and animals - our bodies - environmental stewardship	**B. Our Island Home - Living Things Growing And Changing ..... 10** - plants growing and changing - Bermuda plants and trees - trees as a natural resource - a Bermuda pond habitat - life cycles - protecting our natural resources
C. All About Water, Weather and My Bermuda Home ..... - our island Bermuda - water - four seasons and weather patterns - objects in the sky - day and night cycle	**C. Our Island Home - Water and Weather ..... 10** - sources of water in Bermuda - importance of water - properties of ocean and fresh water - weather and water changes - use of water in Bermuda - sun and cyclical patterns - weather and clothing	**C. Sun, Moon and Stars ..... 6** - objects in the sky - importance of the sun - patterns in the sky - animals and daily and seasonal changes

D. All About Moving Things .....
- things fall down
- how things move
- sinking and floating
- magnets
- safety around moving things

D. Matter and Motion 10
- exploring through our senses
- kinds of materials and their uses
- how things move

D. Pushes and Pulls 8
- positions of objects
- motion
- making things move
- sound – vibrating objects

E. Materials and Their Changes 8
- characteristics of different materials
- measuring objects
- solids, liquids and gases
- changes in materials

Subtotal	Subtotal 34	Subtotal 34
Optional Weeks	Optional Weeks 4	Optional Weeks 4
Total Weeks	Total Weeks 38	Total Weeks 38

PRIMARY SCHOOL

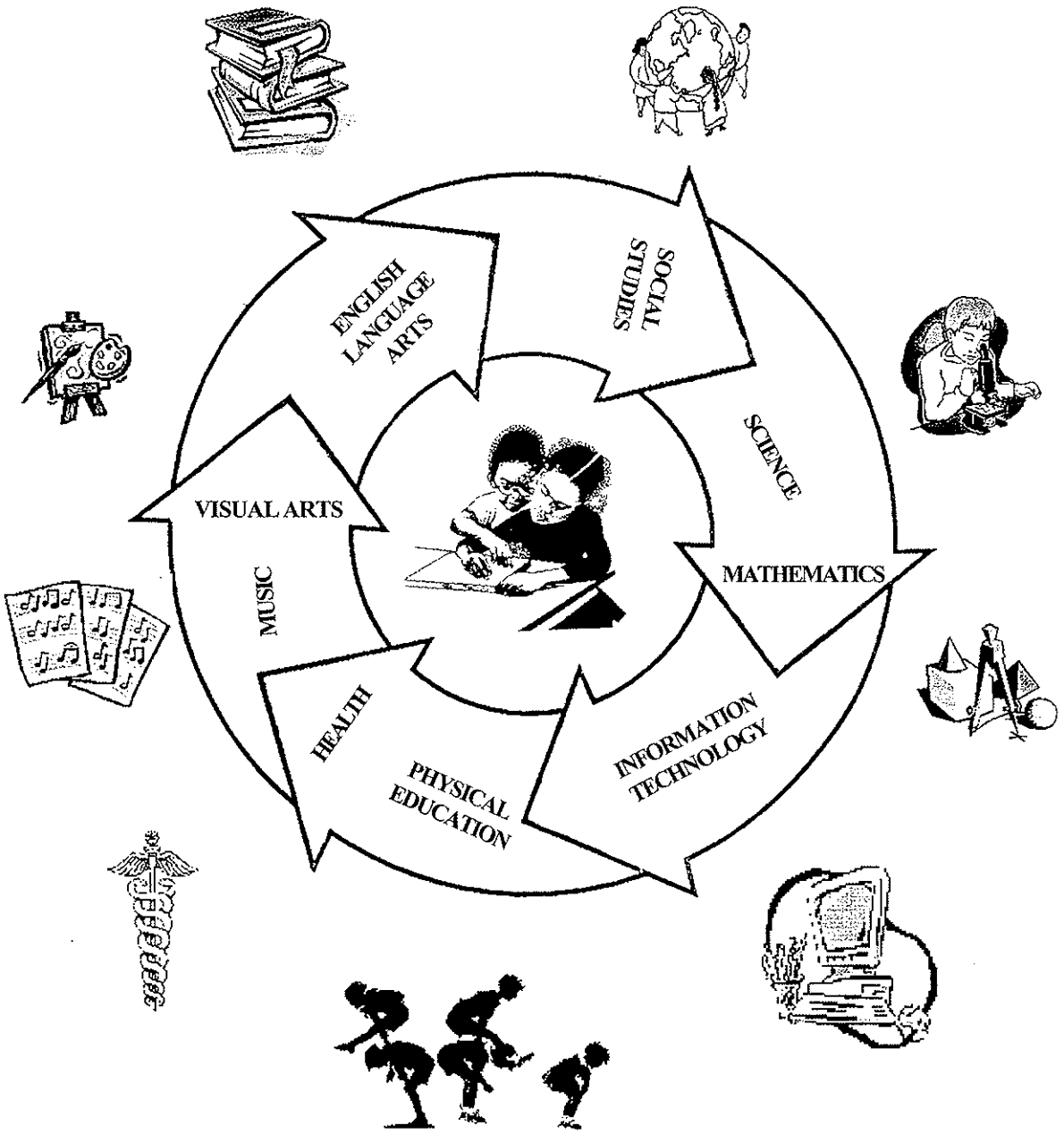
check one: PS ☒ P1 ☐ P2 ☐ P3 ☐ P4 ☐ P5 ☐ P6☐

Science

GOALS		SUBGOALS		MODULE & CURRICULUM CORRELATION MATRIX			
1	Conceptualizing the History and Nature of Science	1.1	Contribution/Diversity				
		1.2	Connections	x	x	x	x
		1.3	Health				
		1.4	Inter-relationship/Mathematics Science Technology				
		1.5	Problem Solving	x	x	x	x
2	Demonstrating the Nature of Scientific Inquiry	2.1	Hypothesis	x	x	x	x
		2.2	Design	x	x	x	x
		2.3	Data Collection		x		
		2.4	Technology Use	x	x	x	x
		2.5	Explanations/Limitations				
		2.6	Explanations/Alternatives				
		2.7	Communications/Results				
		2.8	Research				
3	Demonstrating Positive Attitudes Towards Science	3.1	Present use of Science				x
		3.2	Value, Environment	x	x	x	x
		3.3	Ethical, Applications				
		3.4	Career Options				
4	Advocating for Environmental Responsibility	4.1	Environmental Stewardship	x	x	x	
		4.2	Environmental Applications		x	x	
CONTENT STRUCTURE		Change		x	x	x	x
		Cause & Effect		x		x	x
		Systems		x	x	x	
		Life Science		x	x	x	
		Physical and Earth		x		x	x
		Earth Science					
		MODULE		**A**	**B**	**C**	**D**

MODULE KEY

A - All About Us
B - All About Living Things
C - All About Weather, Water and My Bermuda Home
D - All About Moving Things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Module A

SCIENCE

Module Title: All About Us

Sequence Reference: PS SC-A

PHASE A				PHASE B		
PS	P1	P2	P3	P4	P5	P6
☒	☐	☐	☐	☐	☐	☐

Time allotted: 8 weeks

Subgoal Emphasis:

- 1.2, 1.5 Nature and History of Science
- 2.1, 2.2, 2.4 Scientific Inquiry
- 3.2 Positive Attitude
- 4.1 Advocate for the Environment

Content Focus:

- Change
- Cause and Effect
- Systems
- Life Science
- Physical Science

Curriculum Objectives:

At the end of this module, students will:

- become more aware of their own bodies
- appreciate differences and similarities between people
- explore and describe objects and materials to help realize that senses tell us about the world
- identify some everyday materials

Content Detail:

- our bodies **(health link: Personal and Community Health PS HSB)**
  - body parts
  - functions
  - hygiene
- differences and similarities
  - measuring and comparing
  - looking in a mirror
  - self portrait
- senses
  - tasting, touching, smelling, seeing and hearing
  - physical characteristics: size, smell, texture, colour
- identifying materials
  - plastic
  - glass
  - wood
  - paper
  - fabric
  - stone (rock)
  - metal

Module Title: All About Us	**Sequence Reference:** PS SC-A
Recommended Instructional Strategies:	**Recommended Formative Assessment Strategies:**
• Sing songs about the body • Introduce and reinforce new vocabulary • Use pictures of people and body parts • Various ways to explore senses: - field trip to use our senses - blind folds - "feely" box - smelling containers (CARE!! Asthmatics) - tasting party (CARE!: allergies e.g. peanuts) • Have visitors with various disabilities visit the class • Materials we use: have children identify various kinds of materials and note colour, texture etc • Create body parts flash cards and have children state name of each part • Have children draw a picture of themselves • Take children on a sensory walk. Have them draw or say what they see, hear, smell etc. • Other activities from DLM Early Learning Materials • Other activities from NIAS publications	**Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.** **techniques include:** • **questioning** - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching • **checklists** - teachers use these during observations or interactions to note mastery of particular concepts or skills • **teacher observations** - teachers watch students (individuals or groups) during activities, guided and independent practise • **games and puzzles** (including computer applications) - teachers can monitor levels of success at games or puzzles and intervene when necessary • **drawings** - teachers can diagnose misconceptions based on accuracy • **quizzes** (oral) - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions • **science journals** (reflection that can be teacher assisted) - students draw what they see, what they did, what they liked - teachers will write what the children say

Module Title: All About Us	**Sequence Reference:** PS SC-A

Summative Assessment:

Assessment given at the end of a module where data is used to generate grades.

- Portfolio of student work

Special Resources:
(materials, equipment & community involvement)

- long mirror, finger paint, paints and brushes, soap and water, land magnifiers, paper tubes, tissue paper
- food for tasting (sweet, sour, salty etc.) objects for smelling, objects for hearing, other materials cited in DLM Early Childhood Programme or NIAS books
- activity kits: Science Discovery Kit, Five Senses Kit, Colour and Light Kit
- visits/field trips: nurse visit, aquarium visit, community sensory walk

References - Teacher:

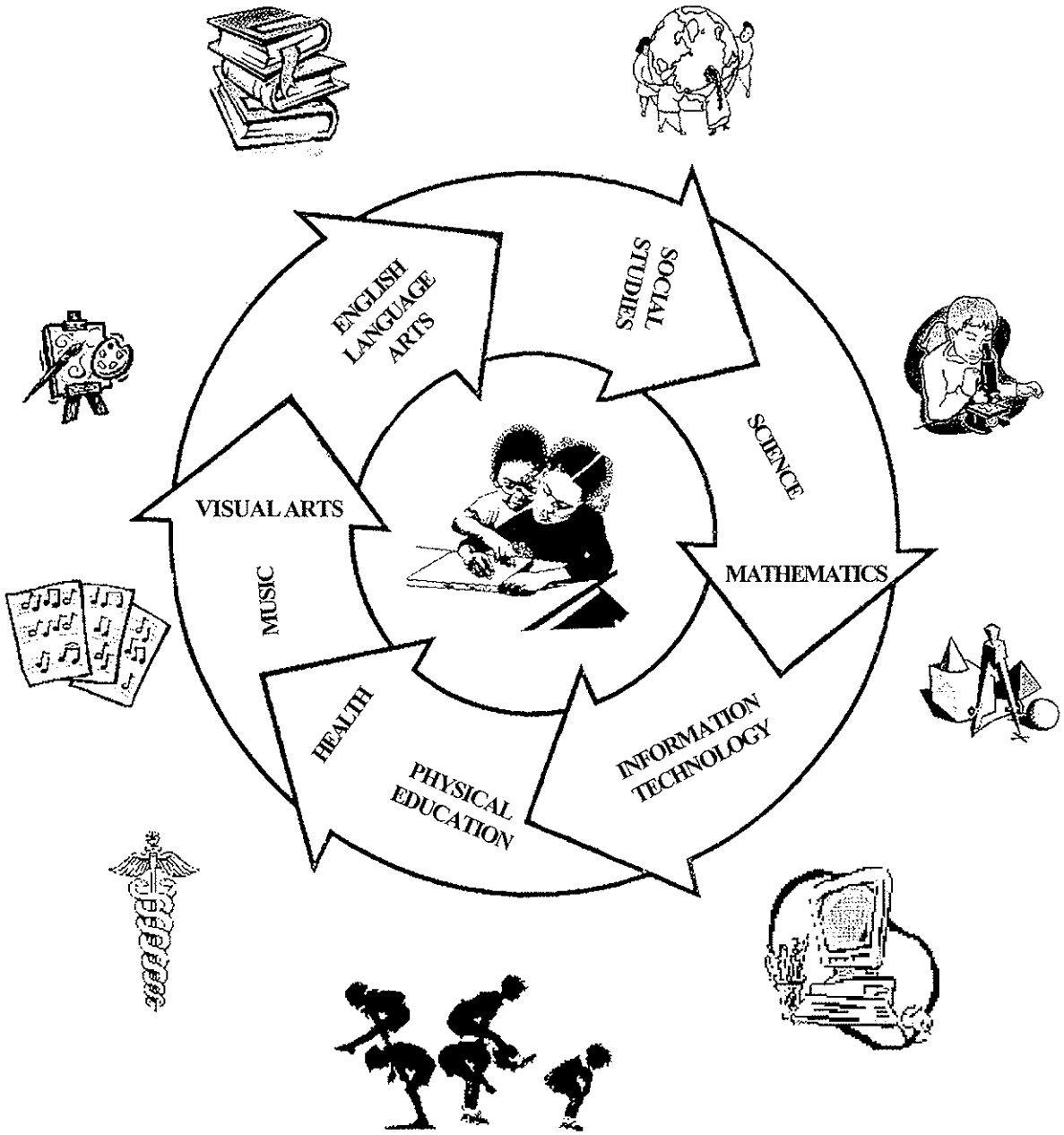
- DLM Early Childhood Programme: Science Centre Activities
- NIAS: All Sorts of Stuff
- NIAS: See and Hear
- NIAS: Science Stories

References - Student:

- N/A

Glossary:

- refer to materials of instruction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Module B

SCIENCE

Module Title: All About Living Things

Sequence Reference: PS SC-B

Time allotted: 10 weeks

PHASE A				PHASE B		
PS	P1	P2	P3	P4	P5	P6
☒	☐	☐	☐	☐	☐	☐

Subgoal Emphasis:

- 1.2, 1.5 Nature and History of Science
- 2.1 - 2.4 Scientific Inquiry
- 3.2 Positive Attitude
- 4.1 - 4.2 Advocate for the Environment

Content Focus:

- Change
- Systems
- Life Science

Curriculum Objectives:

At the end of this module, students will:

- beware of living and non-living things in the environment
- investigate living things in the outdoors
- identify animals by their characteristics
- recognize and describe where animals live and how they get their food
- recognize that some animals lay eggs and some have live births
- recognize that some animal babies look like their mothers and others do not
- appreciate the need to care for animals
- observe and describe how plants change during the life cycle (seed to seed)

Content Detail:

- living and non-living things
  - rocks and soil
  - plants and animals
- living things
  - plants
  - animals: birds, mammals, reptiles, amphibians, fish
  - minibeasts: worms, bees, butterflies, spiders etc.
- animal characteristics
- animal homes
- animal food:
  - what do they eat?
  - how do they get their food?
- care of pets and wild animals
  - food, water and shelter for pets
  - freedom, shelter etc for wild animals
- plant life
  - parts of plants: leaf, flower, root, stem, seeds
  - variety of plants: trees, and flowering plants of Bermuda
  - vegetables and fruits come from plants (cherry, loquat, apple, carrots etc.)

Module Title: All About Living Things	**Sequence Reference:** PS SC-B

Recommended Instructional Strategies:

- Use compare and contrast charts
- Introduce and reinforce new vocabulary
- Sequence animal growth using pictures
- Observe and chart animal growth and changes: caterpillar, fish, tadpole
- Match animal to:
  - baby
  - home
  - product it gives (milk, wool etc.)
  - food it eats
- Reinforce that animals need to be put back in the wild
- Observe animals feeding: pets at home and in the classroom, animals in the zoo
- School Garden: Grow vegetables, flowers and milkweed
  - note changes over time
  - note living things that visit or live in the garden
  - appreciate need to care for the plants in the garden
- Field trip:
  - predict what animals will be found on field trips
  - look for specific animals
  - chart findings (what was the animal, where was it found)
- Minibeast detective: use hand magnifiers and look for Minibeasts – examine rocks, soil and plants
- Other activities from DLM Early Learning Materials
- Other activities from NIAS publications

Recommended Formative Assessment Strategies:

Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.

techniques include:

- **questioning**
  - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching
- **checklists**
  - teachers use these during observations or interactions to note mastery of particular concepts or skills
- **teacher observations**
  - teachers watch students (individuals or groups) during activities, guided and independent practise
- **games and puzzles** (including computer applications)
  - teachers can monitor levels of success at games or puzzles and intervene when necessary
- **drawings**
  - teachers can diagnose misconceptions based on accuracy
- **quizzes** (oral)
  - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions
- **science journals** (reflection that can be teacher assisted)
  - students draw what they see, what they did, what they liked
  - teachers will write what the children say

Module Title: All About Living Things	**Sequence Reference:** PS SC-B

Summative Assessment:

Assessment given at the end of a module where data is used to generate grades.

- Portfolio of student work

Special Resources:

(materials, equipment & community involvement)

- pictures and models of animals and their homes
- other materials cited in DLM Early Childhood Programme or NIAS publications
- visits/field trips: Bermuda Aquarium Museum and Zoo (BAMZ), walk around the outdoors (minibeast detectives), farms
- resource: Learning Through Landscapes, Bermuda; BAMZ classes

References - Teacher:

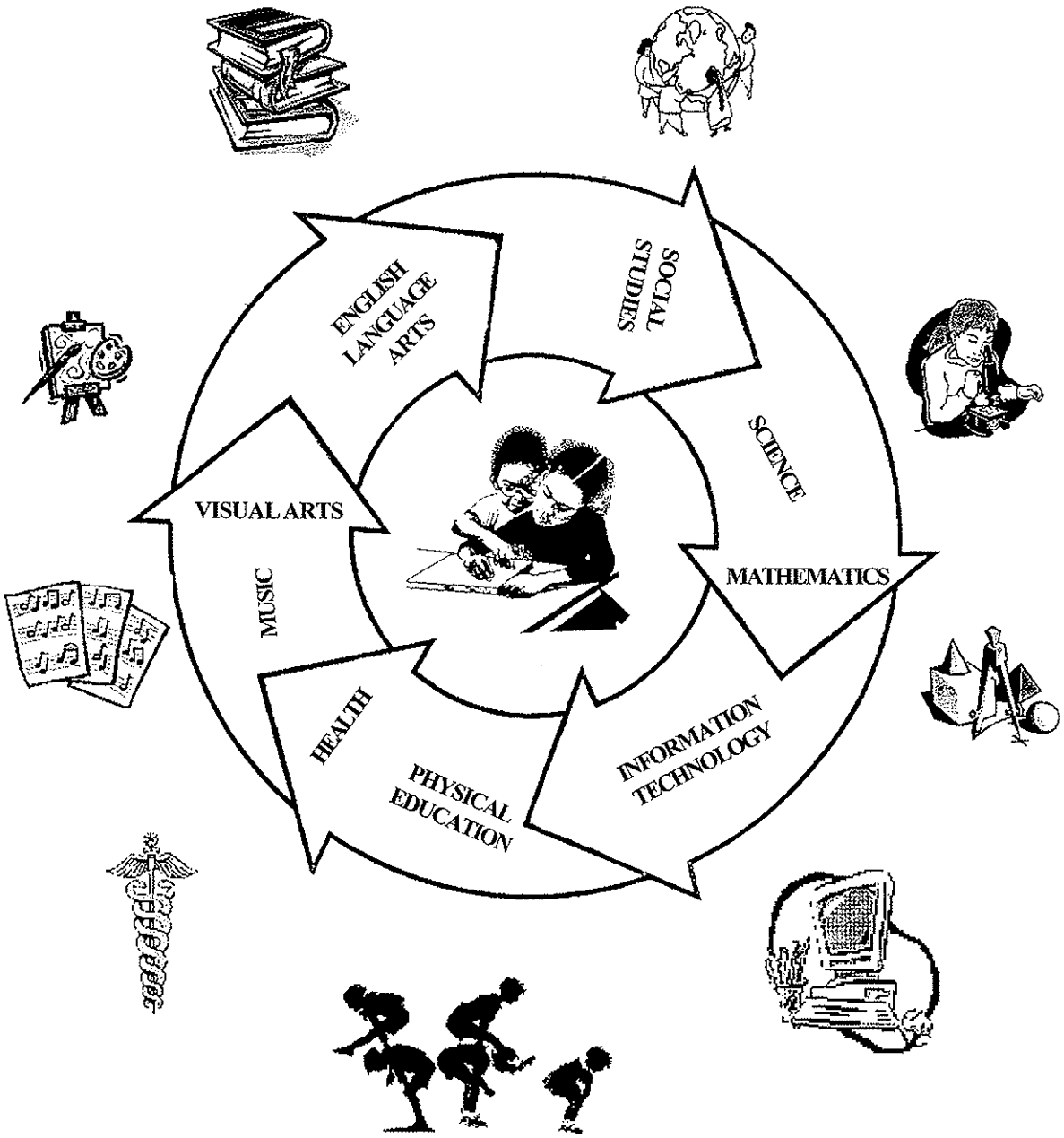
- DLM Early Childhood Programme:
- *Caring for Our World*
- *Ways of Living Things*
- Creepy Crawlies
- NIAS: Big Beasts, Little Beasts
- NIAS: Pottering With Plants
- NIAS: Science Stories

References - Student:

- N/A

Glossary:

- refer to materials of instruction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Module C

SCIENCE

Module Title: All About Weather, Water and My Bermuda Home

Sequence Reference: PS SC-C

	PHASE A			PHASE B		
	PS	P1	P2	P3	P4	P5	P6
Time allotted:	☒	☐	☐	☐	☐	☐	☐

Subgoal Emphasis:

- 1.2, 1.5 Nature and History of Science
- 2.1, 2.2, 2.4 Scientific Inquiry
- 3.2 Positive Attitude
- 4.1 - 4.2 Advocate for the Environment

Content Focus:

- Change
- Cause and Effect
- Systems
- Life Science
- Physical Science

Curriculum Objectives:

At the end of this module, students will:

- be aware of Bermuda as an island formed by a volcano
- recognise that water is important to us
- identify solids, liquids and gases around us
- explore properties of water, sand and soil
- recognise characteristics of four seasons
- compare and contrast types of clothing used for each season
- identify daily weather patterns
- observe and describe objects in the sky
- be aware of day and night cycle

Content Detail:

- Bermuda
  - an island (surrounded by water)
  - formation by a volcano
- water
  - sources in Bermuda (ponds, rain, ocean etc.)
  - uses: drinking, washing, watering plants and fun (swimming, sailing etc.)
- solids, liquids and gases in everyday life
- properties of water, sand and soil
  - water: fresh and salty; freezing, melting, boiling, and dissolving things
  - sand and soil: texture, colour etc
  - all can be warmed by the sun
- four seasons
  - names
  - temperature during seasons (hot, cold, warm)
  - changes during the seasons: some trees lose leaves, some animals hibernate, rain and snow
- weather patterns: rainy, sunny, windy etc.
- objects in the sky: sun, moon and stars
- day and night cycle:
  - sun's changing position
  - sun warming the land and sea
  - our day and night activities (school, play, sleeping, eating etc.)

Module Title: All About Weather, Water and My Bermuda Home	**Sequence Reference:** PS SC-C
Recommended Instructional Strategies:	**Recommended Formative Assessment Strategies:**
• Use compare and contrast charts and graphs • Introduce and reinforce new vocabulary • Dressing for the seasons: Use actual clothing, pictures, other manipulatives to reinforce appropriate dress for different seasons • Investigation (demonstration): Changing state of water - heating and cooling (boiling, freezing, melting) • Class Visit to parts of Bermuda to show how Bermuda was formed • Class Visit to ponds and oceans to take water samples Use magnifiers to examine samples Compare and contrast samples (colour, what is in them etc.) • Demonstration: evaporate salt water to see what is left. Extend by repeating with pond water and comparing results • Investigate how the sun warms things: place sand, water, rock in the sun and note difference in temperature after an hour (CARE! a hot metal object may burn children) • Investigation: Make different kinds of bubble solutions and predict and observe the shapes of bubbles from different shaped wands • What's in the Sky: use pictures and observations to observe day and night cycle • Other activities from DLM Early Learning Materials • Other activities from NIAS publications	**Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.** **techniques include:** • **questioning** - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching • **checklists** - teachers use these during observations or interactions to note mastery of particular concepts or skills • **teacher observations** - teachers watch students (individuals or groups) during activities, guided and independent practise • **games and puzzles** (including computer applications) - teachers can monitor levels of success at games or puzzles and intervene when necessary • **drawings** - teachers can diagnose misconceptions based on accuracy • **quizzes** (oral) - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions • **science journals** (reflection that can be teacher assisted) - students draw what they see, what they did, what they liked - teachers will write what the children say

Module Title: All About Weather, Water and My Bermuda Home	**Sequence Reference:** PS SC-C

Summative Assessment:

Assessment given at the end of a module where data is used to generate grades.

- Portfolio of student work

Special Resources:

(materials, equipment & community involvement)

- thermometers, graphs and charts, calendar, water, bubble recipes and wands
- pictures of seasons and Bermuda, books about Bermuda, volcano experiments other materials cited in DLM Early Childhood Programme or NIAS publications
- visits/field trips: weather station, seashore, Bermuda Aquarium Museum and Zoo
- resources: Learning Through Landscapes, Bermuda; BAMZ classes

References - Teacher:

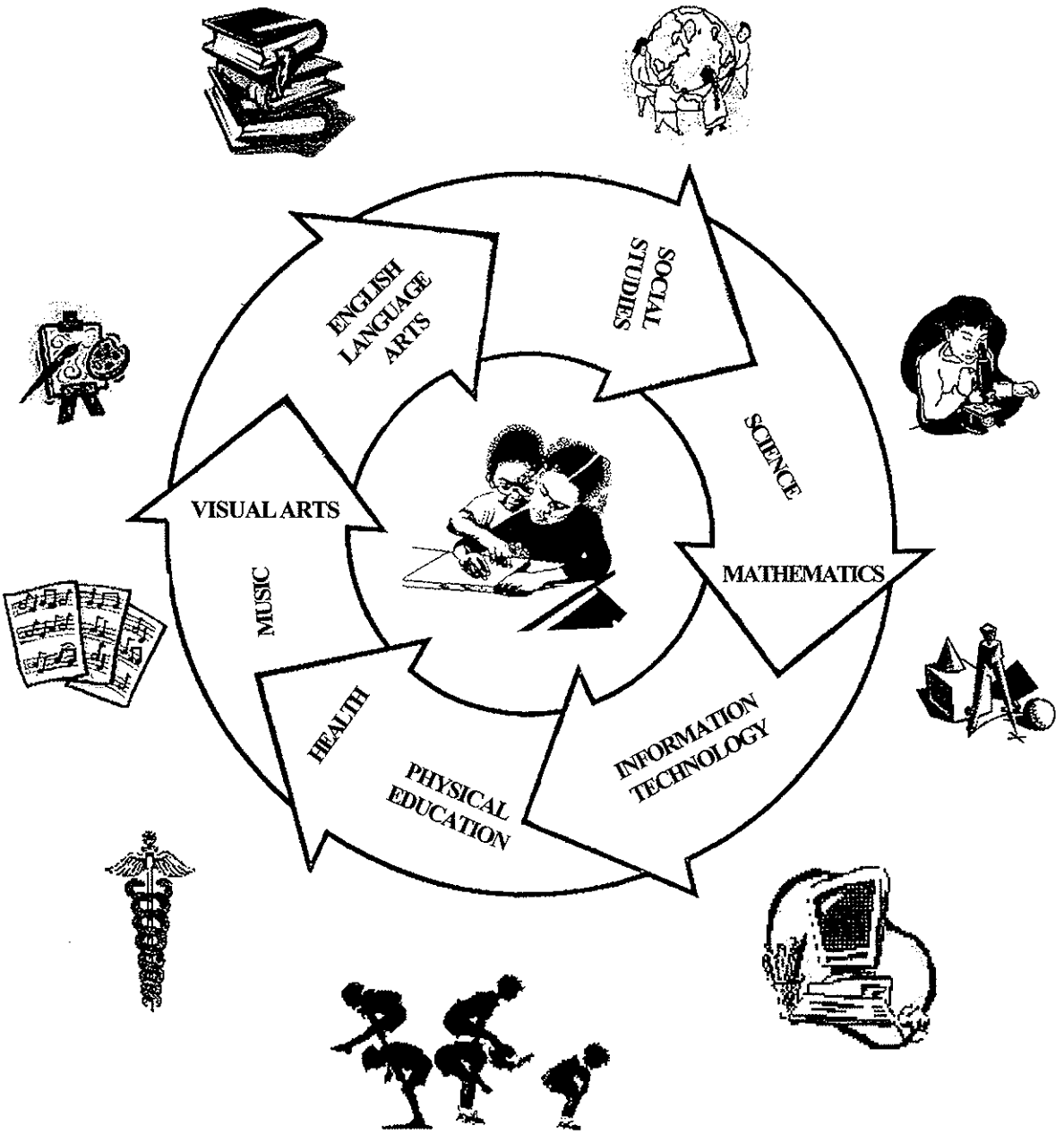
- DLM Early Childhood Programme:
- *Caring for Our World*
- NIAS: Science Stories

References - Student:

- N/A

Glossary:

- refer to materials of instruction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Module D

SCIENCE

Module Title: All About Moving Things

Sequence Reference: PS SC-D

	PHASE A				PHASE B		
	PS	P1	P2	P3	P4	P5	P6
Time allotted:	☒	☐	☐	☐	☐	☐	☐

Subgoal Emphasis:

- 1.2, 1.5 Nature and History of Science
- 2.1, 2.2, 2.4 Scientific Inquiry
- 3.1, 3.2 Positive Attitude

Content Focus:

- Change
- Cause and Effect
- Physical Science

Curriculum Objectives:

At the end of this module, students will:

- be aware of the effect of gravity
- explore how things move
- observe and describe how humans and other animals move
- investigate sinking and floating
- explore properties of magnets
- value safety around moving things

Content Detail:

- gravity – things fall to the ground unless they are held up
- how things move
  - forces: pushes, pulls, twists
  - speed: fast and slow
  - making things stop
- animal movement: hopping, running, swimming, jumping etc. **(PE link: movement)**
- sinking and floating
- magnets
  - can move some things without being touched
  - are attracted to some materials
- safety around moving things
  - vehicles
  - moving parts of machines
  - moving things that are too heavy
  - moving too fast (on bikes, scooters, swings etc)

Module Title: All About Moving Things	**Sequence Reference:** PS SC-D

Recommended Instructional Strategies:

- Use compare and contrast charts and graphs
- Introduce and reinforce vocabulary
- Observe and chart animal movement: caterpillar, fish, toads, rabbits etc. Ccompare to how humans can move.
- Match animal to the way it moves
- Drop various objects from different heights. Introduce concepts of heavy and light; loud and soft; high and low
- Develop concepts of forces by: pushing, pulling, and twisting objects. Have children predict:
  - How can this be moved? (push the cart, pull the drawer or toy etc.)
  - How can I make it go further?
  - How can I make it go faster?
  - How can I stop it?
- Have children describe how objects are moving: rolling, spinning etc.
- Investigating magnets: what do they attract; predict what materials will be attracted, do magnets still attract things through different materials [water, glass, paper, fabric, plastic]
- Water play: Introduce concepts of sinking and floating. Include safety rules around water. Have students predict and chart:
  - Will my object sink or float?
  - How many things can I put in my boat before it sinks?

  Extension: What kind of material should my boat be made of? (e.g. foil, cardboard, paper, Styrofoam)

Recommended Formative Assessment Strategies:

Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.

techniques include:

- **questioning**
  - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching
- **checklists**
  - teachers use these during observations or interactions to note mastery of particular concepts or skills
- **teacher observations**
  - teachers watch students (individuals or groups) during activities, guided and independent practise
- **games and puzzles** (including computer applications)
  - teachers can monitor levels of success at games or puzzles and intervene when necessary
- **drawings**
  - teachers can diagnose misconceptions based on accuracy
- **quizzes** (oral)
  - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions
- **science journals** (reflection that can be teacher assisted)
  - students draw what they see, what they did, what they liked
  - teachers will write what the children say

Module Title: All About Moving Things	**Sequence Reference:** PS SC-D

Summative Assessment:

Assessment given at the end of a module where data is used to generate grades.

- Portfolio of student work

Special Resources:

(materials, equipment & community involvement)

- bikes, trikes etc, cars, *Duplo, Lego, wooden blocks*, magnets, objects that are magnetic and non-magnetic, objects of various weights, balls
- water, charts, paper or markers, other materials cited in DLM Early Childhood Programme or NIAS books
- activity kits: Science Discovery Kit, Magnet Kit, Sinking and Floating Kit
- field trips: walk and watch what moves, trips to town, bus and boat tours, horse and buggy rides
- resource: Learning Through Landscapes, Bermuda; BAMZ classes

References - Teacher:

- DLM Early Childhood Programme:
- *Travellers*
- *Ways of Living Things*
- *Creepy Crawlies*
- *Science Centre Activity Book*
- NIAS: Pull, Push and Twist
- NIAS: All Sorts of Stuff
- NIAS: Science Stories

References - Student:

- N/A

Glossary:

- refer to materials of instruction

Science - P1
Level Code: P1 SC

MINISTRY OF EDUCATION
Bermuda
2001

PRIMARY SCHOOL
PHASE A OVERVIEW

Subject Title: Science **Subject Code:** P1 SC

Time Allotted: 120 min/wk

RATIONALE

Children from their earliest years are curious about their world; they explore, they ask questions and they enjoy the process of discovery. They develop wonderful ideas to explain phenomena that they observe. The science programme at the preschool and primary levels will use rich learning experiences to help the way that these ideas are formed, tested and modified. All children can then discover that science is part of their world, a fascinating world that they can interact with and understand.

The preschool and primary science programme will not only provide a sound foundation for middle level science, but also foster the development of a lifelong appreciation for learning in a world increasingly influenced by science, technology and challenges to the environment.

PRIMARY ONE (P1) REQUIREMENTS

The requirements for this level are as follows:

• **Performance Assessment*** - Science investigations and other activities, dances, skits, role-play, skills tests, teacher observations, oral questioning, interviews	**100%**
• **Product Assessment*** - Games, journals, poems, drawings, models, stories, collages	
• **Written Assessment** - ***Selected response***: matching - ***Constructed response***: fill in the blank, draw a picture, fill in a chart	
Total	**100%**

* **Product and performance assessments scored by rubric. All assessment pieces are to be kept in a student portfolio.**

MATERIALS OF INSTRUCTION (Adopted Text)

Baptiste, H. et al. McGraw Hill Science. New York: McGraw-Hill School Division, 2000.

PHASE A OUTLINE

P1 Module Titles A - D	P2 Modules Titles A - E	P3 Modules Titles A - E
A. All About Science..... 2 - reading about science - science as a human endeavour - science process skills - tools of science - scientific investigation	**A. All About Science..... 2** - reading about science - science as a human endeavour - science process skills - tools of science - scientific investigation	**A. All About Science..... 2** - reading about science - science as a human endeavour - science process skills - tools of science - scientific investigation
B. Alive and Well..... 12 - living and non- living things - life processes - plants and animals - our bodies - environmental stewardship	**B. Our Island Home - Living Things Growing And Changing..... 10** - plants growing and changing - Bermuda plants and trees - trees as a natural resource - a Bermuda pond habitat - life cycles - protecting our natural resources	**B. Adaptation and Survival..... 10** - plant and animal adaptations - habitats - endangerment and extinction - protection of our animals and plants - dinosaurs
C. Our Island Home - Water and Weather ..... 10 - sources of water in Bermuda - importance of water - properties of ocean and fresh water - weather and water changes - use of water in Bermuda - sun and cyclical patterns - weather and clothing	**C. Sun, Moon and Stars ..... 6** - objects in the sky - importance of the sun - patterns in the sky - animals and daily and seasonal changes	**C. Our Island Home – Land and Water..... 8** - Bermuda's natural resources - the ocean and seashore - impact of man on our island home - advocacy for protection of our island home
D. Matter and Motion ..... 10 - exploring through our senses - kinds of materials and their uses - how things move	**D. Pushes and Pulls..... 8** - positions of objects - motion - making things move - sound – vibrating objects	**D. Forces and Magnets..... 6** - force as a push or pull - force of gravity - forces of magnetic attraction and repulsion

E. Materials and Their Changes 8
- characteristics of different materials
- measuring objects
- solids, liquids and gases
- changes in materials

E. Energy in Our Lives 8
- heat, light and sound energy
- pitch and loudness
- sound and hearing
- noise and sound
- light sources
- shadows

Subtotal	34	Subtotal	34	Subtotal	34
Optional Weeks	4	Optional Weeks	4	Optional Weeks	4
Total Weeks	38	Total Weeks	38	Total Weeks	38

PRIMARY SCHOOL

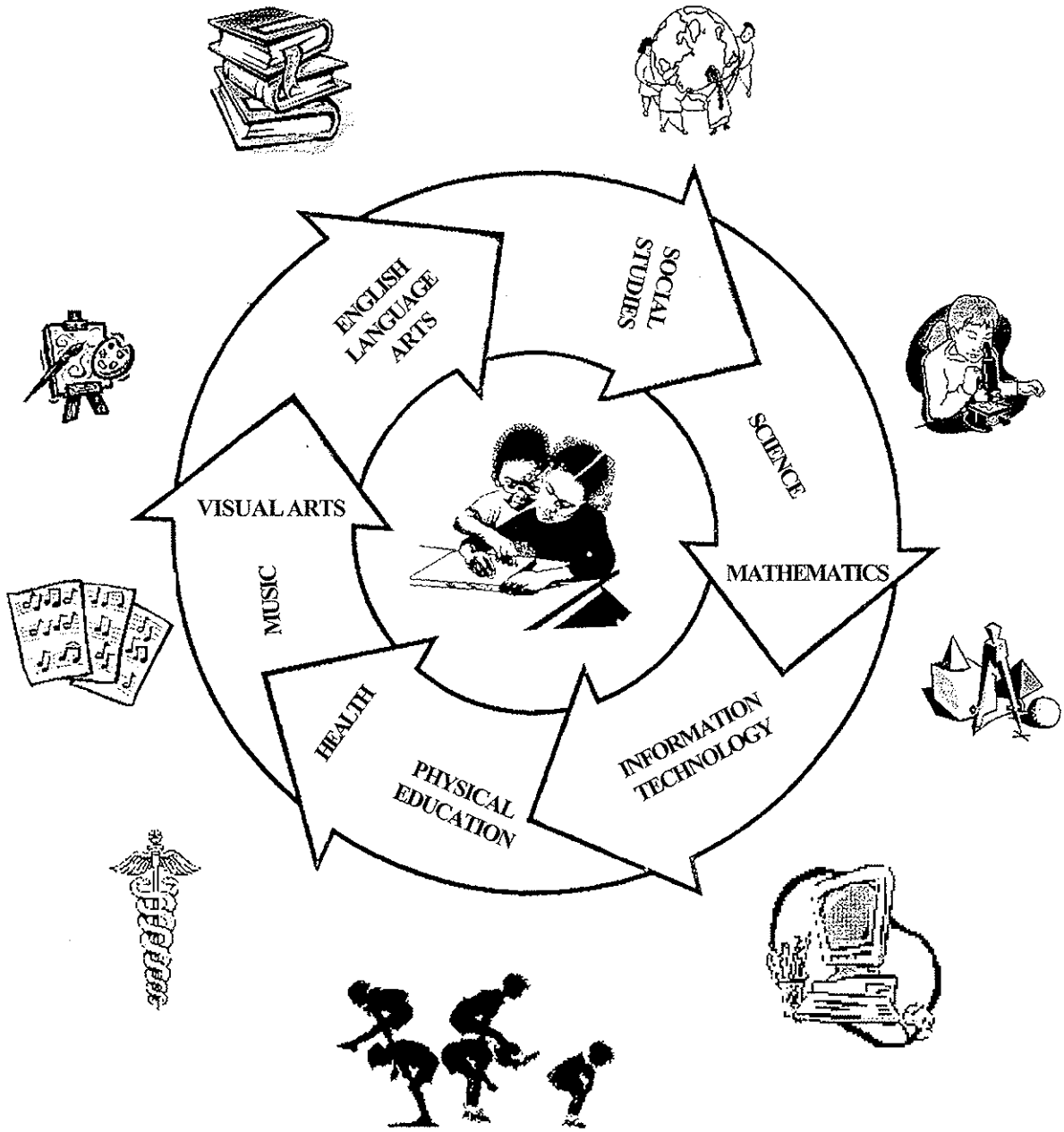
check one: PS ☐ P1 ☒ P2 ☐ P3 ☐ P4 ☐ P5 ☐ P6 ☐

Science

GOALS		SUBGOALS		MODULE & CURRICULUM CORRELATION MATRIX			
1	Conceptualizing the History and Nature of Science	1.1	Contribution/Diversity	x	x		
		1.2	Connections	x	x	x	x
		1.3	Health				
		1.4	Inter-relationship/Mathematics Science Technology	x	x	x	x
		1.5	Problem Solving	x	x	x	x
2	Demonstrating the Nature of Scientific Inquiry	2.1	Hypothesis	x	x	x	x
		2.2	Design	x		x	
		2.3	Data Collection	x	x	x	x
		2.4	Technology Use	x	x	x	
		2.5	Explanations/Limitation	x		x	
		2.6	Explanations/Alternatives				
		2.7	Communications/Results				
		2.8	Research				
3	Demonstrating Positive Attitudes Towards Science	3.1	Present use of Science	x		x	x
		3.2	Value, Environment	x	x	x	x
		3.3	Ethical, Applications	x	x	x	x
		3.4	Career Options	x			
4	Advocating for Environmental Responsibility	4.1	Environmental Stewardship		x	x	
		4.2	Environmental Applications	x	x	x	
CONTENT STRUCTURE		Change		x	x	x	x
		Cause & Effect		x	x	x	x
		Systems		x	x	x	x
		Life Science		x	x		x
		Physical Science		x			x
		Earth Science		x		x	
		MODULE		**A**	**B**	**C**	**D**

MODULE KEY

A - All About Science
B - Alive and Well
C - Our Island Home Water and Weather
D - Matter and Motion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Module A

SCIENCE

Module Title: All About Science

Sequence Reference: P1 SC-A

PHASE A				PHASE B		
PS	P1	P2	P3	P4	P5	P6
☐	☒	☐	☐	☐	☐	☐

Time allotted: 2 weeks

Subgoal Emphasis:

- 1.1, 1.2, 1.4, 1.5 Nature and History of Science
- 2.1 – 2.5 Scientific Inquiry
- 3.1 – 3.4 Positive Attitude
- 4.2 Advocate for the Environment

Content Focus:

- Change
- Cause and Effect
- Systems
- Physical, Life and/or Earth Science

Curriculum Objectives:

At the end of this module, students will:

- discuss a story or article about science
- appreciate science as a human endeavour
- practise a science process skill
- recognize the use of mathematics and technology as tools of science
- carry out a scientific investigation
- value safety as a priority in science

Content Detail:

- all about science
  - scientific discovery, an invention, current news, history of science etc.
  - magazine or newspaper article [NIE or other]
  - fiction or non-fiction story including science fiction
  - video or other multimedia about science
- science as a human endeavour
  - many people have practised science for a long time in all cultures
  - men and women have contributed to science
  - many people make science a career
  - there is a lot still to be learned about our world
- science process skills
  - observing, measuring, estimating
  - classifying
  - inferring and predicting
  - collecting, recording and data
  - hypothesizing and designing an experiment
  - controlling variables and making models
  - communicating: telling, writing, drawing, showing
  - working in groups
- science tools: mathematics and technology
  - using mathematics: counting, graphing
- science investigation: *Be A Smartie Scientist (see Appendix)*
- safety in the science classroom
  - handling materials and equipment safely
  - avoid running or playing during an investigation
  - report any accident to the teacher
  - do not taste anything unless directed by the teacher
  - ask for help when necessary

Module Title: All About Science	**Sequence Reference:** P1 SC-A
Recommended Instructional Strategies:	**Recommended Formative Assessment Strategies:**
• Story or article about science: read a story or article about science or a scientist. Discuss the events, the characters (scientists), and the importance of the invention, event or discovery. Have students recognize that men and women from different cultures have been involved in science from many years ago. Many people choose science as a career. [Science as a human endeavour] Students should use their science journals to reflect on what has been discussed in an age appropriate manner (drawing or writing) • Brainstorm safety rules for science activities. List them, have students decorate them and post them in the classroom. Then students with a science, date, then sign a science safety contect on the inside • Using science tools: students should practise using science equipment, using the computer for science games and interactive simulations; using mathematics in science (measuring, using calculators, reading and making charts and graphs) • Science process skills: explanations and examples [see appendix] • Science investigation: *Be a Smartie Scientist* (refer to appendix for details of investigation)	**Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.** **techniques include:** • **questioning** - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching • **checklists** - teachers use these during observations or interactions to note mastery of particular concepts or skills • **teacher observations** - teachers watch students (individuals or groups) during activities, guided and independent practise • **games and puzzles** (including computer applications) - teachers can monitor levels of success at games or puzzles and intervene when necessary • **drawings** - teachers can diagnose misconceptions based on accuracy • **quizzes** (oral and written) **and worksheets** - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions • **science journals** - students use these to record details of investigations and a method of reflection (teacher will review journals regularly and give feedback) - investigations : what did I think about? - what did I do? - what did I see? - what did I find out? - reflections: what did I learn? - what did I like? - what else do I want to know ?

Module Title: All About Science	**Sequence Reference:** P1 SC-A

Summative Assessment:

Assessment given at the end of a module where data is used to generate grades.

- Possible entries for science journal:
  - reflection on video, article or story
  - description (draw write or tell) of a scientist
  - evidence of mastery of process skill
  - record of laboratory investigation

Special Resources:

(materials, equipment & community involvement)

- variety of science equipment: measuring cups, measuring cylinders, hand lens, rulers, balances, force meters, thermometers
- materials as cited in the investigations in the appendix
- lab safety rules
- stories or videos about scientific endeavours

References - Teacher:

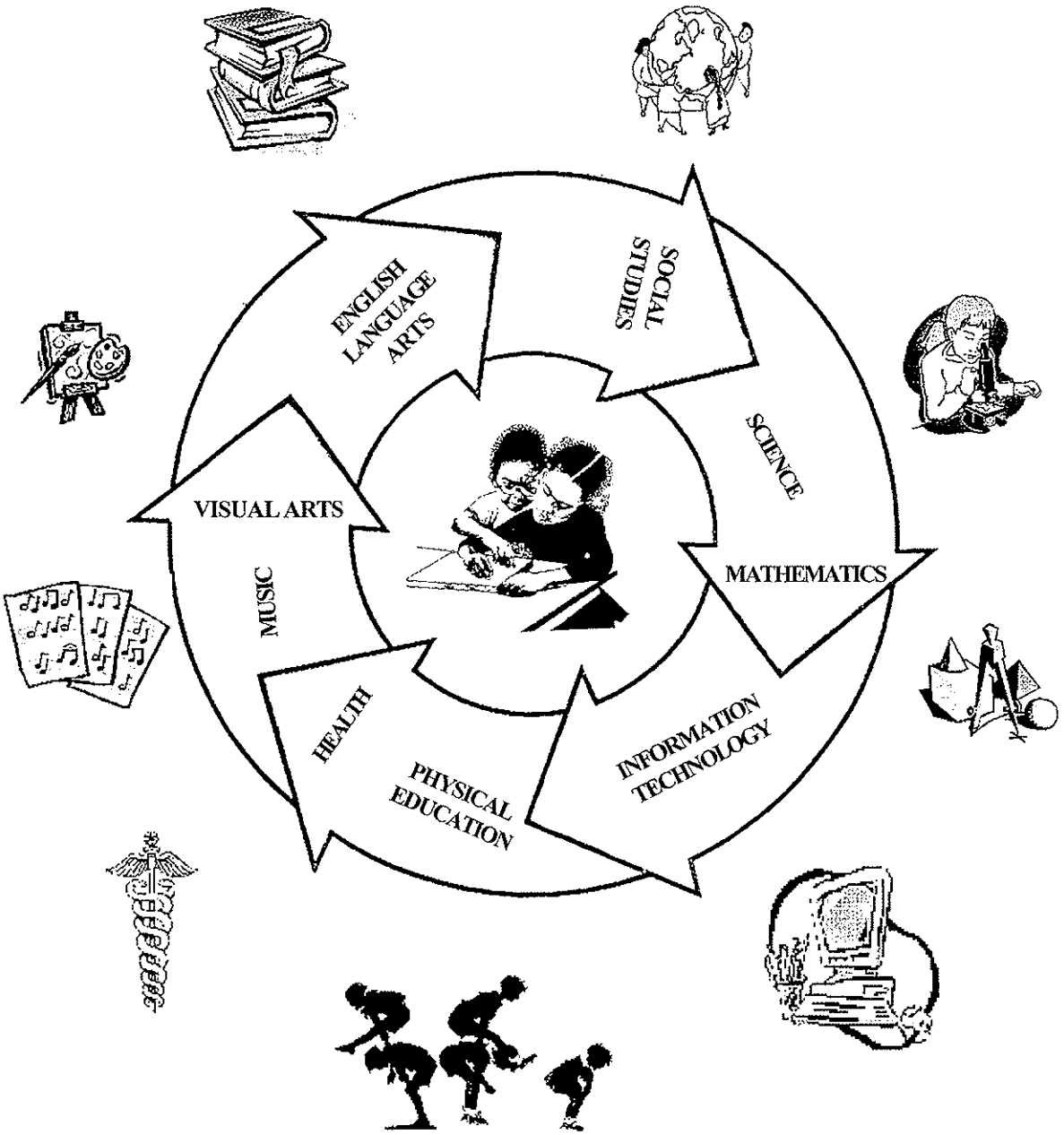
- McGraw-Hill Science Grade K
- Unit: *Be A Scientist*
- Reference Section: *Handbook and Glossary*

References - Student:

- McGraw-Hill Science Grade K
- Reference Section: *Handbook and Glossary*

Glossary:

- refer to text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Module B

SCIENCE

Module Title: Alive and Well

Sequence Reference: P1 SC-B

PHASE A				PHASE B		
PS	P1	P2	P3	P4	P5	P6
☐	☒	☐	☐	☐	☐	☐

Time allotted: 12 weeks

Subgoal Emphasis:

- 1.2, 1.4, 1.5 Nature and History of Science
- 2.1, 2.3, 2.4 Scientific Inquiry
- 3.2 - 3.3 Positive Attitude
- 4.1 - 4.2 Advocate for the Environment

Content Focus:

- Cause and Effect
- Systems
- Change

Curriculum Objectives:

At the end of this module, students will:

- recognize the processes that keep animals and plants alive
- recognize the basic requirements of living things
- recognize that animals, including humans, move, feed, grow, use their senses and reproduce
- recognize the diversity of animal and plant life in the world
- identify some Bermuda animals and plants
- relate structure to function of external body parts
- recognize that humans and other animals learn about the world through their senses
- distinguish between actual plants and animals and those in stories that can have characteristics that are not possible
- recognize their role in taking care of the earth

Content Detail:

- living and non-living things
  - some things are living and some are non-living
  - non-living things that were once alive (dinosaur fossils etc.)
  - non-living things that were never alive (rocks etc.)
- basic requirements of life
  - animals need food, water and air
  - plants need water, light and food from the group etc. light that help in manufacture
- life processes of animals **(biodiversity: refer to glossary)**
  - moving, feeding, growing, getting rid of waste, using their senses and reproducing
- diversity of plants and animals
  - many different kinds of plants and animals in the world
  - plant parts and plants we eat
  - magnifiers (to help to see the world up close)
- plants and animals of Bermuda
  - Bermuda cedar, Bermuda palmetto, other common trees
  - lizards, toads, tree frogs, some varieties of birds, fish and insects
- our bodies
  - external body parts and their functions
  - other selected animals (body parts and functions)
- sense organs in humans and other animals
- difference between the attributes of fictional animals and real animals (animals that talk etc.)
- beginning environmental stewardship
  - looking after their own space, classroom, school grounds, Bermuda
  - treating living things with care

Module Title: Alive and Well	**Sequence Reference:** P1 SC-B

Recommended Instructional Strategies:

- Take a walk in the school grounds to identify what is alive, was once alive, and was never alive.
- Make a mural of living things
- Using pictures of living things cut out of magazines make interactive charts or grouping games to show similarities and differences between living things
- Set up a plant station with different kinds of plants e.g. cactus, flowering plant, vegetable etc. Take care of the plants. Use magnifiers to see details
- Experiment to find out what a plant needs to survive and record findings in pictures
- Introduce idea of fair testing - e.g. plant with soil, light and water; control with soil, no light or water - not fair. Where two factors changed - not a fair test.
- Measure and chart plant growth and other changes. Record changes in pictures
- Role play the parts of a plant and the work that they do
- Categorize plants using a variety of criteria, and record findings as simple graphs
- Sort leaves by size, shape, colour
- Use the leaves for rubbings or printing designs
- Read stories about animals and discuss whether the animal's qualities are real or fictional.
- Arrange visits of children's pets and discuss how they take care of them. Monitor and record the pet's activity
- Keep a small Bermuda animal in the classroom for a week (snails, lizards, insects, toad). Record what the animal eats and its daily activity. Use magnifiers to see the details.
- Reinforce the names of human body parts through songs and rhymes and actions. Compare with animal body parts.
- Take a sensory walk in the school grounds
- Model good environmental practice in the classroom, school and school grounds. Sort trash/recycle/reuse/cut down on waste/trash-free lunches/turn off lights when leaving a room/respect living things etc
- Encourage observational skills by providing lots of opportunities to draw and paint the living world.
- Set up a small aquarium in the classroom. Use these to help to students to understand characteristics of living things and environmental stewardship.

Recommended Formative Assessment Strategies:

Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.

techniques include:

- **questioning**
  - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching
- **checklists**
  - teachers use these during observations or interactions to note mastery of particular concepts or skills
- **teacher observations**
  - teachers watch students (individuals or groups) during activities, guided and independent practise
- **games and puzzles** (including computer applications)
  - teachers can monitor levels of success at games or puzzles and intervene when necessary
- **drawings**
  - teachers can diagnose misconceptions based on accuracy
- **quizzes** (oral and written) **and worksheets**
  - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions
- **science journals**
  - students use this to record details of investigations and a method of reflection (teacher will review journals regularly and give feedback)
  - investigations: what did I think about?
  - what did I do?
  - what did I see?
  - what did I find out?
  - reflections: what did I learn?
  - what did I like?
  - what else do I want to know?

Module Title: Alive and Well	**Sequence Reference:** P1 SC-B

Summative Assessment:

Assessments given at the end of a module where the data is used to generate grades.

- Performance based:
  - Adapt any activities from previous section or activity book and collect in student portfolio

Special Resources:

(materials, equipment & community involvement)

- Bermuda Aquarium, Museum and Zoo
- Class - *' From Bugs to Bunnies'* "*Bermuda's Animals and Plants*" - the variety of animal life at the Aquarium and Zoo
- Bermuda Zoological Society Resource Box - Plants and Animals of Bermuda
- SPCA
  - A representative could possibly visit your classroom with an animal from the shelter
- Botanical Gardens
  - Visit the Fern House and Blind Garden
- Nature Reserves
  - Visit any that are close to your school
- Bermuda Society for the Blind

References - Teacher:

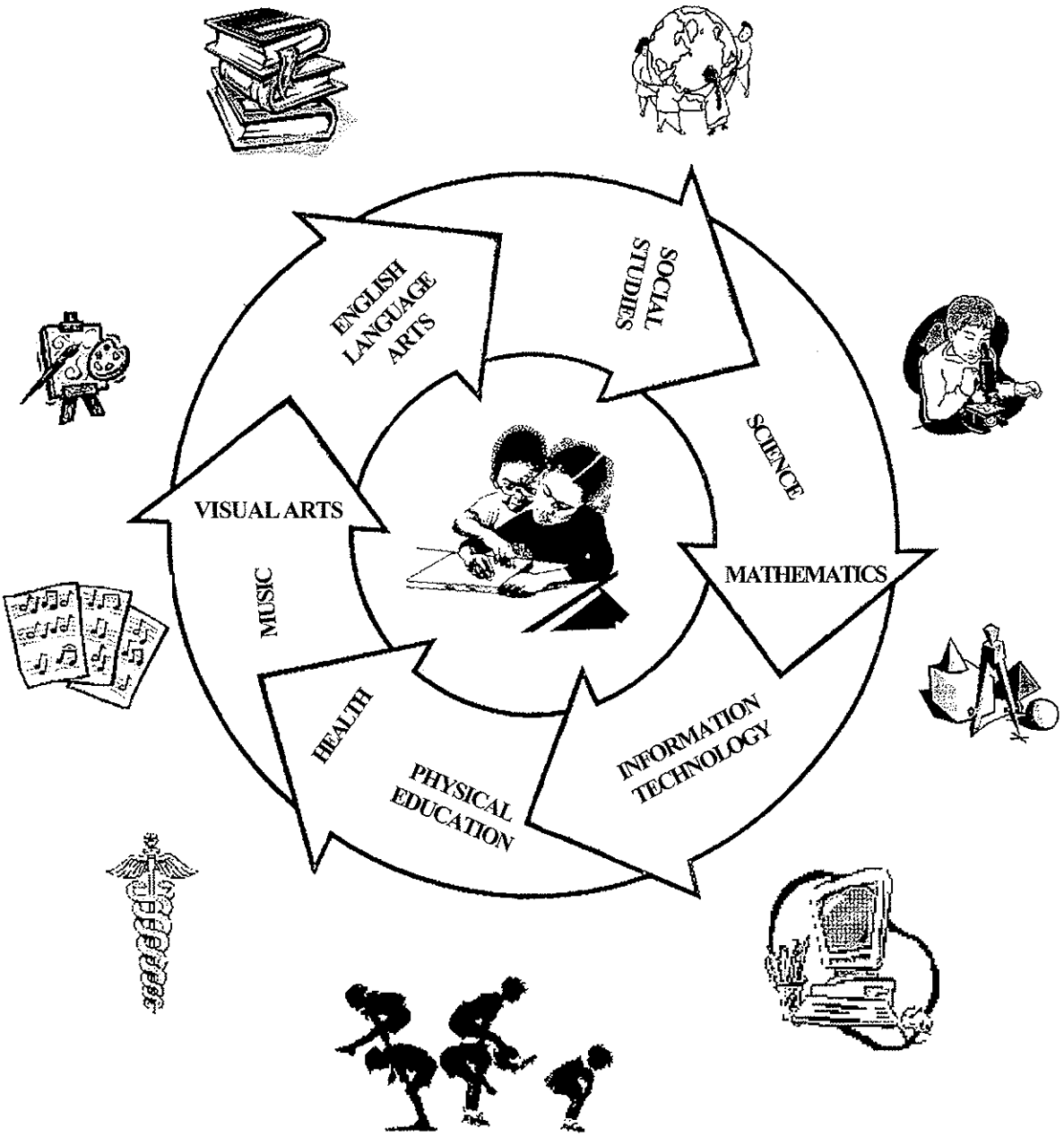
- McGraw-Hill Science. Grade k
- Unit 2: *Learn About Plants*
- Unit 3: *Learn About Animals*

References - Student:

- McGraw-Hill Science. Grade K
- Unit 2: *Learn About Plants*
- Unit 3: *Learn About Animals*

Glossary:

- Biodiversity: the variety of life – combination of two words biological and diversity. It includes the different types of plants and animals (species diversity), the different types of homes they live in (habitat diversity), and how individuals of a certain type of plant and animal vary (genetic diversity). examples are:
  - species diversity: cat, bluebird, human being, hibiscus, ant, amoeba (micro-organism)
  - habitat diversity: coral reef, marsh, Bermuda forests
  - genetic diversity: tabby cats, Siamese cats, brown-skinned people, blue-eyed people
- other terms: refer to text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Module C

SCIENCE

Module Title: Our Island Home – Water and Weather

Sequence Reference: P1 SC-C

	PHASE A			PHASE B		
PS	P1	P2	P3	P4	P5	P6
☐	☒	☐	☐	☐	☐	☐

Time allotted: 10 weeks

Subgoal Emphasis:

- 1.2, 1.4, 1.5 Nature and History of Science
- 2.1 - 2.5 Scientific Inquiry
- 3.1 - 3.3 Positive Attitudes
- 4.1 - 4.2 Advocate for the Environment

Content Focus:

- Change
- Cause and Effect
- Systems
- Earth Science

Curriculum Objectives:

At the end of this module, students will:

- observe and identify water in our environment
- recognize that water is important to all living things
- explore the properties of water
- recognize how water can be changed by weather
- explore where water goes and who used it up
- recognize that the sun warms the earth and provides light
- identify the cyclical patterns of seasons and of day and night
- identify daily weather patterns
- identify the appropriate way to dress related to the type of weather

Content Detail:

- sources of water in Bermuda
  - dew, rain, hail
  - ponds and ocean
  - exhaled air
- importance of water
  - drinking **(link to health)** and watering plants
  - habitat for living things (marine and fresh water)
  - leisure time activities
- properties of ocean and fresh water
  - using senses: taste, smell, touch
  - floating and sinking
  - changing to the ocean-temperature, summer weather, winter and stormy weather
- weather and water changes
  - rain, hail and snow
  - storing rain water in Bermuda
  - changes to the ocean – temperature, summer weather, winter and stormy weather
- use of water in Bermuda
  - fresh (potable) water
  - ocean water (leisure activities, and producing fresh water)
  - domestic supply and conservation
- sun as source of energy
  - warming earth, land and sea-changing seasons
  - providing light-day and night cycle
- daily weather patterns
  - hot, windy, cold, rainy etc.
  - rain gauges and wind socks
- appropriate dress for different kinds of weather
  (link to Social Studies module Environment P1 SS-D)

Module Title: Our Island Home-Water and Weather	**Sequence Reference:** P1 SC-C

Recommended Instructional Strategies:

- What happens to water: have students pour water into a bowl and shallow plate. Draw and predict what will happen if these are left on a sunny windowsill. Discuss and chart (draw) changes each day. Repeat using coloured litre bottle with water. Substitute ice for water to note process of melting.
- Take a walk near a pond or seashore and draw, write and tell about characteristics of this source of water. If appropriate and safe have students wade through water and note how it is harder to wade through water. Visit the Aquarium and discover fish adaptations for living in water- classroom fish tank is also valuable.
- Compare two plants over several days – one watered regularly and another without water.
- Health connection:
  - Importance of hygiene – practise hand washing
  - Drinking water – discuss the need for water, how the body feels without water (thirst), relate hot weather with thirst and perspiring
  - Breathing out water: have students exhale on a cool surface and note condensation
- Invite a senior citizen to the class to talk about forecasting weather during their childhood-using shark oil, reading the skies and water etc.
- Have students discover patterns in weather changes by keeping journal/calendar
- Types of weather:
  - Observe and discuss weather for a couple of days, then have children draw or cut out magazine pictures showing different types of weather
  - Suitable clothing
    Ask: What do you wear when it is rainy?
    What do you wear when it is sunny?
  - Give children old fabric swatches of material appropriate for different weather and have them classify.
- Kinds of weather:
  Provide the following labels: - sunny, cloudy, rainy, snowy or windy. Give students picture of each word, to sort.
  (refer to Social Studies module Environment P1 SS-D)

Recommended Formative Assessment Strategies:

Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.

techniques include:

- **questioning**
  - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching
- **checklists**
  - teachers use these during observations or interactions to note mastery of particular concepts or skills
- **teacher observations**
  - teachers watch students (individuals or groups) during activities, guided and independent practise
- **games and puzzles** (including computer applications)
  - teachers can monitor levels of success at games or puzzles and intervene when necessary
- **drawings**
  - teachers can diagnose misconceptions based on accuracy
- **quizzes** (oral and written) **and worksheets**
  - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions
- **science journals**
  - students use these to record details of investigations and a method of reflection (teacher will review journals regularly and give feedback)
  - investigations: what did I think about
  - what did I do?
  - what did I see?
  - what did I find out?
  - reflections: what did I learn?
  - what did I like?
  - what else do I want to know?

Module Title: Our Island Home-Water and Weather	**Sequence Reference:** P1 SC-C

Summative Assessment:

Assessments given at the end of a module where the data is used to generate grades.

- Performance based:
  - Adapt any activities from previous section or activity book and collect in student portfolio

Special Resources:

(materials, equipment & community involvement)

- cross curricular connections: Mathematics, English Language Arts, Health Education, Social Studies (P1 SS-D)
- visits/fields trips: weather station, to the seaside, to a pond or nature reserve, walk around the school grounds

References - Teacher:

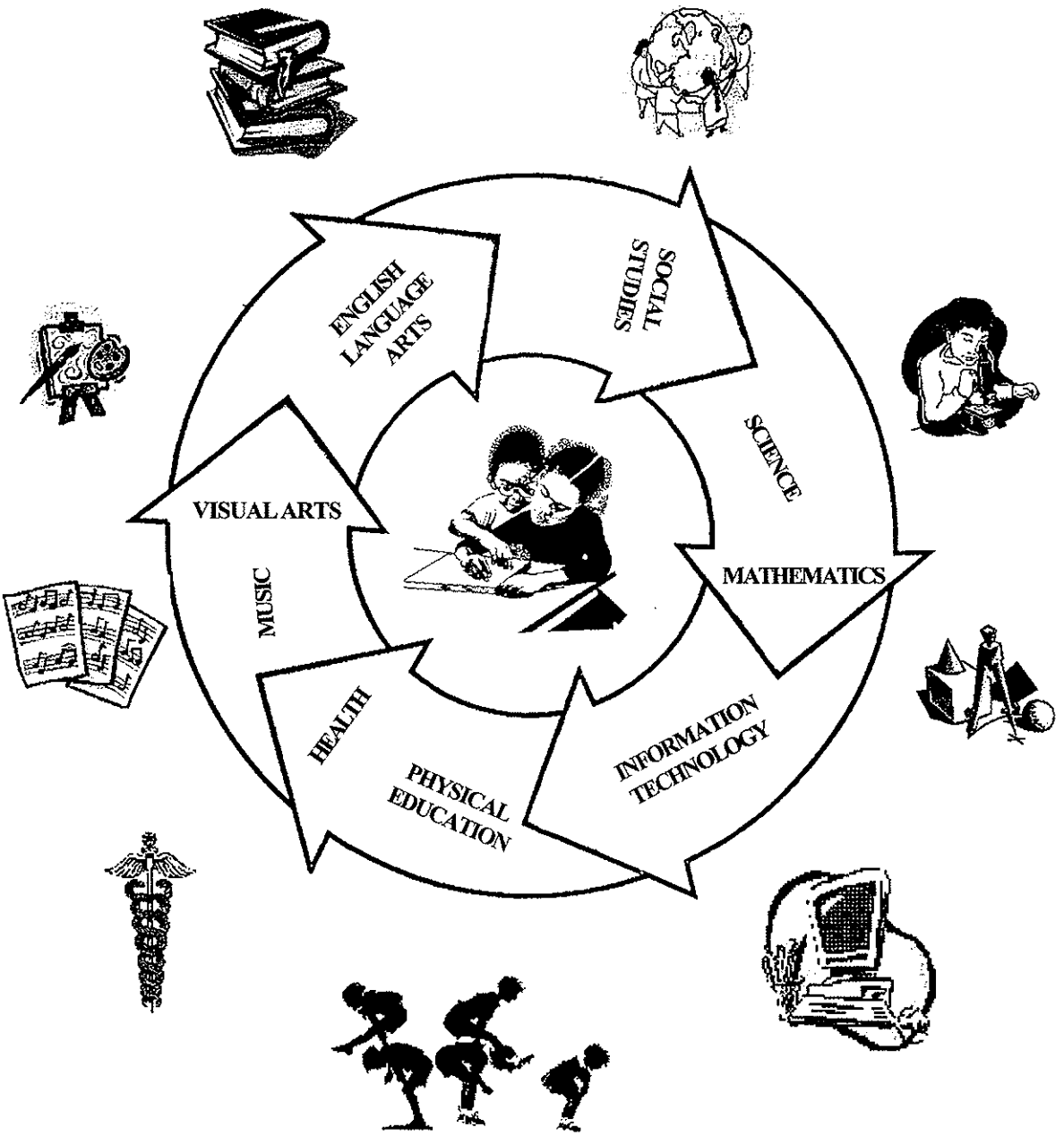
- McGraw-Hill Science. Grade K
- Unit 5: *Weather and Seasons*

References - Student:

- McGraw-Hill Science. Grade K
- Unit 5: *Weather and Seasons*

Glossary:

- refer to text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Module D

SCIENCE

Module Title: Matter and Motion

Sequence Reference: P1 SC-D

PHASE A				PHASE B		
PS	P1	P2	P3	P4	P5	P6
☐	☒	☐	☐	☐	☐	☐

Time allotted: 10 weeks

Subgoal Emphasis:

- 1.2, 1.4, 1.5 Nature and History of Science
- 2.1, 2.3 Scientific Inquiry
- 3.1 – 3.3 Positive Attitude

Content Focus:

- Change
- Cause and Effect
- Systems
- Physical Science
- Life Science

Curriculum Objectives:

At the end of this module, students will:

- observe, explore describe different properties of matter
- recognize familiar materials
- explain why objects are made from different materials
- sort objects based on features
- explore and describe the way things move
- recognize that things fall to the ground unless something holds them up

Content Detail:

- properties using senses
  - seeing, hearing etc.
  - taking care of our senses
  - science words to describe properties:
  - hard/soft; heavy/light; bright/dull; float/sink; rough/smooth; transparent/not transparent etc.
- kinds of materials
  - metal
  - wood
  - plastic
  - glass
  - wool etc.
  - rock
- uses of different materials
  - steel for strength
  - glass for transparency
  - wool for warmth
- ways that things move
  - swing, spin, turn; push, pull; float, sink; dancing, flying etc
  - invisible forces- magnets making things move
- invisible forces-effect of gravity

Module Title: Matter and Motion	**Sequence Reference:** P1 SC-D

Recommended Instructional Strategies:

- Sorting objects:
  Students are given a selection of objects.
  Following a discussion on hard and soft, the students are asked to group their objects as hard and soft.
  After a review by the teacher, students are asked to regroup their objects, using different properties.
  Following activity, teacher can hold up objects and ask students to describe the properties of the objects, using property words.
- Have students mimic or write a story or poem about *"what would life be like without gravity?"*
- Sinking and floating
  Teacher demonstrates the terms "sink" and "float" to students.
  Students are given a variety of objects to test.
  Students make two groups, one of "floats" and one of "sinks".
  Students are then give new objects and asked to predict whether they will sink or float.
  Students then test objects.
  Students are asked to describe objects that float and ones that sink, using property words.
- Why do we use that?
  Teacher brings a bike or other common object (or picture of) into the classroom.
  Students name the parts of the bike.
  Students touch, feel and describe the parts of the bike, using property words.
  Students then describe what the parts of the bike are used for and link property words to use.
- Measuring matter

basic skill: measuring

Teacher introduces the words: length, long, tall, short, etc. as property words to describe matter.
Students then use a non-standard method of measuring to determine the length of objects.
(paperclips, cut-out hands)
Teacher introduces idea that scientists use special equipment to measure length, i.e. A ruler.
Teacher demonstrates how to use a ruler.
Students measure and record using a ruler.
An estimating exercise can also be introduced here.

Recommended Formative Assessment Strategies:

Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.

techniques include:

- **questioning**
  - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching
- **checklists**
  - teachers use these during observations or interactions to note mastery of particular concepts or skills
- **teacher observations**
  - teachers watch students (individuals or groups) during activities, guided and independent practise
- **games and puzzles** (including computer applications)
  - teachers can monitor levels of success at games or puzzles and intervene when necessary
- **drawings**
  - teachers can diagnose misconceptions based on accuracy
- **quizzes** (oral and written) **and worksheets**
  - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions
- **science journals**
  - students use these to record details of investigations and a method of reflection (teacher will review journals regularly and give feedback)
  - investigations: what did I think about?
  - what did I do?
  - what did I see?
  - what did I find out?
  - reflections: what did I learn?
  - what did I like?
  - what else do I want to know?

Module Title: Matter and Motion	**Sequence Reference:** P1 SC-D

Summative Assessment:

Assessments given at the end of a module where the data is used to generate grades.

- Performance based:
  - Adapt any activities from previous section or activity book and collect in student portfolio

Special Resources:

(materials, equipment & community involvement)

- cross curricular connections: Mathematics, Art, Health Education, English Language Arts, Physical Education

References - Teacher:

- McGraw Hill Science. Grade K
- Unit 1: *Learn About Your World*
- Unit 6: Make Things Move

References - Student:

- McGraw Hill Science. Grade K
- Unit 6: Make Things Move

Glossary:

- refer to text

Science - P2
Level Code: P2 SC

MINISTRY OF EDUCATION
Bermuda
2001

PRIMARY SCHOOL
PHASE A OVERVIEW

Subject Title: Science **Subject Code:** P2 SC

Time Allotted: 120 min/wk

RATIONALE

Children from their earliest years are curious about their world; they explore, they ask questions and they enjoy the process of discovery. They develop wonderful ideas to explain phenomena that they observe. The science programme at the preschool and primary levels will use rich learning experiences to help the way that these ideas are formed, tested and modified. All children can then discover that science is part of their world, a fascinating world that they can interact with and understand.

The preschool and primary science programme will not only provide a sound foundation for middle level science, but also foster the development of a lifelong appreciation for learning in a world increasingly influenced by science, technology and challenges to the environment.

PRIMARY TWO (P2) REQUIREMENTS

The requirements for this level are as follows:

• **Performance Assessment** - Science investigations and other activities, dances, skits, role-play, skills tests, teacher observations, oral questioning, interviews	**45%**
• **Product Assessment** - Games, journals, poems, posters, drawings, models, projects, topic portfolio, stories, collages, crosswords	**45%**
• **Written Assessment** - ***Selected response***: multiple choice, true-false, matching - ***Constructed response:*** fill in the blank, label or draw a diagram, table or graph	**10%**
Total	**100%**

***Product and performance assessments scored by rubric**

MATERIALS OF INSTRUCTION (Adopted Text)

Baptiste, H. et al. McGraw Hill Science. New York: McGraw-Hill School Division, 2000.

PHASE A OUTLINE

P1 Module Titles A - D	P2 Modules Titles A - E	P3 Modules Titles A - E
A. All About Science..... 2 - reading about science - science as a human endeavour - science process skills - tools of science - scientific investigation	**A. All About Science..... 2** - reading about science - science as a human endeavour - science process skills - tools of science - scientific investigation	**A. All About Science..... 2** - reading about science - science as a human endeavour - science process skills - tools of science - scientific investigation
B. Alive and Well..... 12 - living and non- living things - life processes - plants and animals - our bodies - environmental stewardship	**B. Our Island Home - Living Things Growing And Changing..... 10** - plants growing and changing - Bermuda plants and trees - trees as a natural resource - a Bermuda pond habitat - life cycles - protecting our natural resources	**B. Adaptation and Survival..... 10** - plant and animal adaptations - habitats - endangerment and extinction - protection of our animals and plants - dinosaurs
C. Our Island Home - Water and Weather ..... 10 - sources of water in Bermuda - importance of water - properties of ocean and fresh water - weather and water changes - use of water in Bermuda - sun and cyclical patterns - weather and clothing	**C. Sun, Moon and Stars ..... 6** - objects in the sky - importance of the sun - patterns in the sky - animals and daily and seasonal changes	**C. Our Island Home – Land and Water ..... 8** - Bermuda's natural resources - the ocean and seashore - impact of man on our island home - advocacy for protection of our island home
D. Matter and Motion ..... 10 - exploring through our senses - kinds of materials and their uses - how things move	**D. Pushes and Pulls..... 8** - positions of objects - motion - making things move - sound – vibrating objects	**D. Forces and Magnets..... 6** - force as a push or pull - force of gravity - forces of magnetic attraction and repulsion

E. Materials and Their Changes 8
- characteristics of different materials
- measuring objects
- solids, liquids and gases
- changes in materials

E. Energy in Our Lives 8
- heat, light and sound energy
- pitch and loudness
- sound and hearing
- noise and sound
- light sources
- shadows

Subtotal 34	Subtotal 34	Subtotal 34
Optional Weeks 4	Optional Weeks 4	Optional Weeks 4
Total Weeks 38	Total Weeks 38	Total Weeks 38

PRIMARY SCHOOL

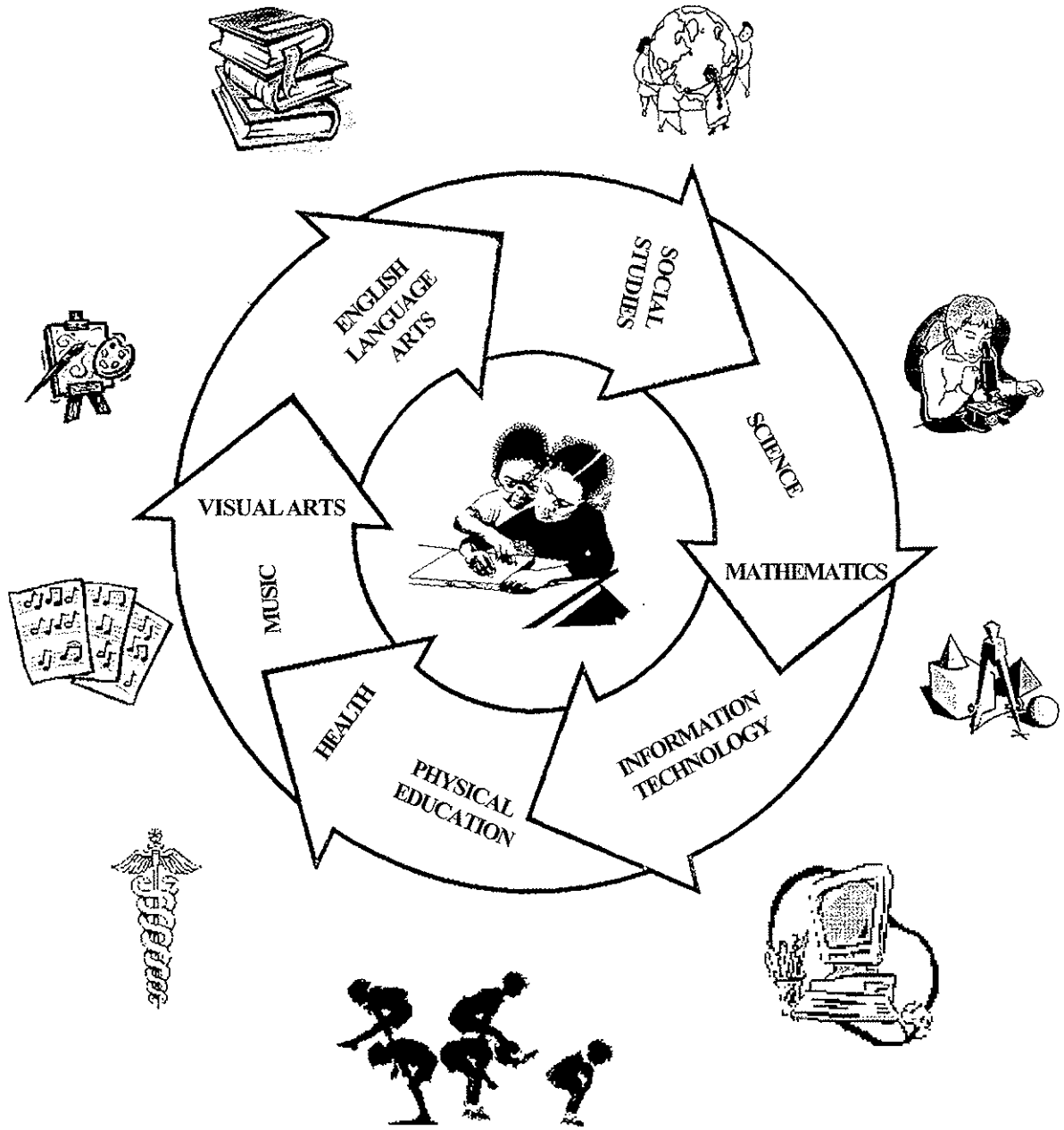
check one: PS ☐ P1 ☐ P2 ☒ P3 ☐ P4 ☐ P5 ☐ P6 ☐

Science

GOALS		SUBGOALS		MODULE & CURRICULUM CORRELATION MATRIX				
1	Conceptualizing the History and Nature of Science	1.1	Contribution/Diversity	x		x		x
		1.2	Connections	x	x	x	x	x
		1.3	Health		x	x	x	x
		1.4	Inter-relationship/Mathematics Science Technology	x	x	x	x	x
		1.5	Problem Solving	x	x	x	x	x
2	Demonstrating the Nature of Scientific Inquiry	2.1	Hypothesis	x	x	x	x	x
		2.2	Design	x	x	x	x	x
		2.3	Data Collection	x	x	x	x	x
		2.4	Technology Use	x	x	x	x	x
		2.5	Explanations/Limitation	x	x	x	x	x
		2.6	Explanations/Alternatives		x	x	x	x
		2.7	Communications/Results		x	x	x	x
		2.8	Research		x	x	x	x
3	Demonstrating Positive Attitudes Towards Science	3.1	Present use of Science	x	x		x	x
		3.2	Value, Environment	x	x	x	x	x
		3.3	Ethical, Applications	x	x	x	x	x
		3.4	Career Options	x	x		x	x
4	Advocating for Environmental Responsibility	4.1	Environmental Stewardship		x		x	x
		4.2	Environmental Applications	x	x			
CONTENT STRUCTURE		Change		x	x	x	x	x
		Cause & Effect		x	x	x	x	x
		Systems		x		x	x	
		Life Science		x	x			
		Physical Science		x			x	x
		Earth Science		x		x		
		MODULE		**A**	**B**	**C**	**D**	**E**

MODULE KEY

A - All About Science
B - Our Island Home-Living Things Growing and Changing
C - Sun, Moon and Stars
D - Pushes and Pulls
E - Materials and Their Changes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Module A

SCIENCE

Module Title: All About Science

Sequence Reference: P2 SC-A

PHASE A				PHASE B		
PS	P1	P2	P3	P4	P5	P6
☐	☐	☒	☐	☐	☐	☐

Time allotted: 2 weeks

Subgoal Emphasis:

- 1.1, 1.2, 1.4, 1.5 Nature and History of Science
- 2.1 – 2.5 Scientific Inquiry
- 3.1 – 3.4 Positive Attitude
- 4.2 Advocate for the Environment

Content Focus:

- Change
- Cause and Effect
- Systems
- Physical, Life and/or Earth Science

Curriculum Objectives:

At the end of this module, students will:

- discuss a story or article about science
- appreciate science as a human endeavour
- practise a science process skill
- recognise the use of mathematics and technology as tools of science
- carry out a scientific investigation
- value safety as a priority in science

Content Detail:

- all about science
  - scientific discovery, an invention, current news, history of science etc.
  - magazine or newspaper article [NIE or other]
  - fiction or non-fiction story including science fiction
  - video or other multimedia about science
- science as a human endeavour
  - many people have practised science for a long time in all cultures
  - men and women have contributed to science
  - many people make science a career
  - there is a lot still to be learned about our world
- science process skills
  - observing, measuring, estimating
  - classifying
  - inferring and predicting
  - collecting, recording and analyzing data
  - hypothesizing and designing an experiment
  - controlling variables and making models
  - communicating: telling, writing, drawing, showing
  - working in groups
- science tools: mathematics and technology
  - using mathematics: counting, graphing
- science investigation: *Eye Spy (see Appendix)*
- safety in the science classroom
  - handling materials and equipment safely
  - avoid running or playing during an investigation
  - report any accident to the teacher
  - do not taste anything unless directed by the teacher
  - ask for help when necessary

Module Title: All About Science	**Sequence Reference:** P2 SC-A

Recommended Instructional Strategies:

- Story or article about science: read a story or article about science or a scientist. Discuss the events, the characters (scientists), the importance of the invention, event or discovery. Have students recognize that men and women from different cultures have been involved in science from many years ago. Many people choose science as a career. [science as a human endeavour] Students should use their science journals to reflect on what has been discussed in an age appropriate manner (drawing or writing)
- Brainstorm safety rules for science activities. List them, have students decorate them and post them in the classroom. The have students write a science safety contract date then sign it. This contract can be written on the inside cover of the science journal (exercise book)
  such as:
  - I will be safe during science class
  - I will handle science materials safety
  - I will report any accidents to the teacher
  - I will ...
- using science tools: students should practise using science equipment, using the computer for science games and interactive simulations; using mathematics in science (measuring, using calculators, reading and making charts and graphs)
- science process skills: explanations and examples [see appendix]
- science investigation: *Eye Spy*
  (refer to appendix for details of investigation)

Recommended Formative Assessment Strategies:

Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.

techniques include:

- **questioning**
  - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching
- **checklists**
  - teachers use these during observations or interactions to note mastery of particular concepts or skills
- **teacher observations**
  - teachers watch students (individuals or groups) during activities, guided and independent practise
- **games and puzzles** (including computer applications)
  - teachers can monitor levels of success at games or puzzles and intervene when necessary
- **mind maps, drawings**
  - teachers can diagnose misconceptions based on accuracy
- **quizzes** (oral and written) **and worksheets**
  - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions
- **science journals**
  - students use these to record details of investigations and a method of reflection (teacher will review journals regularly and give feedback)
  - investigations : what did I think about?
  - what did I do?
  - what did I see?
  - what did I find out?
  - reflections: what did I learn?
  - what did I like?
  - what else do I want to know ?

Module Title: All About Science	**Sequence Reference:** P2 SC-A

Summative Assessment:

Assessment given at the end of a module where data is used to generate grades.

- Possible entries for science journal:
  - reflection on video, article or story
  - description (draw, write or tell) of a scientist
  - evidence of mastery of process skill
  - record of laboratory investigation: *Eye Spy*

Special Resources:

(materials, equipment & community involvement)

- variety of science equipment: measuring cups, measuring cylinders, hand lens, rulers, balances, forcemeters, thermometers
- materials as cited in the investigations in the appendix
- lab safety rules
- stories or videos about scientific endeavours

References - Teacher:

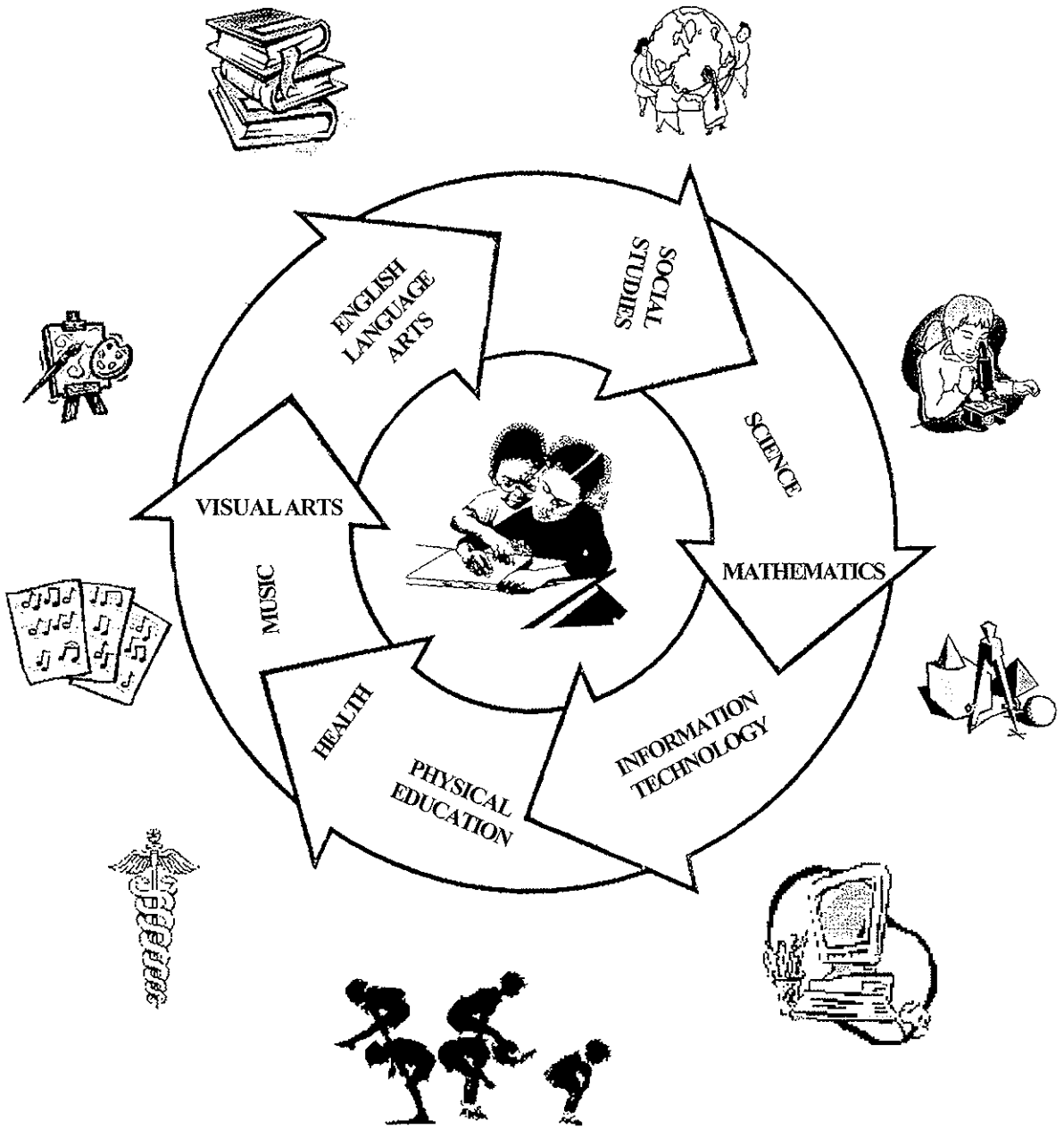
- McGraw-Hill Science. Grade 1
- Unit: *Be A Scientist*
- Reference Section: *Handbook and Glossary*

References - Student:

- McGraw-Hill Science. Grade 1
- Reference Section: *Handbook and Glossary*

Glossary:

- refer to text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Module B

SCIENCE

Module Title: Our Island Home -Living Things Growing and Changing

Sequence Reference: P2 SC-B

PHASE A				PHASE B		
PS	P1	P2	P3	P4	P5	P6
☐	☐	☒	☐	☐	☐	☐

Time allotted: 10 weeks

Subgoal Emphasis:

- 1.2 - 1.5 Nature and History of Science
- 2.1 - 2.8 Scientific Inquiry
- 3.1 - 3.4 Positive Attitude
- 4.1, 4.2 Advocate for the Environment

Content Focus:

- Change
- Cause and Effect
- Systems
- Life Science

Curriculum Objectives:

At the end of this module, students will:

- identify the main parts of a plant and explain their functions
- demonstrate the conditions for healthy growth of plants
- identify some Bermuda plants, their fruit and seeds (caution - some Bermuda plants and seeds are poisonous - make sure children wash hands after handling)
- categorise a selection of seeds and make predictions on how they disperse
- recognize the importance of plants
- explore a typical Bermuda pond habitat
- recognize the importance of conserving our pond habitats
- compare the life cycle of an animal hatched from an egg and one born live including humans
- describe changes in themselves since birth and suggest ways in which they may change as they get older
- describe how offspring are like their parents and each other - but different

Content Detail:

- the main parts of a plant and their functions
- conditions for growth of plants
- Bermuda plants - their fruits and seeds
- the importance of plants
  - provide homes and nesting spaces for animals
  - provide food for animals
  - life cycles of plants, seeds and how they disperse
- trees
  (link to Social Studies The Environment P2 SS-D)
  - a natural resource
  - provide wood, oxygen, shade
  - things that are made from trees
  - growing and protecting trees ("Growing with Trees")
- pond habitats
  - variety of life (biodiversity: see glossary)
  - importance
  - non-living things
- life cycles of animals
  - animal babies - animals hatching from eggs, animals born live, human growth and development
- variation in offspring
  - offspring are like their parents and each other, but different

Module Title: Our Island Home-Living Things Growing and Changing	**Sequence Reference:** P2 SC-B

Recommended Instructional Strategies:

- Create a gallery of class photos showing the children or their parents changing, as they get older. Discuss biological traits that students share with their parents or siblings
- Discuss growing and have students predict how much they will grow in the year. Record heights at beginning and during the year. Communicate data as graphs. **Encourage students to be sensitive and accepting of differences (link to Health Education)**
- Grow plants under a variety of conditions. Vary light, soils, water, liquids, and pollutants. Have children notice changes, pose questions, use appropriate measuring instruments and describe their observations accurately. Record and share their findings.
- Emphasise fair testing
- Experiment to find out the functions of the leaf, stem and roots of a plant. Record observations over a period of several weeks in pictures or simple text.
- Collect local seeds and experiment to see if they float, can be blown or catch on to things. Have the children make predictions about how the seeds move around. Try growing some of the seeds. Encourage careful and accurate observation and recording
- Make pictures from seeds and other dried plant material
- Make a collection of different kinds of wood and things made from wood. Discuss trees as a natural resource and as an important part of the environment.
- Walk the school grounds or neighbourhood and identify the trees. Record numbers for each species and communicate as a graph. Estimate heights and girth of trees
- Do bark rubbings of the different trees, label and display
- Make a Bermuda tree mural
- Read poems and stories about trees
- Set up a tank for tadpoles and monitor and record changes. March is the best time to find the eggs
- Bring caterpillars into the classroom. Make sure the children always bring some of the plant that they found the caterpillar on so that you know what it eats. Record changes. Use magnifiers for careful observation.
- Model good care of any classroom animals. Provide the caterpillar with fresh host plants/leaves each day. Set the butterfly or moth free when it has completed metamorphosis make sure the tadpoles and toads are fed.
- Through observation, compare and contrast the different animal life cycles.
- Contact Dept of Agricultural and Fisheries, BZS or National Trust for an interpretative pond arboretum visit

Recommended Formative Assessment Strategies:

Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.

techniques include:

- **questioning**
  - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching
- **checklists**
  - teachers use these during observations or interactions to note mastery of particular concepts or skills
- **teacher observations**
  - teachers watch students (individuals or groups) during activities, guided and independent practise
- **games and puzzles** (including computer applications)
  - teachers can monitor levels of success at games or puzzles and intervene when necessary
- **mind maps, drawings**
  - teachers can diagnose misconceptions based on accuracy
- **quizzes** (oral and written) **and worksheets**
  - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions
- **science journals**
  - students use these to record details of investigations and a method of reflection (teacher will review journals regularly and give feedback)
  - investigations: what did I think about?
  - what did I do?
  - what did I see?
  - what did I find out?
  - reflections: what did I learn?
  - what did I like?
  - what else do I want to know?

Module Title: Our Island Home-Living Things Growing and Changing	**Sequence Reference:** P2 SC-B

Summative Assessment:

Assessments given at the end of a module where the data is used to generate grades.

- Performance based examples:
  - Adapt any activities from previous section
  - Student project: have students present a collage or sequence of own growth and development showing inherited traits
  - Assess students using rubrics for understanding of concept, process and final product
  - Class project: song, rap, skit, dance or choral speaking on different aspects of Living Things Growing and Changing – can present to a school assembly
  - Use on adapt the performance assessment item at the end of chapter of topics found in this unit
- End of unit test: teacher made or from Unit 1: *A Tree* and Unit 5: *A Pond*

Special Resources:

(materials, equipment & community involvement)

- Bermuda Aquarium, Museum and Zoo
  - Class - *'Animal Babies'* - discover animals that hatch from eggs and animals that were born live at the Aquarium and Zoo
- Bermuda Zoological Society Resource Boxes: "Plants - Living and Growing", Animals and their Young, Insects, "Amphibians"
  - Please call the Education office at 293 2727 x116 to book any of the above
- Botanical Gardens - provides a wonderful variety of trees to explore
- Department of Agriculture and Fisheries
  - Entomologist - Can sometimes provide live insects showing various stages of metamorphosis, but she needs warning
- Department of Environmental Health - Environmental Health Officer - can provide information on mosquito life cycles
- cross curricular connections: English Language Arts, Mathematics, Art, Social Studies (P2 SS-D)
- field trips/visits: nature reserve near the school (can call for information), Windy Bank Chicken Farm, Tulo Valley Endemic Plant Production Propagation
- videos: Learn-A-Lots *Insects* (PANATEL)

References - Teacher:

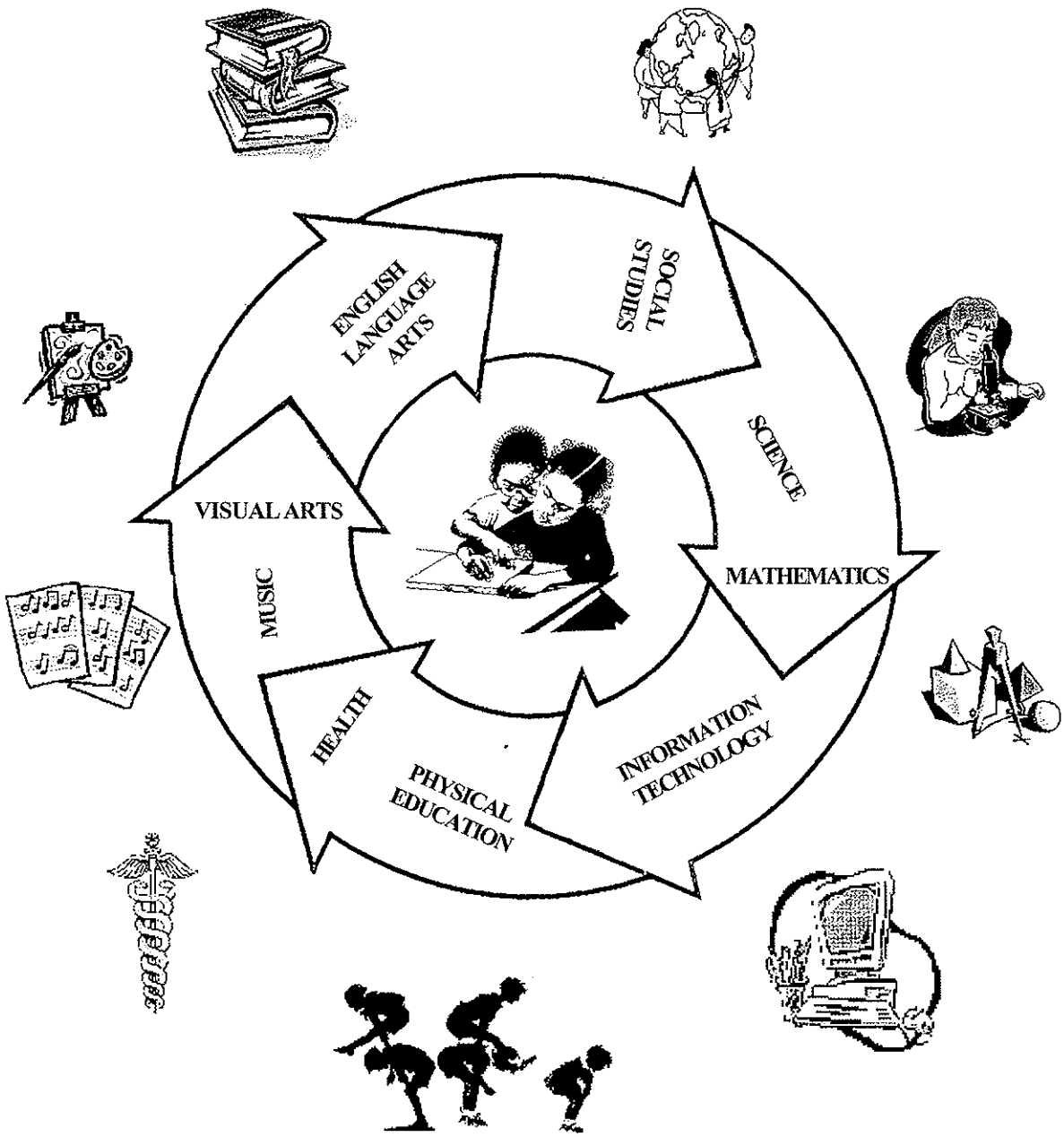
- McGraw-Hill Science. Grade 1
- Unit 1: *A Tree*
- Unit 5: *A Pond*
- Bermuda Zoological Society Resources Boxes (refer above)

References - Student:

- McGraw-Hill Science. Grade 1
- Unit 1: *A Tree*
- Unit 5: *A Pond*

Glossary:

- Biodiversity: the variety of life – combination of two words biological and diversity. It includes the different types of plants and animals (species diversity), the different types of homes they live in (habitat diversity), and how individuals of a certain type of plant and animal vary (genetic diversity). examples are:
  - species diversity: cat, bluebird, human being, hibiscus, ant, amoeba (micro-organism)
  - habitat diversity: coral reef, marsh, Bermuda forests
  - genetic diversity: tabby cats, Siamese cats, brown-skinned people, blue-eyed people
- other terms: refer to text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Module C

SCIENCE

Module Title: Sun, Moon and Stars

Sequence Reference: P2 SC-C

PHASE A				PHASE B		
PS	P1	P2	P3	P4	P5	P6
☐	☐	☒	☐	☐	☐	☐

Time allotted: 6 weeks

Subgoal Emphasis:

- 1.1 - 1.5 Nature and History of Science
- 2.1 - 2.8 Scientific Inquiry
- 3.2 - 3.3 Positive Attitudes

Content Focus:

- Change
- Cause and Effect
- Systems
- Earth Science

Curriculum Objectives:

At the end of this module, students will:

- identify and describe things that can be seen in the sky
- recognize that the sun as the source of heat and light
- observe and describe patterns of changes in the sky that occur during day and night
- be aware of the changes in the moon over one month
- describe how animals (including humans) respond to daily and seasonal changes

Content Detail:

- objects in the sky: sun, moon, stars
- sun (our star)
  - provides heat: warms up land and sea
  - provides light and causes shadows
  - is important to plants and animals
  - danger of looking directly at the sun (health connection)
- changes in the sky
  - day to night
  - position of the sun: sunrise and sunset, midday
  - what stars look like: different brightness, star patterns
  - cloud cover and the sun (where is the sun)
  - season
- moon phases
- animals response to daily and seasonal changes
  - daily changes - animals that hide/sleep during the day and come out at night; humans and other animals sleep at night and work, eat, play during the day
  - seasonal changes - animal adaptations to cold weather, hot weather, hibernation, migration

Module Title: Sun, Moon and Stars	**Sequence Reference:** P2 SC-C

Recommended Instructional Strategies:

- Make picture cards of sun, moon and stars. Have students name them and when they can be seen
- Encourage parents to help students draw the shape of the moon over a 2-4 week period
- Act out objects in the sky and their movements
- Discuss changes in activities of people and animals over the day/night cycle such as sleeping, going to school, eating lunch, waking. Explain that some animals such as owls and bats come out only at night
- Investigation: How the sun's energy changes things
  - Place ice and or water at different places on the school grounds or classroom. Revisit after a period of time. Observe and describe the changes. Students can use thermometers to measure temperature differences
- Use binoculars and/or telescope to explore "close" and "far away". Explain these concepts with reference to the sun, moon and stars
- Choose a particular spot on the school grounds and draw children's shadows during the morning, at noon and during the afternoon. Discuss how shadows are formed (the body blocks the light from the sun). This can be extended to shadow making or shadow puppets in the classroom using a flashlight
- Warm and cold colours:
  Have children predict which colours are best worn on a hot or cold day. Place different coloured felt squares (white, yellow, light blue, dark blue and red) in the sun. After ½ hour have children check how the squares feel. Then ask: Which colours would you wear on a hot day? What colours would you wear on a cold day?

Recommended Formative Assessment Strategies:

Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.

techniques include:

- **questioning**
  - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching
- **checklists**
  - teachers use these during observations or interactions to note mastery of particular concepts or skills
- **teacher observations**
  - teachers watch students (individuals or groups) during activities, guided and independent practise
- **games and puzzles** (including computer applications)
  - teachers can monitor levels of success at games or puzzles and intervene when necessary
- **mind maps, drawings**
  - teachers can diagnose misconceptions based on accuracy
- **quizzes** (oral and written) **and worksheets**
  - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions
- **science journals**
  - students use this to record details of investigations and a method of reflection (teacher will review journals regularly and give feedback)
  - investigations: what did I think about?
  - what did I do?
  - what did I see?
  - what did I find out?
  - reflections: what did I learn?
  - what did I like?
  - what else do I want to know?

Module Title: Sun, Moon and Stars	**Sequence Reference:** P2 SC-C

Summative Assessment:

Assessments given at the end of a module where the data is used to generate grades.

- Performance based examples:
  - Adapt any activities from previous section
  - Class project: use sheets of paper and craft materials to produce a day and night sky as a wall mural on two sides or the ceiling of the classroom, assess students using rubrics for understanding of concept, process and final product
  - Use or adapt the performance assessment tasks at the end of chapter/topics found in this unit
- End of unit test: teacher-made or from Unit 2: *The Sky*

Special Resources:

(materials, equipment & community involvement)

- cross curricular connections: English Language Arts, Mathematics
- guest speakers: astronomer, pilot
- field trips/visits: a starry night "lock in" with members of astronomy society or persons with telescope or binoculars
- school library or children's library for a special visit based on Space

References - Teacher:

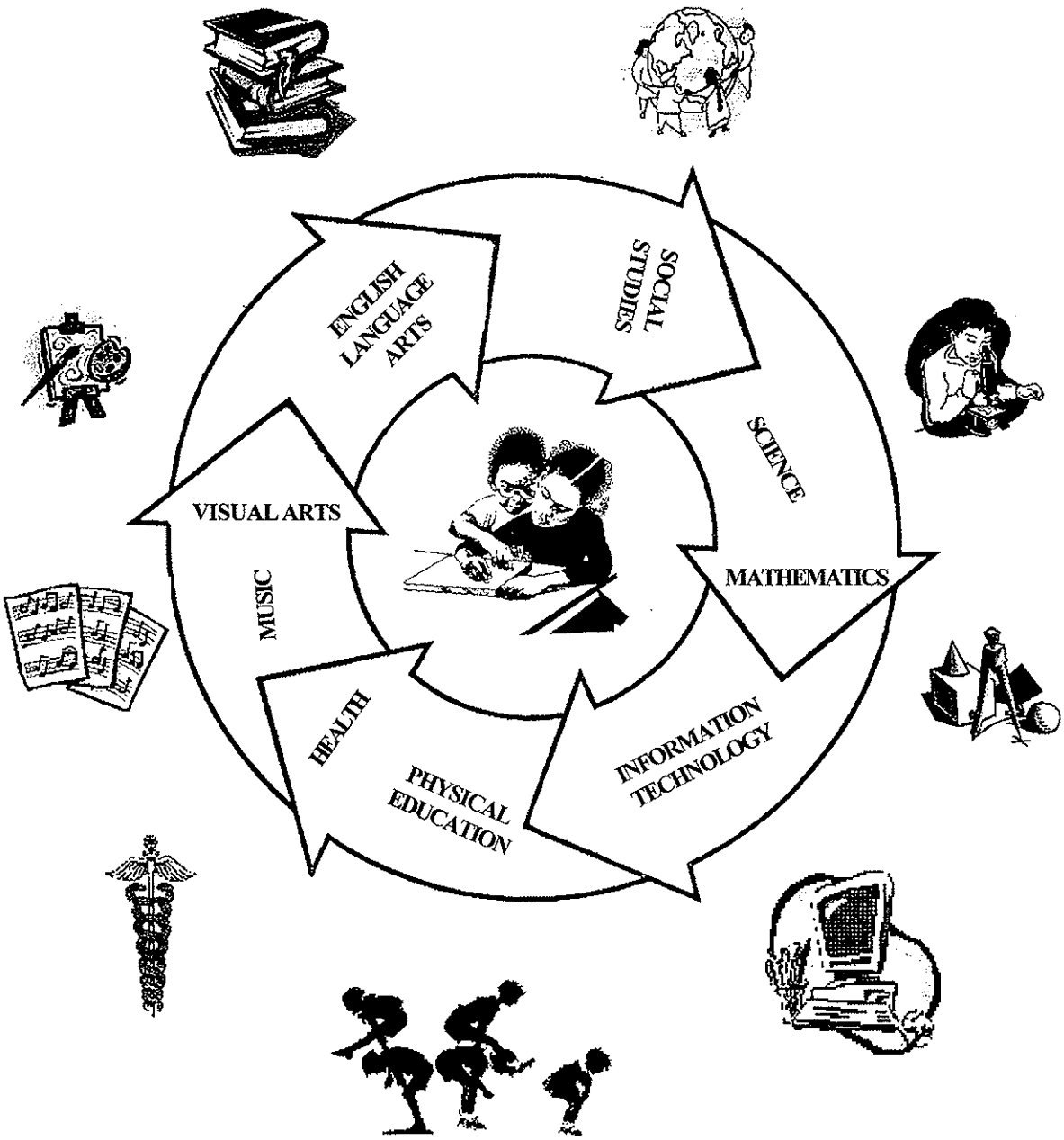
- McGraw Hill Science. Grade 1
- Unit 2: *The Sky*

References - Student:

- McGraw Hill Science. Grade 1
- Unit 2: *The Sky*

Glossary:

- refer to text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Module D

SCIENCE

Module Title: Pushes And Pulls

Sequence Reference: P2 SC-D

PHASE A				PHASE B		
PS	P1	P2	P3	P4	P5	P6
☐	☐	☒	☐	☐	☐	☐

Time allotted: 8 weeks

Subgoal Emphasis:

- 1.2 - 1.5 Nature and History of Science
- 2.1 – 2.8 Scientific Inquiry
- 3.1- 3.4 Positive Attitude
- 4.1 Advocate for the Environment

Content Focus:

- Change
- Cause and Effect
- Systems
- Physical Science

Curriculum Objectives:

At the end of this module, students will:

- describe the position of objects relative to themselves or other objects
- investigate and describe the motion of various living things and objects
- predict whether objects will be moved with a push and/or a pull
- compare very fast moving objects to slow moving ones
- recognize that sound can be made by vibrating objects

Content Detail:

- relative position of objects: e.g. above, below, left, right, next to, etc.
- motion of objects: e.g. stationary, push, pull, turning, stopping, fast, slow
- how objects move:
  - piano keys (push)
  - drawer (push and pull)
  - variety of toys and machines
  - animal motion: various animals e.g. bunny, snake, fish, people
  - motion caused by the wind: flags and waves
- what affects making things move
  - size of push or pull
  - surfaces: rough, smooth
  - friction
  - weight
  - making thing stop (resistance to motion)
- speed of movement
  - how far, how fast
  - comparing speed (using concepts faster, slower etc.)
  - things that move faster than the eye can see
- vibrations
  - voice box
  - drum skin
  - rulers
  - strings

Module Title: Pushes And Pulls	**Sequence Reference:** P2 SC-D

Recommended Instructional Strategies:

- Teachers and students play "Simon Says". Teacher observes student movements as a check for understanding.
- Experiential – students will carefully touch voice box and note feeling when talking, humming, singing, being silent. Teacher will discuss importance of voice box, how it vibrates when we talk, how to take care of this part of the body (playing roughly, grabbing necks etc)
- Find a video about a theme park – describe movement of various rides (roller coaster, merry-go-round, simulated 3D rides, tea cup rides, bumper cars etc.)
- Pushes and pulls
  Students investigate what type of things they can pull with a clothes peg.
  Students investigate what type of things they can push by blowing with a straw. Students are asked how they might move bigger or heavier objects.
- Soft push – hard push
  From a start line, students push a car with a soft push and measure the distance that it has travelled.
  The experiment is repeated but with a hard push.
  Students measure the distance moved by the car
- Spinners
  Students make a spinner out of card and then time it (using clapping) falling to the ground.
- Fast or slow?
  Students go outside and observe.
  Students are asked to record two lists, one of fast things, one of slow things.

Recommended Formative Assessment Strategies:

Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.

techniques include:

- **questioning**
  - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching
- **checklists**
  - teachers use these during observations or interactions to note mastery of particular concepts or skills
- **teacher observations**
  - teachers watch students (individuals or groups) during activities, guided and independent practise
- **games and puzzles** (including computer applications)
  - teachers can monitor levels of success at games or puzzles and intervene when necessary
- **mind maps, drawings**
  - teachers can diagnose misconceptions based on accuracy
- **quizzes** (oral and written) **and worksheets**
  - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions
- **science journals**
  - students use these to record details of investigations and a method of reflection (teacher will review journals regularly and give feedback)
  - investigations: what did I think about?
  - what did I do?
  - what did I see?
  - what did I find out?
  - reflections: what did I learn?
  - what did I like?
  - what else do I want to know?

Module Title: Pushes And Pulls	**Sequence Reference:** P2 SC-D

Summative Assessment:

Assessments given at the end of a module where the data is used to generate grades.

- Performance bases:
  - Adapt any activities from previous section
  - Student project: students bring a toy from home and explain how it moves, what makes it move faster, slower, or stop. Assess students using rubric for understanding of concept.
  - Class game - make flags called Push or Pull and give pair to each student. Teacher or other students ask class or group to predict how various objects will move. Students will raise correct flags. Flags can be colour coded or have arrows designated them Push and Pull for students who have difficulty reading. Teacher checks understanding by recording students answers using checklist
  - Use or adapt the performance assessment tasks at the end of chapter/topic found in this unit
- End of unit test: teacher made or from Unit 4 *On the Move*:

Special Resources:

(materials, equipment & community involvement)

- cross curricular connections: English Language Arts, Mathematics, module P1 SC-B Materials and Their Changes
- guest speakers: drivers of any vehicles, pianist or other musicians (movement of piano keys, strings inside piano, drum skins, violin or guitar strings)
- field trips/visits: watching tug boats moving cruise ships in the harbour, cranes on a building site

References - Teacher:

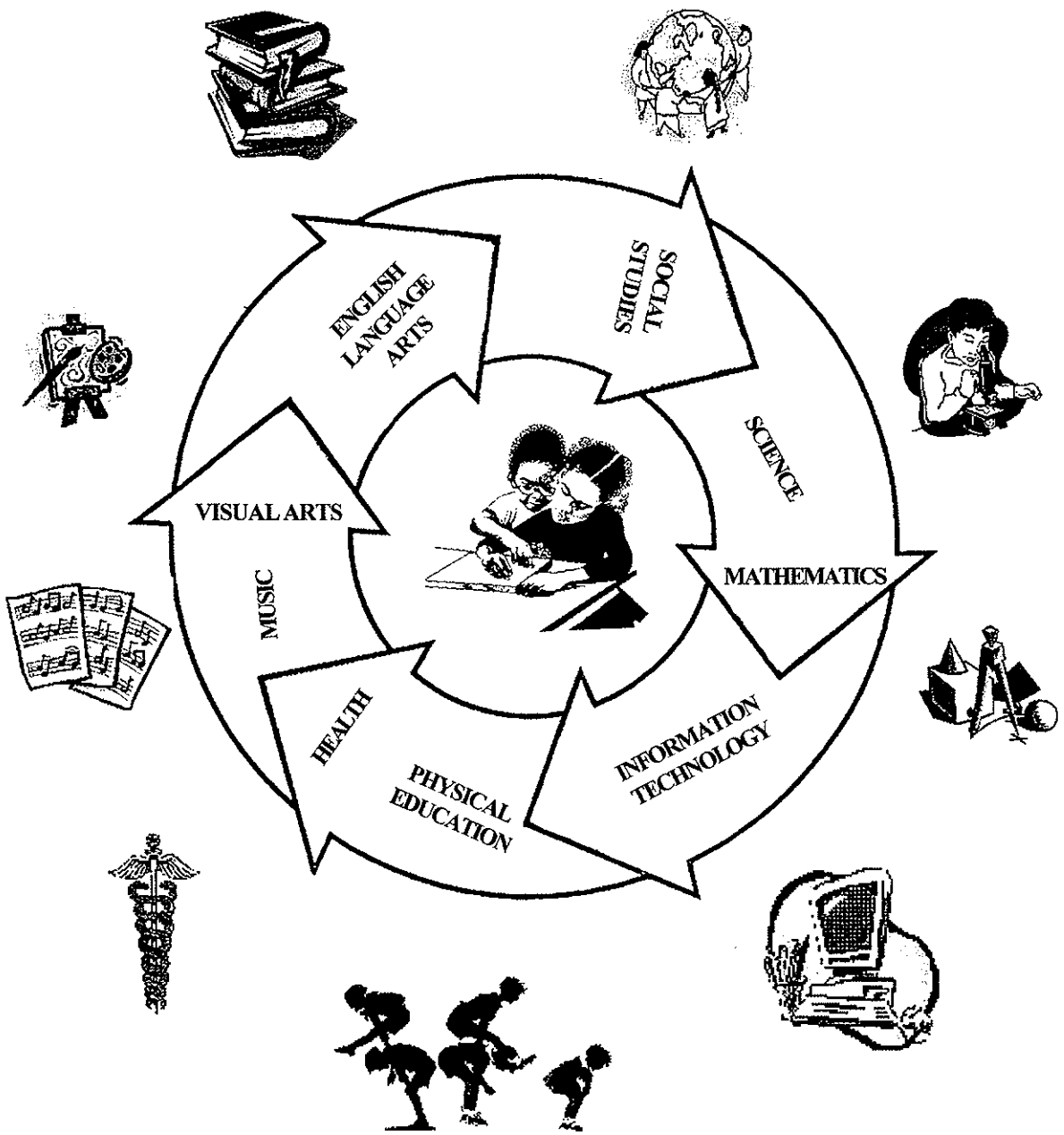
- McGraw-Hill Science. Grade 1
- Unit 4: *On the Move*

References - Student:

- McGraw-Hill Science. Grade 1
- Unit 4: *On the Move*

Glossary:

- refer to text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Module E

SCIENCE

Module Title: Materials and Their Changes

Sequence Reference: P2 SC-E

PHASE A				PHASE B		
PS	P1	P2	P3	P4	P5	P6
☐	☐	☒	☐	☐	☐	☐

Time allotted: 8 weeks

Subgoal Emphasis:

- 1.2 – 1.5 Nature and History of Science
- 2.1 – 2.8 Scientific Inquiry
- 3.1 – 3.4 Positive Attitude
- 4.1 Advocate for the Environment

Content Focus:

- Change
- Cause and Effect
- Physical Science

Curriculum Objectives:

At the end of this module, students will:

- recognize and describe characteristics of different materials
- distinguish between man-made and natural materials
- investigate and describe the properties of solids, liquids and gases
- measure physical properties of objects
- explore and describe ways in which materials can be changed
- recognize the importance of conserving our natural resources

Content Detail:

- characteristics of materials
- natural and man-made materials
  - natural: wood, water, straw, air, gold, silver
  - man-made: plastic (polythene, Styrofoam), soap, margarine
- solids, liquids and gases in everyday life
  - solids: wood, metal, plastic, rocks
  - liquids: water, gasoline, cooking oil
  - gases: air, gas for the stove, chlorine
- measurement
  - comparative measurement
  - standard and non standard measurement: mass and length
- changing materials
  - physical changes: twisting, squashing, melting, bending, stretching
  - permanent changes: cooking, sand to concrete
  - changing natural materials for our use (wood to paper; sheep's wool to sweater; mud to china etc.)
  - using and conserving our natural resources **(link to P2 SC-D)**

Module Title: Materials and Their Changes	**Sequence Reference:** P2 SC-E

Recommended Instructional Strategies:

- Ask students to predict how they can change the shape of various objects – springs/slinky, soap, crayon, and paper. Children can draw original object, write how it was changed (squash, bend, twist) and draw a picture of the object after changing.
- Have students play statue and change their shapes into letters, animals, objects (balls etc). Name the process –stretched myself, curled myself etc.
- Students could use paper mâché or silly putty to make various objects. Students could guess whether the original substance could be obtained again in the original state
- Teacher and children use groups of everyday objects and find out where they come from by exploring their characteristics:
  - This toy is made from wood and wood comes from a tree
  - This candle is made of wax and bees make wax

  Can extend this activity by having a carpenter and a beekeeper visit the class
- Students can explore the characteristics of materials by making new things
  - Using wool or yarn to knit, crochet or plait
  - Cooking – boiling an egg, making a pizza or cookies
- Obtain cotton from cotton trees and compare with cotton clothing
- Students can predict what kinds of musical sounds different materials would make. They can then test their predictions using elastic bands, water in a bottle, paper or card as drum skin etc.

Recommended Formative Assessment Strategies:

Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.

techniques include:

- **questioning**
  - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching
- **checklists**
  - teachers use these during observations or interactions to note mastery of particular concepts or skills
- **teacher observations**
  - teachers watch students (individuals or groups) during activities, guided and independent practise
- **games and puzzles** (including computer applications)
  - teachers can monitor levels of success at games or puzzles and intervene when necessary
- **mind maps, drawings**
  - teachers can diagnose misconceptions based on accuracy
- **quizzes** (oral and written) **and worksheets**
  - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions
- **science journals**
  - students use these to record details of investigations and a method of reflection (teacher will review journals regularly and give feedback)
  - investigations: what did I think about?
  - what did I do?
  - what did I see?
  - what did I find out?
  - reflections: what did I learn?
  - what did I like?
  - what else do I want to know?

Module Title: Materials and Their Changes	**Sequence Reference:** P2 SC-E

Summative Assessment:

Assessments given at the end of a module where the data is used to generate grades.

- Performance based:
  - Adapt any activities from previous section
  - Class project: create a corridor bulletin board about this topic sing rubrics, assess students for understanding of concept, process and final product
  - Use or adapt the performance assessment item at the end of chapter of topics found in this unit
- End of unit test: teacher made or from Unit 3: *Matter, Matter Everywhere*

Special Resources:
(materials, equipment & community involvement)

- cross curricular connections: Art, English Language Arts, Mathematics, Music, module P2 SC-D Pushes and Pulls
- visitors: artists (Art teacher), seamstress, chef, senior citizen
- field trips/visits: Bermuda Pottery, restaurant kitchen, bakery, recycling centre, gravel pit, Bermuda Government Quarry

References - Teacher:

- McGraw-Hill Science. Grade 1
- Unit 3: *Matter, Matter Everywhere*
- Unit 1: *A Tree (topic 5)*

References - Student:

- McGraw-Hill Science. Grade 1
- Unit 3: *Matter, Matter Everywhere*
- Unit 1: *A Tree (topic 5)*

Glossary:

- refer to text

Science - P3
Level Code: P3 SC

MINISTRY OF EDUCATION
Bermuda
2001

PRIMARY SCHOOL
PHASE A OVERVIEW

Subject Title: Science **Subject Code:** P3 SC

Time Allotted: 150 min/wk

RATIONALE

Children from their earliest years are about their world; they explore, they ask questions and they enjoy the process of discovery. They develop wonderful ideas to explain phenomena that they observe. The science programme at the preschool and primary levels will use rich learning experiences to help the way that these ideas are formed, tested and modified. All children can then discover that science is part of their world, a fascinating world that they can interact with and understand.

The preschool and primary science programme will not only provide a sound foundation for middle level science, but also foster the development of a lifelong appreciation for learning in a world increasingly influenced by science, technology and challenges to the environment.

PRIMARY THREE (P3) REQUIREMENTS

The requirements for this level are as follows:

• **Performance Assessment*** - Science investigations and other activities, dances, skits, role-play, skills tests, teacher observations, oral questioning, interviews	**40%**
• **Product Assessment*** - Games, journals, poems, posters, drawings, models, projects, stories, collages, crosswords, reports, letters, scores from interactive computer applications, topic portfolio	**45%**
• **Written Assessment** - ***Selected response***: multiple choice, true-false, matching - ***Constructed response:*** fill in the blank, short answers, label a diagram, visual organizers (web, graph, chart, concept map, illustration)	**15%**
Total	**100%**

*** Product and performance assessment scored by rubric**

MATERIALS OF INSTRUCTION (Adopted Text)

Baptiste, H. et al. McGraw Hill Science. New York: McGraw-Hill School Division, 2000.

PHASE A OUTLINE

P1
Module Titles A - D

A. All About Science..... 2
- reading about science
- science as a human endeavour
- science process skills
- tools of science
- scientific investigation

B. Alive and Well..... 12
- living and non- living things
- life processes
- plants and animals
- our bodies
- environmental stewardship

C. Our Island Home - Water and Weather 10
- sources of water in Bermuda
- importance of water
- properties of ocean and fresh water
- weather and water changes
- use of water in Bermuda
- sun and cyclical patterns
- weather and clothing

D. Matter and Motion 10
- exploring through our senses
- kinds of materials and their uses
- how things move

P2
Modules Titles A - E

A. All About Science..... 2
- reading about science
- science as a human endeavour
- science process skills
- tools of science
- scientific investigation

B. Our Island Home - Living Things Growing And Changing..... 10
- plants growing and changing
- Bermuda plants and trees
- trees as a natural resource
- a Bermuda pond habitat
- life cycles
- protecting our natural resources

C. Sun, Moon and Stars 6
- objects in the sky
- importance of the sun
- patterns in the sky
- animals and daily and seasonal changes

D. Pushes and Pulls..... 8
- positions of objects
- motion
- making things move
- sound – vibrating objects

P3
Modules Titles A - E

A. All About Science 2
- reading about science
- science as a human endeavour
- science process skills
- tools of science
- scientific investigation

B. Adaptation and Survival..... 10
- plant and animal adaptations
- habitats
- endangerment and extinction
- protection of our animals and plants
- dinosaurs

C. Our Island Home – Land and Water..... 8
- Bermuda's natural resources
- the ocean and seashore
- impact of man on our island home
- advocacy for protection of our island home

D. Forces and Magnets..... 6
- force as a push or pull
- force of gravity
- forces of magnetic attraction and repulsion

E. Materials and Their Changes 8
- characteristics of different materials
- measuring objects
- solids, liquids and gases
- changes in materials

E. Energy in Our Lives 8
- heat, light and sound energy
- pitch and loudness
- sound and hearing
- noise and sound
- light sources
- shadows

Subtotal	34	Subtotal	34	Subtotal	34
Optional Weeks	4	Optional Weeks	4	Optional Weeks	4
Total Weeks	38	Total Weeks	38	Total Weeks	38

PRIMARY SCHOOL

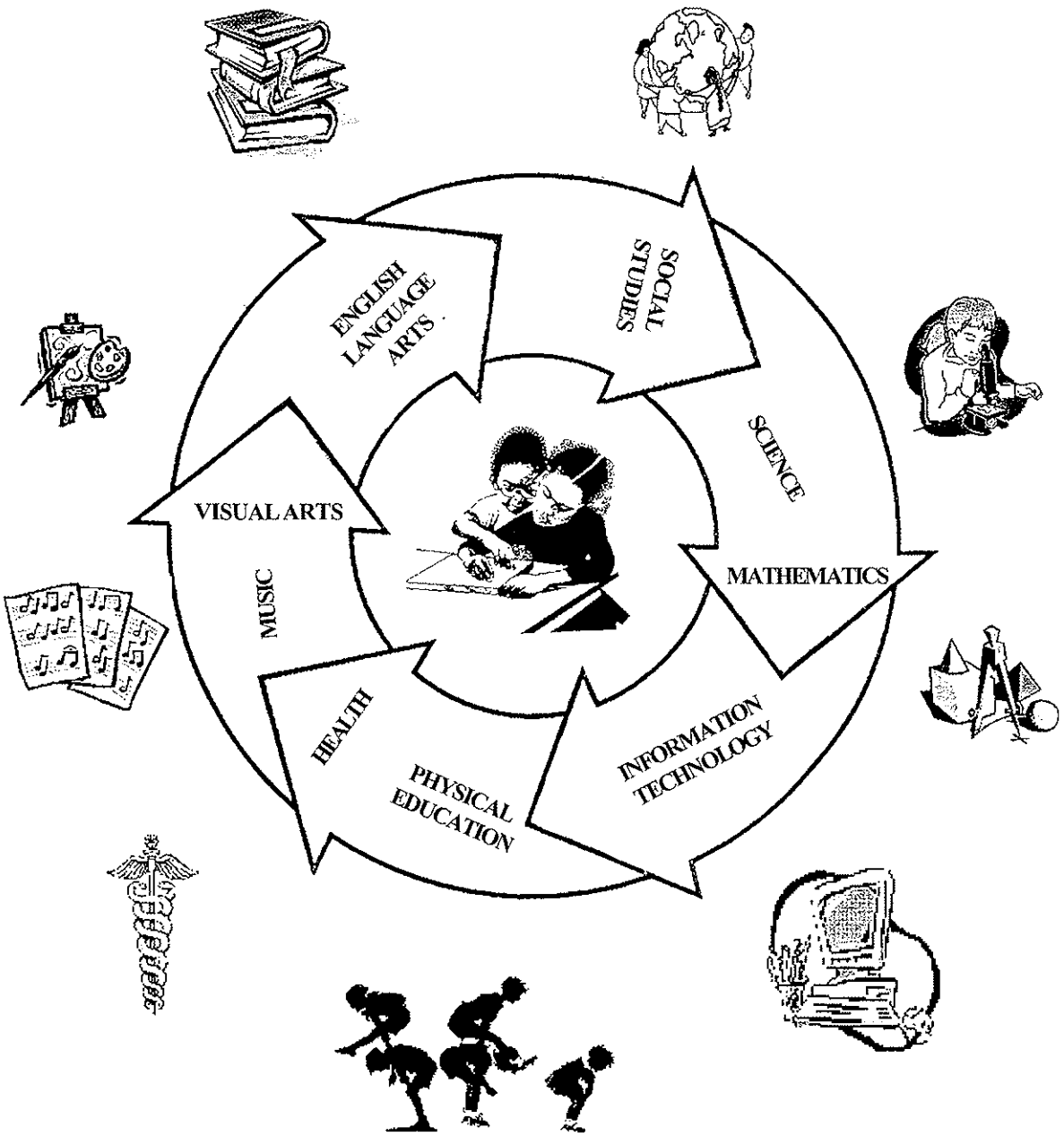
check one: PS ☐ P1 ☐ P2 ☐ P3 ☒ P4 ☐ P5 ☐ P6 ☐

Science

GOALS		SUBGOALS		MODULE & CURRICULUM CORRELATION MATRIX				
1	Conceptualizing the History and Nature of Science	1.1	Contribution/Diversity	x		x	x	
		1.2	Connections	x	x	x	x	x
		1.3	Health				x	x
		1.4	Inter-relationship/Mathematics Science Technology	x	x	x	x	x
		1.5	Problem Solving	x	x	x	x	
2	Demonstrating the Nature of Scientific Inquiry	2.1	Hypothesis	x	x	x	x	x
		2.2	Design	x	x	x	x	
		2.3	Data Collection	x	x	x	x	x
		2.4	Technology Use	x	x	x	x	
		2.5	Explanations/Limitation	x	x	x	x	
		2.6	Explanations/Alternatives		x	x		
		2.7	Communications/Results		x	x		
		2.8	Research		x	x		
3	Demonstrating Positive Attitudes Towards Science	3.1	Present use of Science	x	x	x	x	x
		3.2	Value, Environment	x	x	x	x	
		3.3	Ethical, Applications	x	x	x	x	
		3.4	Career Options	x		x		
4	Advocating for Environmental Responsibility	4.1	Environmental Stewardship		x	x		x
		4.2	Environmental Applications	x	x	x		
CONTENT STRUCTURE		Change		x	x	x	x	x
		Cause & Effect		x	x	x	x	x
		Systems		x	x		x	
		Life Science		x	x			
		Physical Science		x			x	x
		Earth Science		x		x		
		MODULE		**A**	**B**	**C**	**D**	**E**

MODULE KEY

A - All About Science
B - Adaptation And Survival
C - Our Island Home-Land and Water
D - Forces And Magnets
E - Energy In Our Lives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Module A

SCIENCE

Module Title: All About Science

Sequence Reference: P3 SC-A

PHASE A				PHASE B		
PS	P1	P2	P3	P4	P5	P6
☐	☐	☐	☒	☐	☐	☐

Time allotted: 2 weeks

Subgoal Emphasis:

- 1.1, 1.2, 1.4, 1.5 Nature and History of Science
- 2.1 – 2.5 Scientific Inquiry
- 3.1 – 3.4 Positive Attitude
- 4.2 Advocate for the Environment

Content Focus:

- Change
- Cause and Effect
- Systems
- Physical, Life and/or Earth Science

Curriculum Objectives:

At the end of this module, students will:

- discuss a story or article about science
- appreciate science as a human endeavour
- practise a science process skill
- recognise the use of mathematics and technology as tools of science
- carry out a scientific investigation
- value safety as a priority in science

Content Detail:

- all about science
  - scientific discovery, an invention, current news, history of science etc.
  - magazine or newspaper article [NIE or other]
  - fiction or non-fiction story including science fiction
  - video or other multimedia about science
- science as a human endeavour
  - many people have practised science for a long time in all cultures
  - men and women have contributed to science
  - many people make science a career
  - there is a lot still to be learned about our world
- science process skills
  - observing, measuring, estimating
  - classifying
  - inferring and predicting
  - collecting, recording and analyzing data
  - hypothesizing and designing an experiment
  - controlling variables and making models
  - communicating: telling, writing, drawing, showing
  - working in groups
- science tools: mathematics and technology
  - using mathematics: counting, graphing
- science investigation: *How Strong are Plastic Bags? (see Appendix)*
- safety in the science classroom
  - handling materials and equipment safely
  - avoid running or playing during an investigation
  - report any accident to the teacher
  - do not taste anything unless directed by the teacher
  - ask for help when necessary

Module Title: All About Science	**Sequence Reference:** P3 SC-A
Recommended Instructional Strategies:	**Recommended Formative Assessment Strategies:**
• Story or article about science: read a story or article about science or a scientist. Discuss the events, the characters (scientists), the importance of the invention, event or discovery. Have students recognize that men and women from different cultures have been involved in science from many years ago. Many people choose science as a career. [science as a human endeavour] Students should use their science journal to reflect on what has been discussed in an age appropriate manner (drawing or writing) • Brainstorm safety rules for science activities. List them, have students decorate them and post them in the classroom. • Using science tools: students should practice using science equipment, using the computer for science games and interactive simulations; using mathematics in science (measuring, using calculators, reading and making charts and graphs) • Science process skills: explanations and examples [see appendix] • Science investigation: *How Strong are Plastic Bags*? (refer to appendix for details of investigation)	**Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.** **techniques include:** • **questioning** - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching • **checklists** - teachers use these during observations or interactions to note mastery of particular concepts or skills • **teacher observations** - teachers watch students (individuals or groups) during activities, guided and independent practise • **games and puzzles** (including computer applications) - teachers can monitor levels of success at games or puzzles and intervene when necessary • **mind maps, drawings** - teachers can diagnose misconceptions based on accuracy • **quizzes** (oral and written) **and worksheets** - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions • **science journals** - students use these to record details of investigations and a method of reflection (teacher will review journals regularly and give feedback) - investigations : what did I think about? - what did I do? - what did I see? - what did I find out? - reflections: what did I learn? - what did I like? - what else do I want to know ?

Module Title: All About Science	**Sequence Reference:** P3 SC-A

Summative Assessment:

Assessment given at the end of a module where data is used to generate grades.

- Possible entries for science journal:
  - Reflection on video, article or story
  - Description (draw, write or tell) of a scientist
  - Evidence of mastery of process skill
  - Record of laboratory investigation: *How Strong are Plastic Carrier Bags?*

Special Resources:

(materials, equipment & community involvement)

- variety of science equipment: measuring cups, measuring cylinders, hand lens, rulers, balances, force meters, thermometers
- materials as cited in the investigations in the appendix
- lab safety rules
- stories or videos about scientific endeavours

References - Teacher:

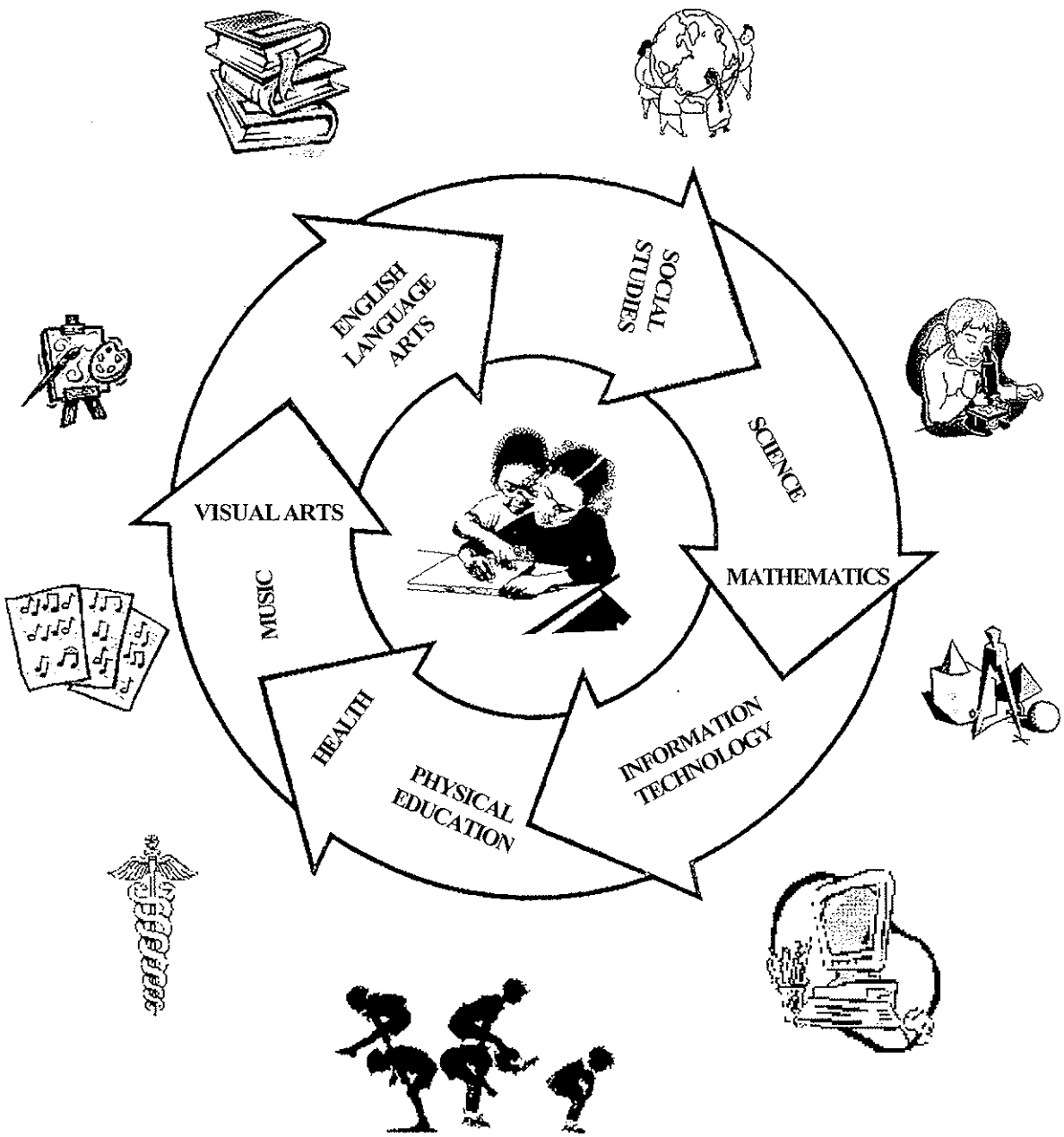
- McGraw-Hill Science. Grade 2
- Unit: *Be A Scientist*
- Reference Section: *Handbook and Glossary*

References - Student:

- McGraw-Hill Science. Grade 2
- Reference Section: *Handbook and Glossary*

Glossary:

- refer to text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Module B

SCIENCE

Module Title: Adaptation and Survival

Sequence Reference: P3 SC-B

PHASE A				PHASE B		
PS	P1	P2	P3	P4	P5	P6
☐	☐	☐	☒	☐	☐	☐

Time allotted: 10 weeks

Subgoal Emphasis:

- 1.2, 1.4, 1.5 Nature and History of Science
- 2.1 – 2.8 Scientific Inquiry
- 3.1 – 3.3 Positive Attitude
- 4.1 - 4.2 Advocate for the Environment

Content Focus:

- Change
- Cause and Effect
- Systems
- Life Science

Curriculum Objectives:

At the end of this module, students will:

- recognize that different animals and plants live in different places and that they are adapted to their environment
- relate external features of animals and plants to their survival in their particular habitat
- explore and describe habitats of animals and plants near the school grounds
- recognize their role in taking care of habitats of living things
- explain why some animals and plants are endangered or become extinct
- identify the endangered species of Bermuda
- identify some of the animals that have become extinct in earth's history

Content Detail:

- animal and plant adaptations
  - plants and plant parts: root, leaf, stem, flower, kinds of seeds
  - adaptation of plant parts: e.g. shape and thickness of leaf, plants in costal environments
  - animals: types of animals adaptations associate with feeding habit, where they live and what they do e.g. birds beaks and feet, fish fins, mouths and body shapes
- habitats **(biodiversity: refer to glossary)**
  - provide air, water, shelter and food for animals and plants
  - non-living components (rocks, soil, water)
  - provide homes for different groups of animals and plants e.g. under a rock, in a tree, on a beach, under a log, in the pond
- habitats near school grounds: as above
- environmental stewardship
  - preventing damage to habitats
  - reducing waste and recycling
  - composting
- endangerment and extinction
  - animals become threatened or endangered through the actions of humans
  - Bermuda's threatened and endangered species e.g. - skink, cahow, sea turtles, endemic plants, various mollusks
  - fossil records show us that many species have become extinct through reasons other than humans influence e.g. dinosaurs

(link to module P3 SC-C Our Island Home Land and Water)

Module Title: Adaptation and Survival	**Sequence Reference:** P3 SC-B

Recommended Instructional Strategies:

- Make predictions about what animals and plants would be found in the school grounds.
  - Take a walk in the school grounds - challenge students to find, plants and animals in as many different places as possible. Produce a record in writing or pictures showing clearly the living things and where they were found e.g. in a wall, under a rock, in the grass etc.
  - Discuss differences between habitats and the animals and plants found in them. How do these differences or adaptations help them survive?
- Recreate a particular habitat in a terrarium/vivarium in the classroom. Take care of the animals and plants in the vivarium
- Set up experiments to determine the preferred habitat for small animals such as snails, "roly-polies" or other insects
- Make Plaster of Paris fossils of shells and leaves from clay molds
- Look for fossils in Bermuda rocks - West Indian top shell, Palmetto trunks and snail shells are evident on some of the South Shore beaches/rocky costal areas
- Make models and drawings of dinosaurs
- Discuss the various adaptations of the dinosaurs that tell scientists about the way they lived
  - Contact Marsh Folly Composting Centre for back yard Composting Programme
- Compost all biodegradable lunch waste and use resultant soil in school garden
- Model good environmental practice. Recycle cans and reuse paper and other materials in art and design classes
- Sort pictures of a variety of animal and plants into the correct environments
- Identify pictures of Bermuda's endangered animals and say why they are endangered
- Make predictions of the sorts of animals and plants found in a picture of a particular habitat
- Draw a picture of a plant that would do well in a beach habitat and one that would not do well
- Advocacy: Create a chapter of Rock Watchers for your school using resources provided by the organisation

Recommended Formative Assessment Strategies:

Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.

techniques include:

- **questioning**
  - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching
- **checklists**
  - teachers use these during observations or interactions to note mastery of particular concepts or skills
- **teacher observations**
  - teachers watch students (individuals or groups) during activities, guided and independent practise
- **games and puzzles** (including computer applications)
  - teachers can monitor levels of success at games or puzzles and intervene when necessary
- **mind maps, drawings**
  - teachers can diagnose misconceptions based on accuracy
- **quizzes** (oral and written) **and worksheets**
  - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions
- **science journals**
  - students use these to record details of investigations and a method of reflection (teacher will review journals regularly and give feedback)
  - investigations: what did I think about?
  - what did I do?
  - what did I see?
  - what did I find out?
  - reflections: what did I learn?
  - what did I like?
  - what else do I want to know?

Module Title: Adaptation and Survival	**Sequence Reference:** P3 SC-B

Summative Assessment:

Assessments given at the end of a module where the data is used to generate grades.

- Performance based examples:
  - Adapt any activities from previous section
  - Student/group project: provide a variety of craft materials for students to construct an animal from their imagination. Students must consider where the animal lives, how and what it eats, how it moves and protects itself. Students present animal to class or group explaining features. Assess students using rubrics for understanding of concept, process and final product
  - Class Project- presentation for assembly, another class or parents: Role play the animals and plants and abiotic (non-living) factors such as sunlight, wind, shade, salt spray in a given habitat to show how the animals and plants adapt to survive. Assess students using rubrics for understanding of concept, process and final product
  - Use or adapt the performance assessment tasks at the end of chapter/topics found in this unit
- End of unit test: teacher-made or from Unit 1: *Watering Earth's Plants*; Unit 5: *Rocky Homes*; Unit 2: *Clues from the Past* (Topics 1 – 3 only)

Special Resources:

(materials, equipment & community involvement)

- cross curricular connections: English Language Arts, Mathematics, Art
- guest speakers: recycling centre technician, garbage collector, Bermuda National Trust, Rock Watchers; Keep Bermuda Beautiful (KBB), Backyard Composting Programme (297-7856)
- field trips/visits: Bermuda Aquarium, Museum and Zoo, Island habitats using guides - Spittal Pond, Warwick Pond, beaches, recycling centre, Marsh Folly Composting Site (2927454) ;Fossil Field trip: Rocky Bay Park, Palm Grove GardensCoastline, Spittal Pond; Bermuda Underwater Exploration Institute: class exhibit Bermuda – exhibit Bermuda "birth" and geological time scale
- KBB-tour by memberr to discuss litter problems in school neighbourhood
  - trip to marine gas station where operators explain how they encourage boaters to reduce litter
- Internet sites:
  - www.bamz.org
  - www.audubon.bm

References - Teacher:

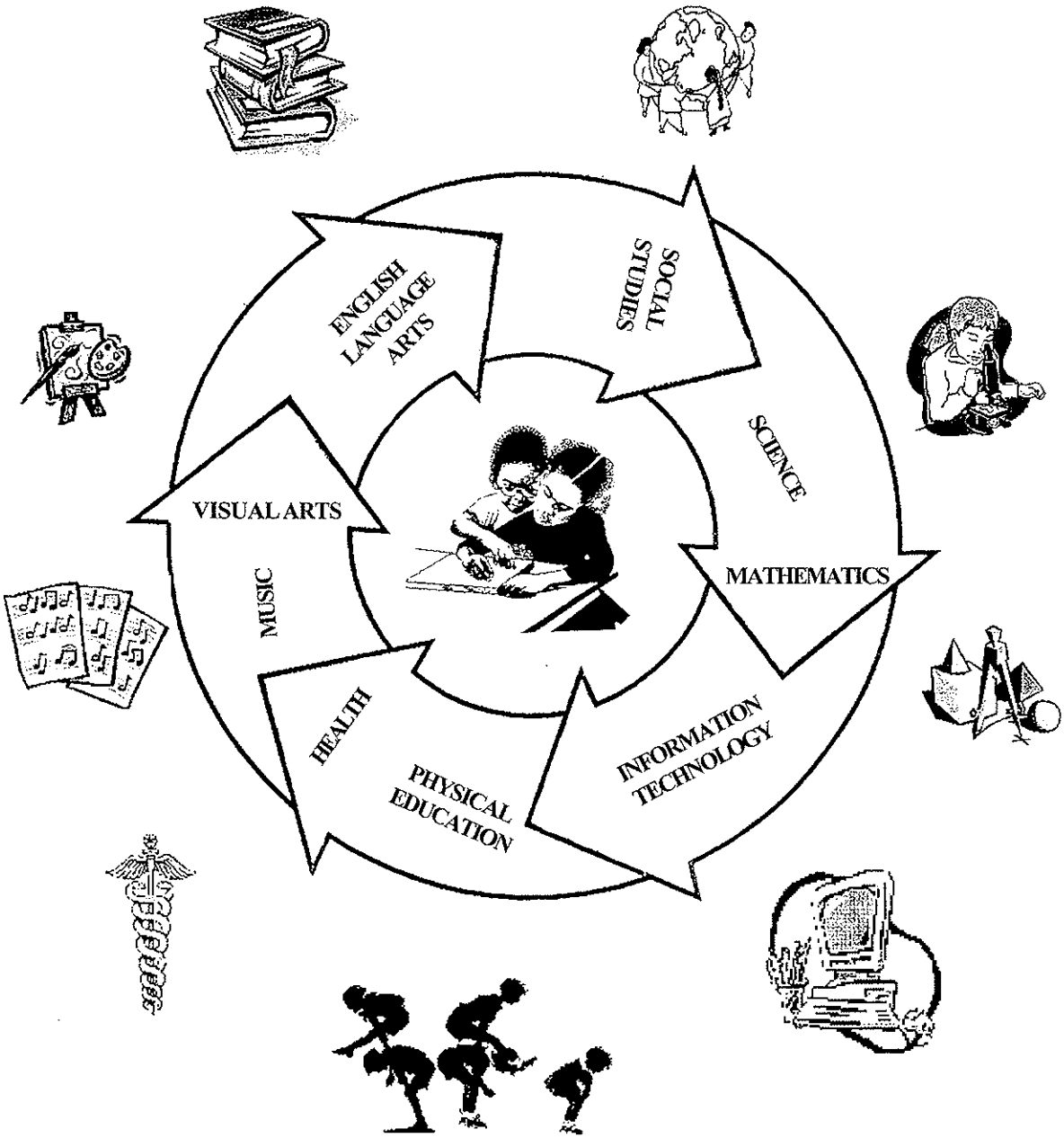
- McGraw-Hill Science. Grade 2
- Unit 1: *Watering Earth's Plants*
- Unit 5: *Rocky Homes*
- Unit 2: *Clues from the Past* (topics 1-3 only)
- Literacy Place: Story Studio (Week 3 page R24-25)

References - Student:

- McGraw-Hill Science. Grade 2
- Unit 1: *Watering Earth's Plants*
- Unit 5: *Rocky Homes*
- Unit 2: *Clues From the Past* (topics 1-3 only)
- Literacy Place Story: Studio (Week 3 page R24-25)

Glossary:

- **Biodiversity:** the variety of life – combination of two words biological and diversity. It includes the different types of plants and animals (species diversity), the different types of homes they live in (habitat diversity), and how individuals of a certain type of plant and animal vary (genetic diversity). examples are:
  - species diversity: cat, bluebird, human being, hibiscus, ant, amoeba (micro-organism)
  - habitat diversity: coral reef, marsh, Bermuda forests
  - genetic diversity: tabby cats, Siamese cats, brown-skinned people, blue-eyed people
- other terms: refer to text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Module C

SCIENCE

Module Title: Our Island Home – Land and Water

Sequence Reference: P3 SC-C

PHASE A				PHASE B		
PS	P1	P2	P3	P4	P5	P6
☐	☐	☐	☒	☐	☐	☐

Time allotted: 10 weeks

Subgoal Emphasis:

- 1.1, 1.2, 1.4, 1.5 Nature and History of Science
- 2.1 - 2.8 Scientific Inquiry
- 3.1 - 3.4 Positive Attitudes
- 4.1 - 4.2 Advocate for the Environment

Content Focus:

- Change
- Cause and Effect
- Earth Science

Curriculum Objectives:

At the end of this module, students will:

- observe and describe features of our environment
- compare features of Bermuda with those of other countries
- examine and describe rocks, soils and water from the environment
- describe how Bermuda was formed
- recognize the impact of plants, humans and weather on our island
- recognize and describe the characteristics of the ocean and seashore
- identify and describe various living things from the ocean habitat
- advocate for the protection of our natural resources

Content Detail:

- features of the environment: hills, ponds, ocean, beach, seashore
- environments that are different from Bermuda: rivers, mountains etc.
- rocks, soils, water
  - rocks: size (boulders to sand), colour, hardness
  - soils: colour, components
  - fresh (rain) water, salt water, brackish (pond) water
- Bermuda and its formation: volcano, coral deposition, dunes and beach sand, cave formation
- impact of plants, humans and weather
  - evidence: fossils
  - weathering over time
  - positive: enhancing beauty
  - negative: buildings, destroying habitats, pollution, wasting water

  (link to P3 SC-B Adaptation and Survival)
  (link to Social Studies P3 SS-D The Environment)
- characteristics of ocean and seashore
  - ocean: salinity, apparent colour, waves, organisms, fish
  - seashore: sand, seaweed, dunes
- living things in our ocean: fish, whales, turtles, marine invertebrates **(link to P3 SC-B Adaptation and Survival)**
- advocacy for the environment

Module Title: Our Island Home – Land and Water	**Sequence Reference:** P3 SC-C

Recommended Instructional Strategies:

- Provide students with pictures of Bermuda's environment. Ask them to identify landforms and water sources. Extend to pictures from other countries include terms such as river, mountain
- Brainstorm with students the characteristics of rocks (and sand) and soil. Collect samples of rocks, beach sand from various beaches and soil. Have students examine and classify them based on identified characteristics. Create a chart to record observations
- Make a set of cards each with one aspect of the formation of Bermuda. Have students place the cards in correct order.
- Have students make an earth (or Bermuda) book- use card and paper cut into a circle. Draw a picture of the earth or Bermuda on the cover. Draw or write one thing about the topic on each page. Attach pages and cover with string. Have students share their book.
- To help understand weathering have children shape a large ball of clay take a plastic knife and cut into the clay, making smaller pieces (wind, sun and water do this)
- Investigations: How can weathering change chalk?
  Give your hypothesis
  If you shake chalk, will it weather? Tell what you think
  Control the Variables
  Put chalk into each container. You will shake one container. You will not shake the other.

Test

1. Observe the pieces of chalk. Draw how they look.
2. Put chalk into each container. Put on lids.
3. Shake one container for one minute
4. Open containers and observe. Draw what they look like. Compare results to hypothesis. How did the chalk change?

- Make a sponge painting of an ocean scene including the seashore. Create labels for characteristics and organisms.
- Set up a class aquarium (See BZS *EcoFile* for help)
- Craft: make ocean creatures from plasticine or other materials
- Investigate and chart differences between ocean water and fresh water

Recommended Formative Assessment Strategies:

Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.

techniques include:

- **questioning**
  - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching
- **checklists**
  - teachers use these during observations or interactions to note mastery of particular concepts or skills
- **teacher observations**
  - teachers watch students (individuals or groups) during activities, guided and independent practise
- **games and puzzles** (including computer applications)
  - teachers can monitor levels of success at games or puzzles and intervene when necessary
- **mind maps, drawings**
  - teachers can diagnose misconceptions based on accuracy
- **quizzes** (oral and written) **and worksheets**
  - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions
- **science journals**
  - students use these to record details of investigations and a method of reflection .(teacher will review journals regularly and give feedback)
  - investigations : what did I think about?
  - what did I do?
  - what did I see?
  - what did I find out?
  - reflections: what did I learn?
  - what did I like?
  - what else do I want to know?

Module Title: Our Island Home – Land and Water	**Sequence Reference:** P3 SC-C

Summative Assessment:

Assessments given at the end of a module where the data is used to generate grades.

- Performance based examples:
  - Adapt any activities from previous section
  - Student project: Student will choose one animal found in the ocean and make a poster, create a model or write a song about how it looks, how it moves and at least one other important fact about it. Assess students using rubrics for understanding of concept, process and final product
  - Class project: develop a model of Bermuda's landforms giving each student or group of students responsibility for one section. Assess students using rubrics for understanding of concept, process and final product
  - Use or adapt the performance assessment tasks at the end of chapter/ topics found in this unit
- End of unit test: teacher-made or from Unit 2 W*atering Earth's Plants (Topics 4 – 6); Rocky Homes (Topics 4 – 6)*

Special Resources:

(materials, equipment & community involvement)

- cross curricular connections: link to PSC C Adaptation and Survival, English Language Arts, Mathematics, Social Studies
- guest speaker: fisherman, construction worker (excavator)
- field trips/visits: Bermuda Aquarium Museum and Zoo; A Bermuda Commercial Vegetable Garden (soils): an excavation site (limestone rock) beaches (dunes, seashore), Crystal Caves, Admiral's Caves or other public caves with guide, Bermuda Underwater Exploration Institute

References - Teacher:

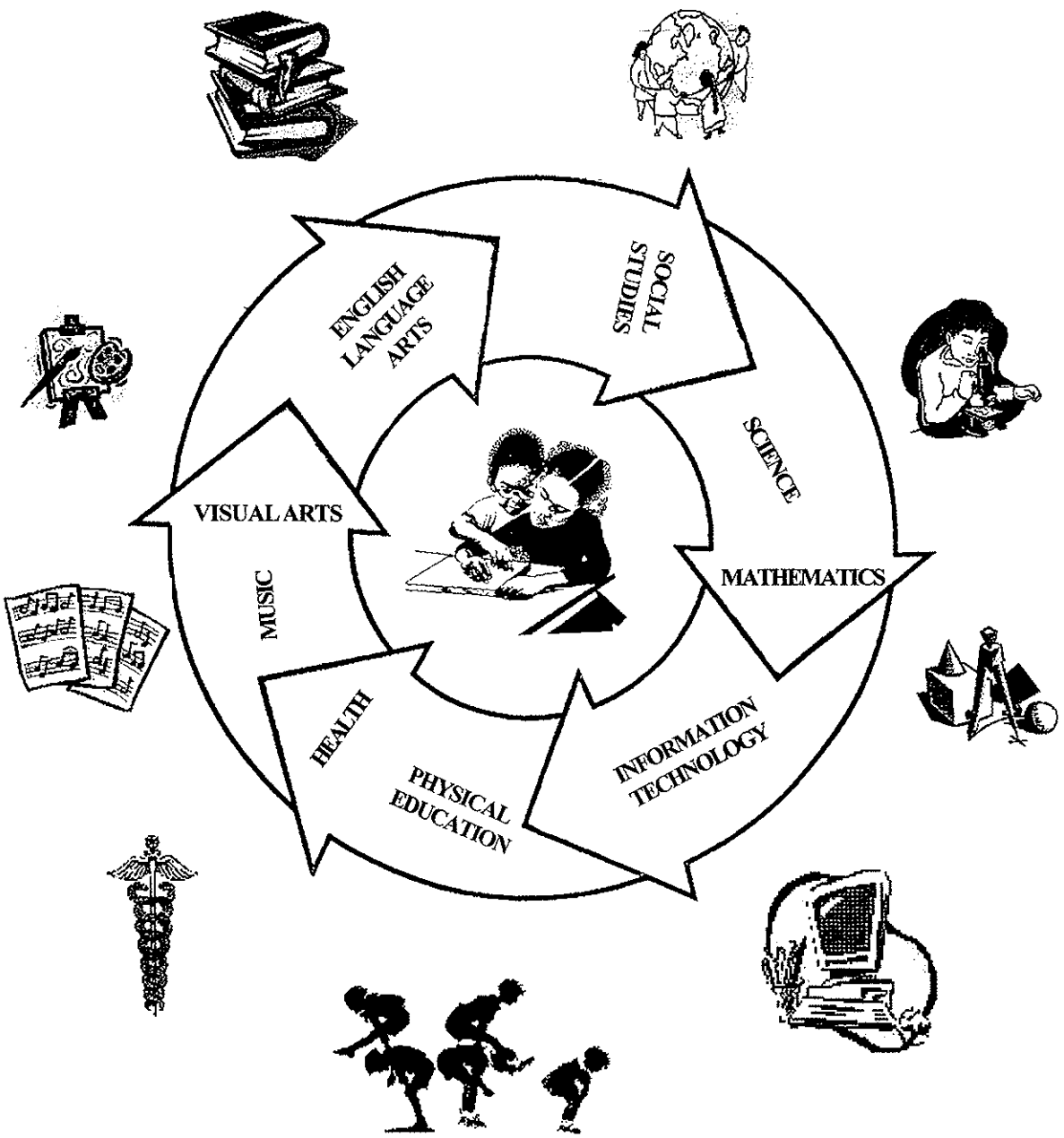
- McGraw-Hill Science. Grade 2
- Unit 1 *Watering Earth's Plants* Topics 4 – 6
- Unit5 Rocky *Homes* Topics 4 - 6

References - Student:

- McGraw Hill Science. Grade 2
- Unit 1 *Watering Earth's Plants* Topics 4 – 6
- Unit 5 *Rocky Homes* Topics 4 - 6

Glossary:

- refer to text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Module D

SCIENCE

Module Title: Forces and Magnets

Sequence Reference: P3 SC-D

PHASE A				PHASE B		
PS	P1	P2	P3	P4	P5	P6
☐	☐	☐	☒	☐	☐	☐

Time allotted: 6 weeks

Subgoal Emphasis:

1.2 - 1.5 Nature and History of Science
- 2.1 - 2.5 Scientific Inquiry
- 3.1 – 3.3 Positive Attitude

Content Focus:

- Change
- Cause and Effect
- Systems
- Physical Science

Curriculum Objectives:

At the end of this module, students will:

- recognize that force is a push or a pull
- explore how simple machines help to move heavy things
- be aware that gravity is a force
- investigate how magnets make some things move without being touched
- compare the strengths of different magnets
- research where magnets are used in everyday life research

Content Detail:

- forces
  - pushes or pulls
  - change the way things move
  - friction and forces
- simple machines: ramps and levers
- gravity
  - a force the **pulls** toward the earth
- force of magnets
  - moving things by pushes and pulls called attraction and repulsion
- strengths of magnets
  - pushing and pulling more or bigger things
- uses of magnets: radios, fridge decorations, paper clip holders, answering machines, electromagnets (in scrap heaps)

Module Title: Forces and Magnets	**Sequence Reference:** P3 SC-D

Recommended Instructional Strategies:

- Have students play "One Bounce" with a basketball or football. Have them determine where the ball will go when they push it. Have them experiment how to use forces to change direction. Ask students to predict what will happen if they change the type of ball or the surface or the space between students.
- Physical education teacher can discuss the skeletal and muscular system with students. They can identify how these systems help us move and move objects.
- What sticks to my magnet?
  Students move around the classroom with a magnet to find objects that stick to the magnet.
  The teacher asks students to predict whether an object will be attracted or not. Students then test their predictions.
- Can magnets push or pull?
  Students work in pairs. Each student has a disk magnet. The students draw a picture of a car onto a label and stick it onto their magnet.
  Each student has to use their car to
  a) Pull their partner's car
  b) Push their partner's car
  Students can make a simple map and push each other's cars down the road, then pull each other's cars into the garage.
- Comparing the strengths of magnets
  Students working in groups have a variety of magnets to work with.
  Students have to see how many paper clips each magnet can pick up.
  Students collect information and plot it as a graph.
- What is the law of magnets?
  Students work in pairs with two bar magnets.
  Students follow a worksheet, placing magnets in various positions.
  Students observe and record their results.
- Exploring gravity
  The students are asked a question, if you hold two objects at the same height and drop them at the same time, which will hit the floor first?
  The students then do the activity and record their results.
  The students repeat the experiment with two new objects and compare the results.
  The students have to come up with the idea of a force pulling the objects towards earth.
  Teacher can ask the students to imagine what would happen if this invisible force wasn't there.

Recommended Formative Assessment Strategies:

Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.

techniques include:

- **questioning**
  - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching
- **checklists**
  - teachers use these during observations or interactions to note mastery of particular concepts or skills
- **teacher observations**
  - teachers watch students (individuals or groups) during activities, guided and independent practise
- **games and puzzles** (including computer applications)
  - teachers can monitor levels of success at games or puzzles and intervene when necessary
- **mind maps, drawings**
  - teachers can diagnose misconceptions based on accuracy
- **quizzes** (oral and written) **and worksheets**
  - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions
- **science journals**
  - students use these to record details of investigations and a method of reflection (teacher will review journals regularly and give feedback)
  - investigations: what did I think about?
  - what did I do?
  - what did I see?
  - what did I find out?
  - reflections: what did I learn?
  - what did I like?
  - what else do I want to know?

Module Title: Forces and Magnets	**Sequence Reference:** P3 SC-D

Summative Assessment:

Assessments given at the end of a module where the data is used to generate grades.

- Performance based examples:
  - Adapt any activities from previous section
  - Individual student or group project: Give students four disc magnets and a pencil or rod. Ask students to create "floating" magnets in different patterns. Students will then present the product to the class and explain the reason the magnets are "floating". Assess students using rubrics for understanding of concept, process and final product.
  - Use or adapt the performance assessment tasks at the end of chapter/topics found in this Unit 4: *Watch It Move*
- End of unit test: teacher-made or from Unit 4: *Watch It Move*

Special Resources:

(materials, equipment & community involvement)

- cross curricular connections: English Language Arts, Mathematics, Physical Education
- field trips/visits: toy store (how toys move), playground

References - Teacher:

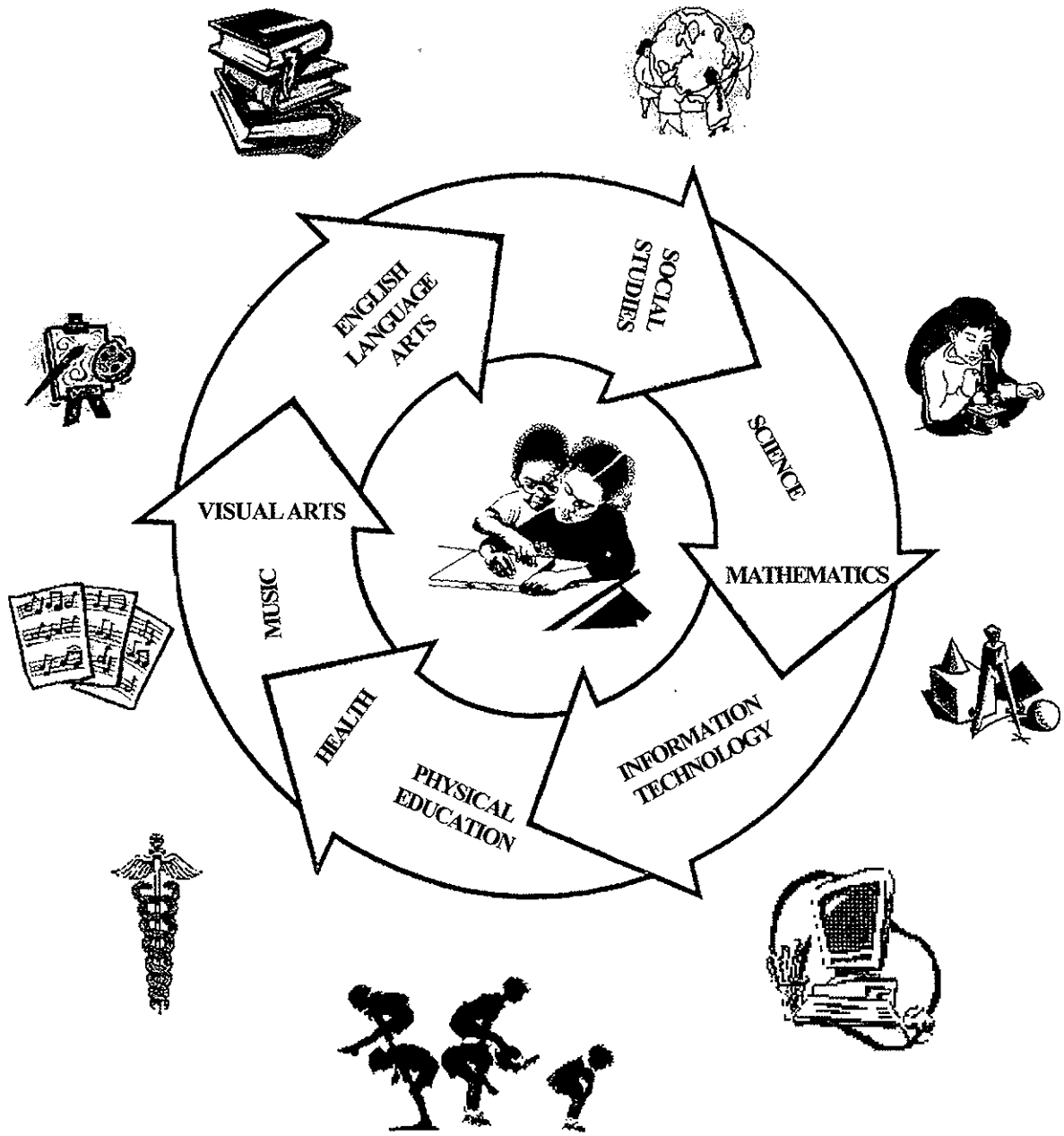
- McGraw-Hill Science. Grade 2
- Unit 4: *Watch It Move*

References - Student:

- McGraw-Hill Science. Grade 2
- Unit 4: *Watch It Move*

Glossary:

- refer to text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Module E

SCIENCE

Module Title: Energy In Our Lives

Sequence Reference: P3 SC-E

PHASE A				PHASE B		
PS	P1	P2	P3	P4	P5	P6
☐	☐	☐	☒	☐	☐	☐

Time allotted: 8 weeks

Subgoal Emphasis:

- 1.2 - 1.4 Nature and History of Science
- 2.1, 2.3 Scientific Inquiry
- 3.1 Positive Attitude
- 4.1 Advocate for the Environment

Content Focus:

- Change
- Cause and Effect
- Physical Science

Curriculum Objectives:

At the end of this module, students will:

- identify where heat light and sound energy are found in everyday lives
- explore how heat energy makes things change
- classify materials based on how well light passes through them
- explain that light cannot pass through some materials and shadows are formed
- examine how light is reflected from surfaces
- identify a variety of sources of sounds
- identify that sounds are made when objects vibrate
- explore methods of changing pitch and loudness of sounds
- recognize that sound travels through a medium
- appreciate our eyes as an organ of sight
- distinguish between noise and sound
- appreciate our ears as an organ of hearing

Content Detail:

- energy in everyday life
  - heat - the sun, candles, burning fuels, friction (rubbing things together) etc.
  - light - the sun, flashlights etc.
  - sound- radio, vehicles, talking etc.
  - other kinds of energy - electrical
- heat energy and change; measuring temperature change
- materials and transmission of light
  - translucent
  - opaque
- when light does not pass through materials
  - shadow formation
  - mirrors and reflection
- seeing and our eyes
  - describing the eye
  - dangerous light - looking at the sun directly
  - taking care of our eyes (shades, caps with peaks, avoid throwing dangerous objects)
  - visual impairment
- sounds from the world around
  - in nature
  - machines
  - making our own sounds using materials (guitar strings, drum skin, vocal chords, elastic bands)
- pitch - the sound of a note
  - pitch can range from high, like a squeak or squeal
  - pitch can range to low, like a foghorn or deep voice
- loudness - the intensity or volume of a sound
- sound can travel through a medium such as: solid, liquid or gas
- pleasant and unpleasant sounds
  - noise - unpleasant sound
  - danger of loud sounds
- hearing and our ears
  - describing the ear
  - taking care of our ears
  - animals and hearing
  - hearing impairment

Module Title: Energy In Our Lives	**Sequence Reference:** P3 SC-E
Recommended Instructional Strategies:	**Recommended Formative Assessment Strategies:**
• Light sources: Students decide from a variety of materials which ones are light sources • Flashlight investigation: Students use flashlights and find objects around the classroom that let light pass through. • Reflection "mirror drawings": Students complete symmetrical drawings by using a mirror. Students Investigate: How does the distance between the flashlight and the object affect the size of the shadow created? • Sounds everywhere: Students go outside and listen to sounds around them. Students record and describe the sounds that they hear. • Guess the sounds Teacher has a variety of sounds recorded onto cassette and plays them for the students. Students guess the sounds they have heard. • Drum sounds: Students make a drum using a plastic beaker and a balloon. Students beat the drum with a pencil. Students are asked to make the sound louder and quieter. • Making musical instruments: Students are encouraged to bring in objects from home (suggestions made by teacher) to make their own sound instrument. Students construct and then play their instruments. • Does sound travel through things? Students work in pairs. A student lays a book on a desk. The student lays one ear on top of the book and their hand covers the other ear. The partner taps the desk, and the student listens. The experiment is repeated with a bag of water and a bag of air replacing the book. • Play a game about hearing: have students close their eyes and teacher and student can make sound. Students will identify where it came from it's getting louder or softer (sources of sound can be moved closer or further away). • Students will research and discuss how persons who are hearing and visually impaired manage in our everyday world. Students will gain understanding and acceptance of individual differences. • Visit to BUE and sound wands with various whale calls etc.	**Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.** **techniques include:** • **questioning** - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching • **checklists** - teachers use these during observations or interactions to note mastery of particular concepts or skills • **teacher observations** - teachers watch students (individuals or groups) during activities, guided and independent practise • **games and puzzles** (including computer applications) - teachers can monitor levels of success at games or puzzles and intervene when necessary • **mind maps, drawings** - teachers can diagnose misconceptions based on accuracy • **quizzes** (oral and written) **and worksheets** - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions • **science journals** - students use these to record details of investigations and a method of reflection .(teacher will review journals regularly and give feedback) - investigations : what did I think about? - what did I do? - what did I see? - what did I find out? - reflections: what did I learn? - what did I like? - what else do I want to know?

Module Title: Energy In Our Lives	**Sequence Reference:** P3 SC-E

Summative Assessment:

Assessments given at the end of a module where the data is used to generate grades.

- Performance based examples:
  - Adapt any activities from previous section
  - Individual student/group project: Make models of the ear or eye (label cornea, lens, ear canal and eardrum). Explain how we hear or see. Describe how to take care of these sense organs. Assess students using rubrics for understanding of concept, process and final product
  - Class Project- Create a collage or photo album about Energy in Our Lives using aspects cited in Content Detail. Create appropriate vocabulary/phrase labels with explanations as appropriate. Each student will be responsible for at least one aspect of this project. Assess students using rubrics for understanding of concept, process and final product
  - Use or adapt the performance assessment tasks at the end of chapter/topics found in this unit – *Changes all Around*
- End of unit test: teacher-made or from Unit 3 *Changes All Around*

Special Resources:

(Materials, equipment & community involvement)

- cross curricular connections: English Language Arts, Mathematics, Health Education, Music
- guest speakers: musician, music teacher, teacher of hearing and/or visually impaired, person who is hearing or visually impaired, engineer/technician from Bermuda telephone company or cable and wireless
- field trips/ visits: taking a "sound walk" in various areas – school, beach, near the road; Bermuda Aquarium, Museum and Zoo, radio or television station, lighthouse, Bermuda telephone company cable and wireless, Bermuda Underwater Exploration Institute

References – Teacher:

- McGraw-Hill Science. Grade 2
- Unit 3: *Changes all Around*

References - Student:

- McGraw-Hill Science. Grade 2
- Unit 3: *Changes All Around*

Glossary:

- refer to text

Science - P4
Level Code: P4 SC

MINISTRY OF EDUCATION
Bermuda
2001

PRIMARY SCHOOL
PHASE B OVERVIEW

Subject Title: Science **Subject Code:** P4 SC

Time Allotted: 150 min/wk

RATIONALE

Children from their earliest years are curious about their world; they explore, they ask questions and they enjoy the process of discovery. They develop wonderful ideas to explain phenomena that they observe. The science programme at the preschool and primary levels will use rich learning experiences to help the way that these ideas are formed, tested and modified. All children can then discover that science is part of their world, a fascinating world that they can interact with and understand.

The preschool and primary science programme will not only provide a sound foundation for middle level science, but also foster the development of a lifelong appreciation for learning in a world increasingly influenced by science, technology and challenges to the environment.

PRIMARY FOUR (P4) REQUIREMENTS

The requirements for this level are as follows:

• **Performance Assessment*** - Science investigations and other activities, dances, skits, role-play, skills tests, teacher observations, oral questioning, interviews	**40%**
• **Product Assessments*** - Games, journals, poems, posters, drawings, models, projects, stories, collages, crosswords, reports, letters, scores from interactive computer applications, topic portfolio	**45%**
• **Written Assessment** - ***Selected response***: multiple choice, true-false, matching - ***Constructed response:*** fill in the blank, short answers, label a diagram, visual organizers (web, graph, chart, concept map, illustration)	**15%**
Total	**100%**

*** Product and performance assessment scored by rubric**

MATERIALS OF INSTRUCTION (Adopted Text)

Baptiste, H. et al. McGraw Hill Science. New York: McGraw-Hill School Division, 2000.

PHASE B OUTLINE

P4 Module Titles A - E	P5 Modules Titles A - E	P6 Modules Titles A - E
A. All About Science ..... 2 - reading about science - science as a human endeavour - science process skills - tools of science - scientific investigation	**A. All About Science ..... 2** - reading about science - science as a human endeavour - science process skills - tools of science - scientific investigation	**A. All About Science ..... 2** - reading about science - science as a human endeavour - science process skills - tools of science - scientific investigation
B. Processes of Life..... 10 - life processes - energy for life - systems - reproduction and life cycles - traits	**B. A Closer Look at Living Things ..... 10** - characteristics of living things - cells as building blocks - basic life functions of organisms - a classification system - characteristics and classification of animals - Bermuda's vertebrates and invertebrates	**B. Our Island Home - Interactions of Living Things ..... 10** - interactions of organisms in an ecosystem - cycling of matter - Bermuda's terrestrial habitats - changes in ecosystems - protecting Bermuda's habitats
C. Save Our Earth and Our Island Home ..... 8 - features of the landscape - man and natural resources - reduce, reuse, recycle - rocks - Bermuda's limestone	**C. A Changing World ..... 6** - rocks and fossils - fossils and today's organisms - weathering and erosion - soils	**C. Oceans ..... 8** - characteristics of oceans - importance of oceans and marine ecosystems - desalination - weather and climate - exploration - pollution and protection
D. Earth in Space .....6 - phases of the moon - our solar system - earth's movement - scientists looking at space - space travel	**D. Electricity and Magnetism ..... 8** - importance of electricity - generation of electricity in Bermuda - static and current electricity - magnets and magnetic fields - applications	**D. Weather ..... 8** - the water cycle - clouds - weather patterns - forecasting weather, weather instruments and technology - weather and climate - sun and weather conditions

E. Matter and Energy 8
- measurement and matter
- mass and weight
- changes in matter
- sources of heat energy
- effects of heat and heat transfer
- heating our homes

E. Changes in Matter 8
- states and properties of matter
- measuring matter
- changes in matter
- composition of matter

E. Matter 6
- characteristics of states of matter
- measuring properties of matter
- reversible and irreversible changes
- dissolving materials
- comparing matter

Subtotal	34	Subtotal	34	Subtotal	34
Optional Weeks	4	Optional Weeks	4	Optional Weeks	4
Total Weeks	38	Total Weeks	38	Total Weeks	38

PRIMARY SCHOOL

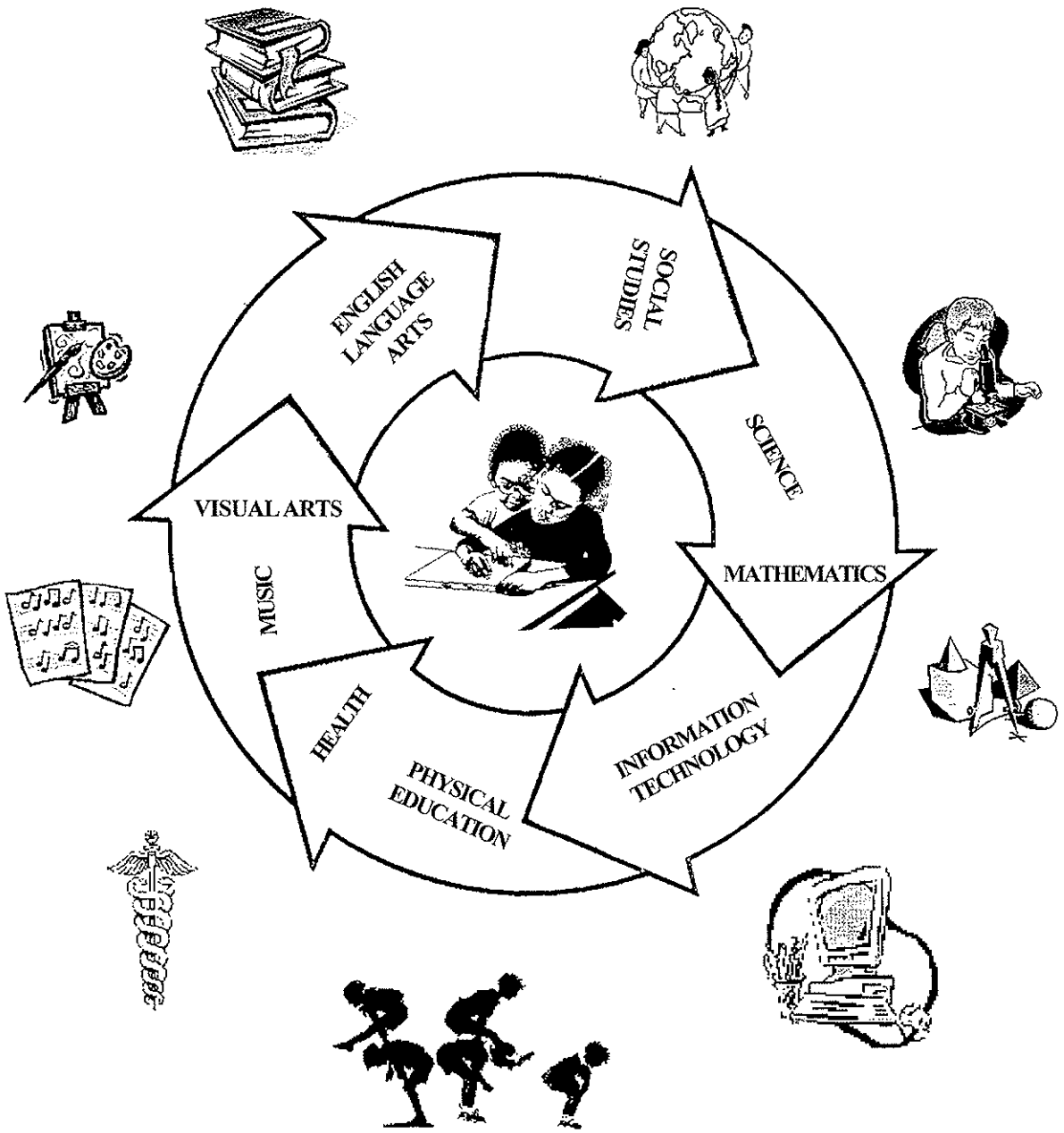
check one: PS ☐ P1 ☐ P2 ☐ P3 ☐ P4 ☒ P5 ☐ P6 ☐

Science

GOALS		SUBGOALS		MODULE & CURRICULUM CORRELATION MATRIX				
1	Conceptualizing the History and Nature of Science	1.1	Contribution/Diversity	x	x	x	x	x
		1.2	Connections	x	x	x	x	x
		1.3	Health		x	x		x
		1.4	Inter-relationship/Mathematics Science Technology	x	x	x	x	x
		1.5	Problem Solving	x	x	x	x	x
2	Demonstrating the Nature of Scientific Inquiry	2.1	Hypothesis	x	x	x	x	x
		2.2	Design	x	x	x	x	x
		2.3	Data Collection	x	x	x	x	x
		2.4	Technology Use	x	x	x	x	x
		2.5	Explanations/Limitation	x	x	x	x	x
		2.6	Explanations/Alternatives		x	x	x	x
		2.7	Communications/Results		x	x	x	x
		2.8	Research		x	x	x	x
3	Demonstrating Positive Attitudes Towards Science	3.1	Present use of Science	x	x	x		x
		3.2	Value, Environment	x	x	x	x	x
		3.3	Ethical, Applications	x	x	x		x
		3.4	Career Options	x		x	x	
4	Advocating for Environmental Responsibility	4.1	Environmental Stewardship		x	x		x
		4.2	Environmental Applications	x	x	x	x	
CONTENT STRUCTURE		Change		x	x	x	x	x
		Cause & Effect		x	x	x	x	x
		Systems		x	x	x	x	x
		Life Science		x	x			
		Physical Science		x				x
		Earth Science		x		x	x	
		MODULE		**A**	**B**	**C**	**D**	**E**

MODULE KEY

A - All About Science
B - Processes Of Life
C - Save Our Island Home and Our Earth
D - Earth in Space
E - Matter And Energy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Module A

SCIENCE

Module Title: All About Science

Sequence Reference: P4 SC-A

PHASE A				PHASE B		
PS	P1	P2	P3	P4	P5	P6
☐	☐	☐	☐	☒	☐	☐

Time allotted: 2 weeks

Subgoal Emphasis:

- 1.1, 1.2, 1.4, 1.5 Nature and History of Science
- 2.1 – 2.5 Scientific Inquiry
- 3.1 – 3.4 Positive Attitude
- 4.2 Advocate for the Environment

Content Focus:

- Change
- Cause and Effect
- Systems
- Physical, Life and/or Earth Science

Curriculum Objectives:

At the end of this module, students will:

- discuss a story or article about science
- appreciate science as a human endeavour
- practise a science process skill
- recognize the use of mathematics and technology as tools of science
- carry out a scientific investigation
- value safety as a priority in science

Content Detail:

- all about science
  - scientific discovery, an invention, current news, history of science etc.
  - magazine or newspaper article [NIE or other]
  - fiction or non-fiction story including science fiction
  - video or other multimedia about science
- science as a human endeavour
  - many people have practised science for a long time in all cultures
  - men and women have contributed to science
  - many people make science a career
  - there is a lot still to be learned about our world
- science process skills
  - observing, measuring, estimating
  - classifying
  - inferring and predicting
  - collecting, recording and data
  - hypothesizing and designing an experiment
  - controlling variables and making models
  - communicating: telling, writing, drawing, showing
  - working in groups
- science tools: mathematics and technology
  - using mathematics: counting, graphing
- science investigation: *A Measuring Circus (see Appendix)*
- safety in the science classroom
  - handling materials and equipment safely
  - avoid running or playing during an investigation
  - report any accident to the teacher
  - do not taste anything unless directed by the teacher
  - ask for help when necessary

Module Title: All About Science	**Sequence Reference:** P4 SC-A
Recommended Instructional Strategies:	**Recommended Formative Assessment Strategies:**
• Story or article about science: read a story or article about science or a scientist. Discuss the events, the characters (scientists), and the importance of the invention, event or discovery. Have students recognize that men and women from different cultures have been involved in science from many years ago. Many people choose science as a career. [science as a human endeavour] Students should use their science journal to reflect on what has been discussed in an age appropriate manner (drawing or writing) • Brainstorm safety rules for science activities. List them, have students decorate them and post them in the classroom. • Using science tools: students should practise using science equipment, using the computer for science games and interactive simulations; using mathematics in science (measuring, using calculators, reading and making charts and graphs) • Science process skills: explanations and examples [see appendix] • Science investigation: *A Measuring Circus* (refer to appendix for details of investigation)	**Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.** **techniques include:** • **questioning** - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching • **checklists** - teachers use these during observations or interactions to note mastery of particular concepts or skills • **teacher observations** - teachers watch students (individuals or groups) during activities, guided and independent practise • **games and puzzles** (including computer applications) - teachers can monitor levels of success at games or puzzles and intervene when necessary • **mind maps, drawings** - teachers can diagnose misconceptions based on accuracy • **quizzes** (oral and written) **and worksheets** - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions • **science journals** - students use these to record details of investigations and a method of reflection (teacher will review journals regularly and give feedback) - investigations : what did I think about? - what did I do? - what did I see? - what did I find out? - reflections: what did I learn? - what did I like? - what else do I want to know?

Module Title: All About Science	**Sequence Reference:** P4 SC-A

Summative Assessment:

Assessment given at the end of a module where data is used to generate grades.

- Possible entries for science journal:
  - Reflection on video, article or story
  - Description (draw, write or tell) of a scientist
  - Evidence of mastery of process skill
  - Record of laboratory investigation: *A Measuring Circus*

Special Resources:
(materials, equipment & community involvement)

- variety of science equipment: measuring cups, measuring cylinders, hand lens, rulers, balances, forcemeters, thermometers
- materials as cited in the investigations in the appendix
- lab safety rules
- stories or videos about scientific endeavours

References - Teacher:

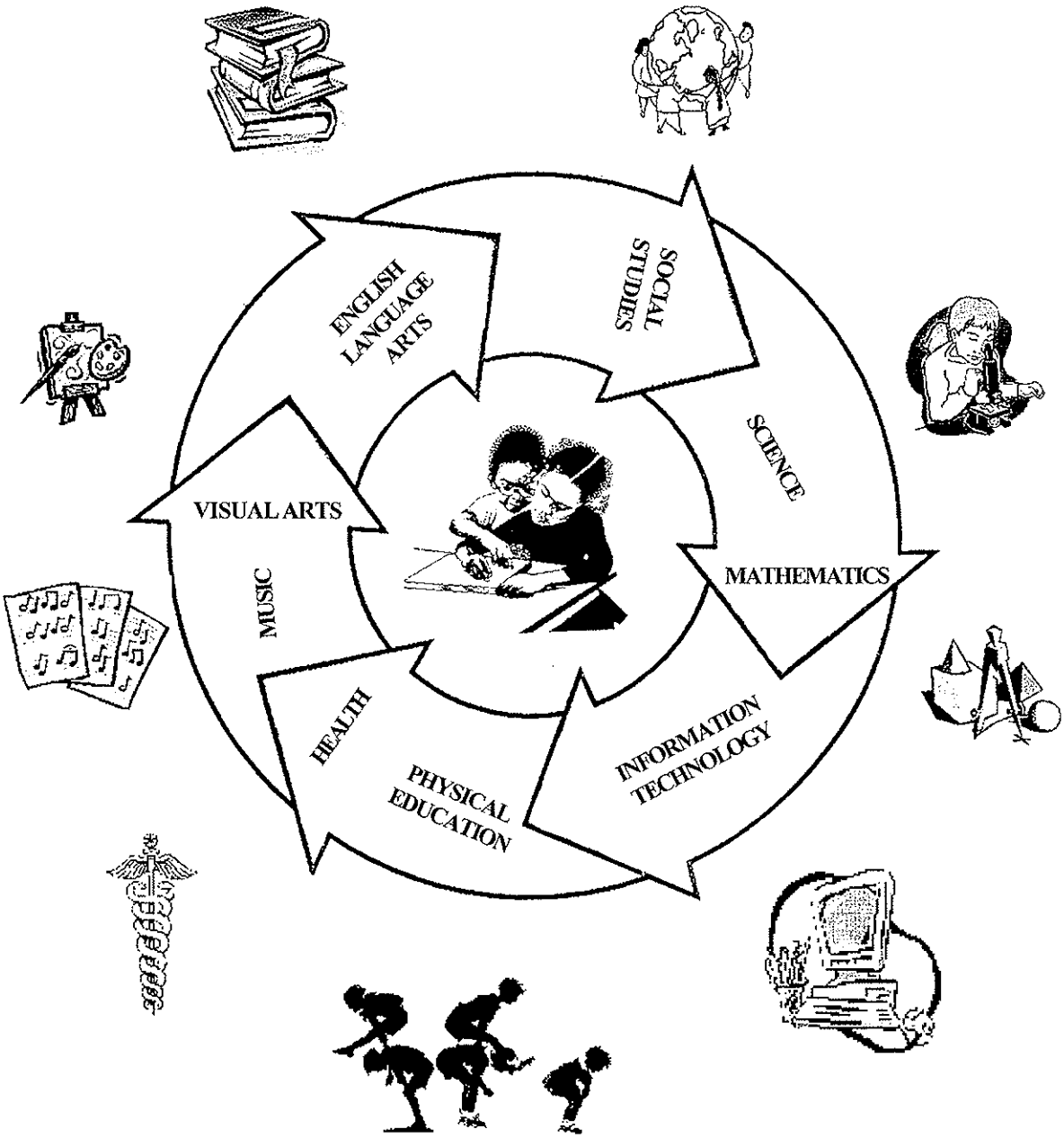
- McGraw-Hill Science. Grade 4
- Unit: *Be A Scientist*
- Reference Section: *Handbook and Glossary*

References - Student:

- McGraw-Hill Science. Grade 4
- Reference Section: *Handbook and Glossary*

Glossary:

- refer to text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Module B

SCIENCE

Module Title: Processes of Life

Sequence Reference: P4 SC-B

Time allotted: 10 weeks

PHASE A				PHASE B		
PS	P1	P2	P3	P4	P5	P6
☐	☐	☐	☐	☒	☐	☐

Subgoal Emphasis:

- 1.2 – 1.5 Nature and History of Science
- 2.1 – 2.8 Scientific Inquiry
- 3.1 – 3.3 Positive Attitudes
- 4.1 – 4.2 Advocate for the Environment

Content Focus:

- Change
- Systems
- Life Science

Curriculum Objectives:

At the end of this module, students will:

- recognise the importance of life processes
- explain that energy is needed for organisms to survive and grow
- describe structures that help living things survive and grow
- recognise the importance of reproduction to survival of species
- compare and contrast plant and animal life cycles
- recognise that human traits can be inherited or learned

Content Detail:

- life processes: nutrition, movement, growth and reproduction
- energy for living and growing
  - sunlight and food
  - other important things: water and air
- structures (human systems)
  - respiratory system and lungs
  - skeletal and muscular system: skull, ribs, backbone, muscles, joints
  - digestive system
  - care of the systems (**link: Health Education P4 HE-C)**
  - recognition that other animals have systems that have the same functions
- reproduction
  - inheritance of characteristics (**biodiversity refer to glossary)**
  - continuation of species
- life cycles:
  - animal: butterfly, toad, human or other mammal
  - plant : flowering plant only (seed to seed)
- traits
  - inherited from parent
  - learned from interacting with the environment

Module Title: Processes of Life	**Sequence Reference:** P4 SC-B

Recommended Instructional Strategies:

- Play a game.
  - What am I? One student can sit at the front of the class and describe things about any aspect of this topic. Students guess what he/she is describing.
  - Interview: talk show host interviews a student who is representing a part of the body or a system. Student have to create questions and answers prior to interviews - charades – one student role plays concept and other students guess answers
- Make a model of one of the systems with labels. Present product to class
- Create a timeline showing birth to graduation from high school or beyond
- Research (teacher or parent guidance) and write about why an extinct mammal did not survive.
- Explain why toads lay so many eggs whilst large mammals and humans usually have only one baby.
- Students will conduct survey of classes in the school looking at traits (curling of tongues and separated earlobes). They will then chart and graph data. Explain the meaning of an inherited trait.
- How Do We Stay Alive?
  Students are to think of things that they do every day and make a list in their journals of all the things that they think they use/do to help them stay alive.
- Exercise Does The Body Good! **(link to P.E. and Health)**
  - Show students a picture of someone being lazy and of someone exercising or show the above using "class actors". Have students determine what will happen to the person's body in both cases. Which is best for your body?
  - Have students do various exercises; explain that we exercise to maintain our muscles and a healthy body.

note: This activity can also be used to teach about heart rate.

- As I grow
  - View video on human growth/development.
  - Students are to make a collage or mobile showing the different stages of human development
- Family tree
  Students bring in pictures of grandparents, parents, siblings, aunts, uncles, cousins, etc. to create a family tree. List in journals the traits that are seen throughout the family e.g. eye colour, height, etc.

Recommended Formative Assessment Strategies:

Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.

techniques include:

- **questioning**
  - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching
- **checklists**
  - teachers use these during observations or interactions to note mastery of particular concepts or skills
- **teacher observations**
  - teachers watch students (individuals or groups) during activities, guided and independent practise
- **games and puzzles** (including computer applications)
  - teachers can monitor levels of success at games or puzzles and intervene when necessary
- **mind maps, drawings**
  - teachers can diagnose misconceptions based on accuracy
- **quizzes** (oral and written) **and worksheets**
  - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions
- **science journals**
  - students use these to record details of investigations and a method of reflection .(teacher will review journals regularly and give feedback)
  - investigations : what did I think about?
  - what did I do?
  - what did I see?
  - what did I find out?
  - reflections: what did I learn?
  - what did I like?
  - what else do I want to know?

Module Title: Processes of Life	**Sequence Reference:** P4 SC-B

Summative Assessment:

Assessments given at the end of a module where the data is used to generate grades.

- Performance based examples:
  - Adapt any activities from previous section
  - Student/group project: Invent a floor or board game called Around the Human Body. Assess students using rubrics for understanding of concept, process and final product
  - Class Project - Create a poster sized Big Book for a preschool or P1 class to explain what we need to live and grow. Assign each group one component. Make a presentation to the intended group. Assess students using rubrics for understanding of concept, process and final product
  - Use or adapt the performance assessment tasks at the end of chapter/topics found in this unit
- End of unit test: teacher-made or from Unit 1 *Living Things*; Unit 7 (Topic 4) *The Human Body; Unit 6 Where Living Things Live*

Special Resources:
(materials, equipment & community involvement)

- cross curricular connections: English Language Arts, Mathematics, Physical Education, Health Education
- guest speakers: school physiotherapist, veterinarian, neonatal or maternity nurse
- field trips/ visits: hospital or clinic, Bermuda Aquarium Museum and Zoo, plant nursery, Botanical Gardens, Bermuda Government Tudor Farm (animals)

References - Teacher:

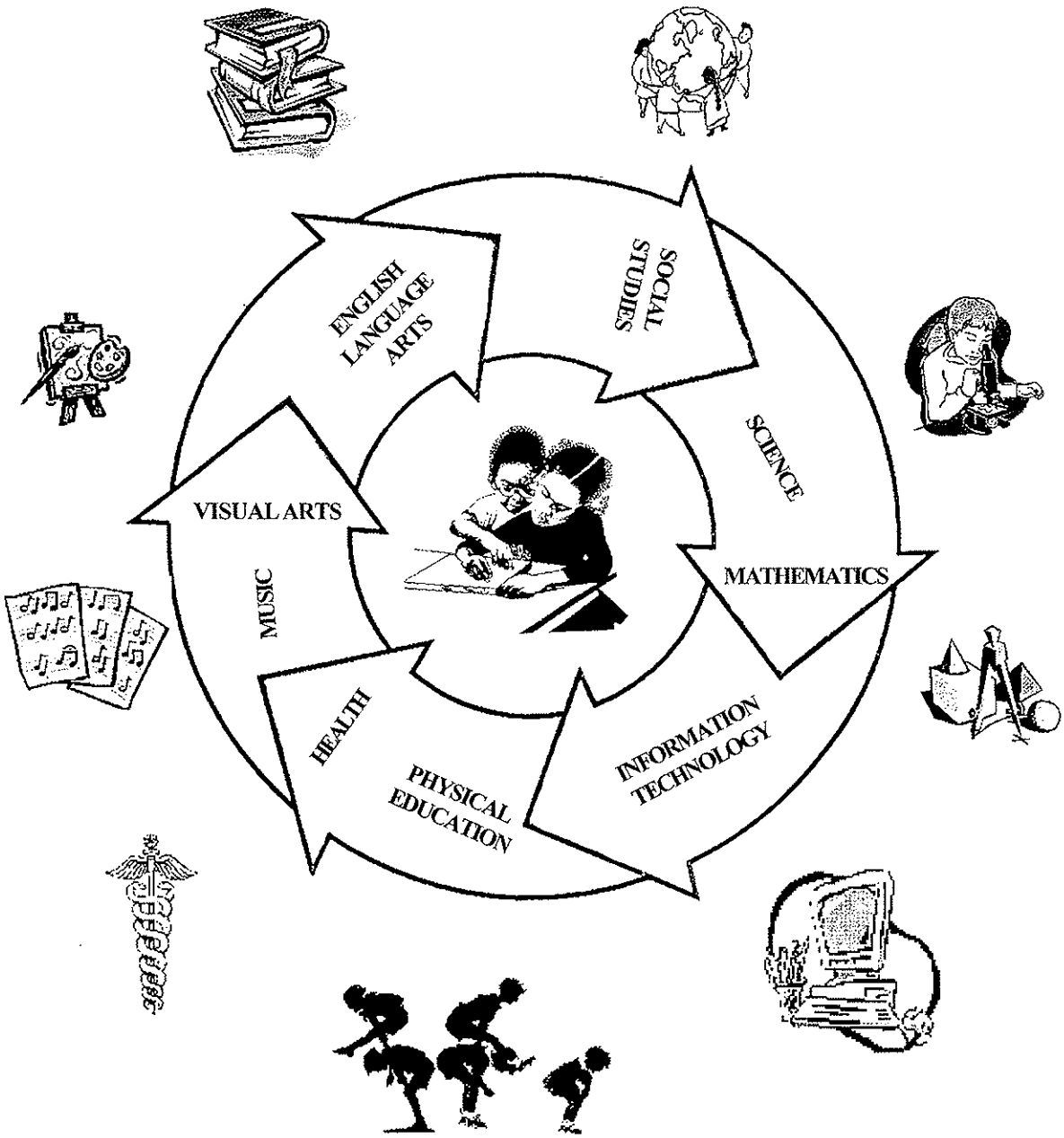
- McGraw-Hill Science. Grade 3
- Unit 1: *Living Things*
- Unit 7: *The Human Body* (Topic 4)
- Unit 6: *Where Living Things Live* (Topic 3)

References - Student:

- McGraw-Hill Science. Grade 3
- Unit 1: *Living Things*

Glossary:

- **Biodiversity:** the variety of life – combination of two words biological and diversity. It includes the different types of plants and animals (species diversity), the different types of homes they live in (habitat diversity), and how individuals of a certain type of plant and animal vary (genetic diversity). examples are:
  - species diversity: cat, bluebird, human being, hibiscus, ant, amoeba (micro-organism)
  - habitat diversity: coral reef, marsh, Bermuda forests
  - genetic diversity: tabby cats, Siamese cats, brown-skinned people, blue-eyed people
- other terms: refer to text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Module C

SCIENCE

Module Title: Save Our Island Home and Our Earth

Sequence Reference: P4 SC-C

PHASE A				PHASE B		
PS	P1	P2	P3	P4	P5	P6
☐	☐	☐	☐	☒	☐	☐

Time allotted: 8 weeks

Subgoal Emphasis:

- 1.1 – 1.5 Nature and History of Science
- 2.1 – 2.8 Scientific Inquiry
- 3.1 – 3.4 Positive Attitude
- 4.1 – 4.2 Advocate for the Environment

Content Focus:

- Change
- Systems
- Cause and Effect
- Earth Science

Curriculum Objectives:

At the end of this module, students will:

- distinguish between the natural landscape of Bermuda and the parts that are created by humans
- identify the resources available to humans
- investigate the impact of man's use of resources
- appreciate the importance of conserving natural resources
- suggest methods by which Bermuda can reduce the impact of the large amount of waste produced here
- examine and describe rock samples
- determine the properties of Bermuda limestone from different parts of the island
- describe how Bermuda limestone was used to build houses

Content Detail:

- natural and man-made features of the landscape
  - hills, seashore, Spittal Pond ; farm land, parks
- resources: air, water, fuels, rocks, minerals and soil
- use of natural resources
  - positive impact: examples of wise use (list above), creating park land
  - negative: pollution (water and air), landfills, deforestation, landfills, building - destroying caves and natural habitats, mining
- Bermuda: limited supply of water, scarcity of land and open space, high concentration of people, pollution, waste
- World crisis: water and farm land, removal of rainforest, pollution, the ozone layer, waste etc.
- Waste management: Reduce, reuse, recycle
- Bermuda limestone: (Southampton- softest; Smiths-Walsingham- hard)
  - colour, hardness(can write with it)
  - reaction with vinegar,
  - weathering and erosion of limestone, action of water, severe weather
  - limestone - a sedimentary rock
- Building in Bermuda: quarrying limestone, making lime, roof slate, current scarcity of limestone and substitution of concrete block
  (link to Social Studies the environment P4 SS-D)

Module Title: Save Our Island Home and Our Earth	**Sequence Reference:** P4 SC-C
Recommended Instructional Strategies:	**Recommended Formative Assessment Strategies:**
• Interview a local senior citizen about changes in a particular area over time-loss of farm land and open spaces to building; the change from burning garbage at the dump to creating the landfill causing a change in the landscape in the area, including the pollution of the pond • Read and discuss with students excerpts of Llewellyn Emery's books "Nothing But a Pond Dog" and "Fires of Pembroke" Or Elizabeth Kawaley's book the "Island that Disappeared." Both authors illustrate the changes in our island home. • **Mining Resources.** Students will "mine" raisins out of a cookie and observe the impact that "mining" had on their cookie. • **Collection of resources.** Have students work together to trace the life cycle of a resource. Have students report on the collection or mining of this resource, its processing, products made from it, use of the products, disposal of the product. • **Resources**. Have students make a list of resources they use throughout the day. Have students classify them as renewable, inexhaustible, or nonrenewable Have students collect recyclable cans over a period of time. Have students graph data. Students can then calculate how much landfill space would be used if cans were not recycled. (1lb of cans takes up approx. 2ft of space). • Start a Compost pile at school and observe what happens to materials in the pile over time. **(link with activities from P4 SS-D)**	**Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.** **techniques include:** • **questioning** - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching • **checklists** - teachers use these during observations or interactions to note mastery of particular concepts or skills • **teacher observations** - teachers watch students (individuals or groups) during activities, guided and independent practise • **games and puzzles** (including computer applications) - teachers can monitor levels of success at games or puzzles and intervene when necessary • **mind maps, drawings** - teachers can diagnose misconceptions based on accuracy • **quizzes** (oral and written) **and worksheets** - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions • **science journals** - students use these to record details of investigations and a method of reflection .(teacher will review journals regularly and give feedback) - investigations : what did I think about? - what did I do? - what did I see? - what did I find out? - reflections: what did I learn? - what did I like? - what else do I want to know?

Module Title: Save Our Island Home and Our Earth	**Sequence Reference:** P4 SC-C

Summative Assessment:

Assessment given at the end of a module where data is used to generate grades.

- Performance based examples:
  - Adapt any activities from previous section
  - Student/group project: Have students write letters to the Minister of the Environment to express concerns about various issues. These topics might include: pollution, destruction of a particular habitat, and loss of open space. Suggestions for solutions should be included. Assess students using rubrics for understanding of concept, process and final product
  - Class Project-collect and label samples of soil, rocks (including beach sand) and water from different locations around the island. (Students can use empty bottle to simulate air) Identify the source, list the properties of each and explain how it is at risk and how it should be conserved/ protected. Present to another audience. Assess students using rubrics for understanding of concept, process and final product
  - Use or adapt the performance assessment tasks at the end of chapter/ topics found in this unit
- End of unit test: teacher-made or from Unit 5: *Rocks and Resources*

Special Resources:
(materials, equipment & community involvement)

- cross curricular connections: English Language Arts, Mathematics, Social Studies (P4 SS-D)
- guest speakers: mason who is a senior citizen, KBB, National Trust education coordinator, author of Bermuda book or another person who has read the book and knows it well.
- Field trips/visits: Tynes Bay Incinerator, Pembroke dump (in process to parkland), building site, recycling center, Bermuda Underwater Exploration Institute (Bermuda sand Collection and sand lab)
- Internet sites: Kids web – Natural Resources www.metroc.gov/dnr/kidsweb/
  Earth to Kids games www.environmentaldefence.org/Earth2Kids/games/
  Protect the Environment: Kids in Action http://tqjunior.thinkquest.org/6076

References - Teacher:

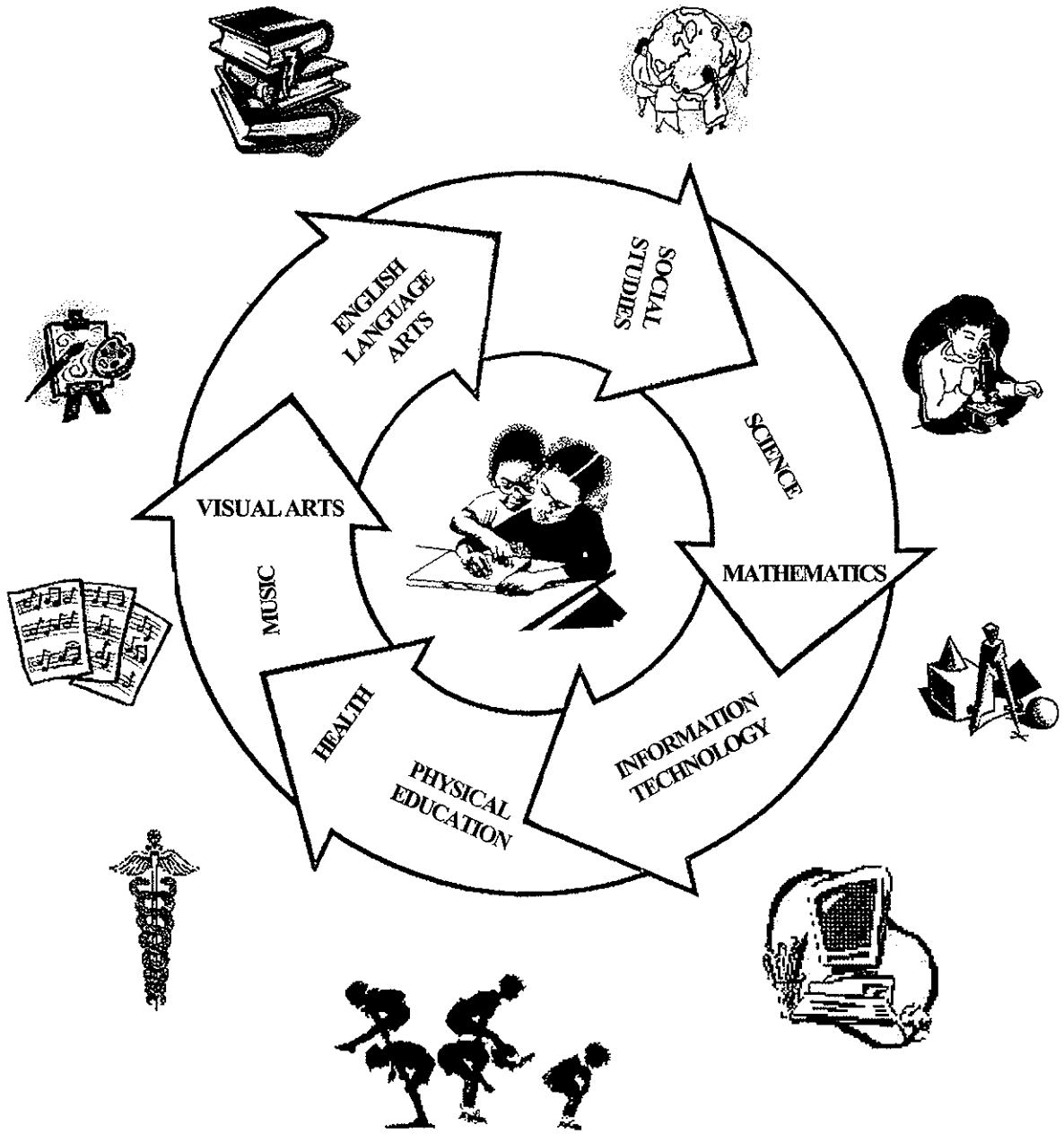
- McGraw Hill Science. Grade 3
- Unit 5: *Rocks and Resource*

References - Student:

- McGraw Hill Science. Grade 3
- Unit 5 *Rocks and Resources*

Glossary:

- refer to text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Module D

SCIENCE

Module Title: Earth in Space

Sequence Reference: P4 SC-D

PHASE A				PHASE B		
PS	P1	P2	P3	P4	P5	P6
☐	☐	☐	☐	☒	☐	☐

Time allotted: 6 weeks

Subgoal Emphasis:

- 1.1, 1.2, 1.4, 1.5 Nature and History of Science
- 2.1 – 2.8 Scientific Inquiry
- 3.2, 3.4 Positive Attitude
- 4.2 Advocate for the Environment

Content Focus:

- Change
- Systems
- Cause and Effect
- Earth Science

Curriculum Objectives:

At the end of this module, students will:

- describe how Earth's movement in space is related to days, months, years, and seasons
- explain how the moon moves in space and how the moon appears to change shape
- name the planets in our solar system and state their position in relation to the sun.
- distinguish between stars and planets and recognize that the sun is the centre of our universe
- recognize the patterns of the stars during different seasons and describe how they appear to move across the sky
- research how scientists view space from earth
- be aware of the history of technology in the exploration of space

Content Detail:

- phases of the moon (new, full, first quarter, second quarter)
- our solar system
  - the nine planets
  - stars
  - satellites (moons)
- earth's movement
  - rotation (day/night)
  - revolution (months/years)
  - orbits
  - tilt of the earth's axis (seasons)
- our sun
- constellations
- scientists looking at space
  - telescopes
  - observatories
- technology of space exploration: rockets, space shuttle, space probe

Module Title: Earth in Space	**Sequence Reference:** P4 SC-D

Recommended Instructional Strategies:

- **How Does the Earth Move each day?** Have students create a shadow stick sundial and watch a shadow to find out.
- **How stars appear to move across the sky**. Use a globe and removable stickers. Have students place a sticker on the globe where they live. Direct students to hold the stars over the globe's North Pole while a partner slowly turns the globe. Have students observe how the stars would appear in the sky over their home as the Earth turns.
- **Moon Phases**. Use three volunteers to represent the Sun, Earth, and Moon. Ask the Sun and Earth to stand facing one another. Then ask the moon to revolve slowly around Earth always facing the Sun. What part of the Moon's face can the children see?
- Have the students observe the moon for two weeks. Each night they should draw what they see.
- **Constellations through the year.** Use 5 student volunteers. Place a lighted lamp on a stool. Have four students each hold 1 constellation –Leo, Scorpio, Pegasus, and Orion (In this order). Each student should stand around the lamp. Have the fifth student represent the Earth and stand between the sun and the constellations. Have the student representing the Earth move to various positions to demonstrate when each constellation can be seen.
- Students will choose an object in the school grounds, which will create a shadow. Students will predict and monitor changes in shadows over a period of time and relate these changes to the change in position of the sun

Recommended Formative Assessment Strategies:

Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.

techniques include:

- **questioning**
  - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching
- **checklists**
  - teachers use these during observations or interactions to note mastery of particular concepts or skills
- **teacher observations**
  - teachers watch students (individuals or groups) during activities, guided and independent practise
- **games and puzzles** (including computer applications)
  - teachers can monitor levels of success at games or puzzles and intervene when necessary
- **mind maps, drawings**
  - teachers can diagnose misconceptions based on accuracy
- **quizzes** (oral and written) **and worksheets**
  - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions
- **science journals**
  - students use these to record details of investigations and a method of reflection. (teacher will review journals regularly and give feedback)
  - investigations : what did I think about?
  - what did I do?
  - what did I see?
  - what did I find out?
  - reflections: what did I learn?
  - what did I like?
  - what else do I want to know?

Module Title: Earth in Space	**Sequence Reference:** P4 SC-D

Summative Assessment:

Assessment given at the end of a module where data is used to generate grades.

- Performance based examples:
  - Adapt any activities from previous section
  - Student/group project: Interview: have students make up questions about Earth's revolution and rotation. Students can use their questions to interview other students and check correct answers. Assess students using rubrics for understanding of concept, process and final product.
  - Class Project - Students choose a section that they are interested in and role-play the "teacher-astronomer" and explain the mini unit to other students. They can create a poster or other props. Assess students using rubrics for understanding of concept, process and final product. Posters can then be displayed on corridor bulletin board.
  - Use or adapt the performance assessment tasks at the end of chapter/topics found in this unit
- End of unit test: teacher-made or from Unit 4: *The Sun and Its Family*

Special Resources:
(materials, equipment & community involvement)

- cross curricular connections: English Language Arts, Mathematics
- field trips/ visits: site with a telescope to look at night sky; meteorological station
- Internet sites: www.starrynight.com www.mhschool.com/science www.scilinks.org

References - Teacher:

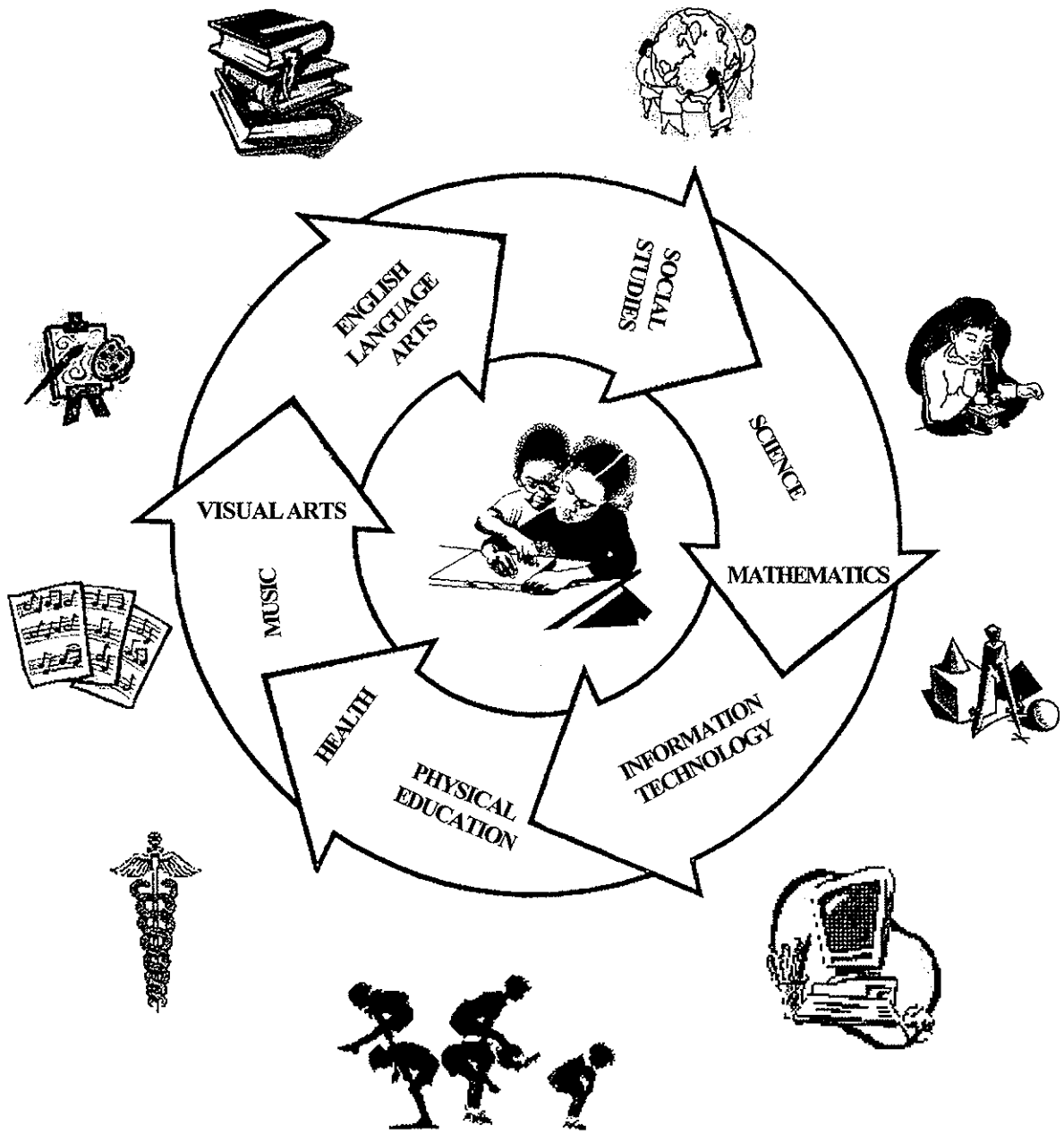
- McGraw-Hill Science. Grade 3
- Unit 4: *The Sun and Its Family*

References - Student:

- McGraw-Hill Science. Grade 3
- Unit 4: *The Sun and Its Family*

Glossary:

- refer to text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Module E

SCIENCE

Module Title: Matter and Energy

Sequence Reference: P4 SC-E

PHASE A				PHASE B		
PS	P1	P2	P3	P4	P5	P6
☐	☐	☐	☐	☒	☐	☐

Time allotted: 8 weeks

Subgoal Emphasis:

- 1.2 - 1.5 Nature and History of Science
- 2.1 - 2.8 Scientific Inquiry
- 3.1 - 3.3 Positive Attitude
- 4.1 Advocate for Environment

Content Focus:

- Change
- Cause and Effect
- Physical Science

Curriculum Objectives:

At the end of this module, students will:

- recognize heat as a form of energy and identify sources of heat
- compare materials according to the degree to which they conduct heat
- examine the effects of heat on various substances
- explore the concept of heat transfer
- be able to suggest solutions to the problems of heating homes in the winter
- measure the volume and mass of various objects
- recognise the difference between mass and weight
- describe how matter can change

Content Detail:

- measurement and matter: volume and mass (metric units)
- mass and weight:
  - effect of gravity
  - mass and weight on earth and moon
- energy and work
- changes in matter
  - heating and mixing
- sources of heat energy
  - friction
  - sun's rays
  - burning fuels
- sources of heat
  - friction
  - sun's rays
  - burning fuels
- effects of heat and heat transfer
  - measuring temperature
  - melting, condensing, evaporating, freezing
  - making new materials
  - making new materials
  - dissolving things faster
  - direction of heat flow
- heating homes in the winter

Module Title: Matter and Energy	**Sequence Reference:** P4 SC-E

Recommended Instructional Strategies:

- Measurement circus: set up stations around the room with measuring tasks. Have students circulate through tasks and record answers on personal answer sheets. Stations could include: a ruler for measuring length of an object; a tape measure for measuring the circumference of an irregular or round object; a thermometer for measuring the temperature of water; a force meter to measure weight or an elastic suspended from a ruler to measure the length extended when an object is attached.
- Testing predictions: Attach a thumbtack to a skewer using wax. Have students predict how long it will take for the thumbtack to drop off when a candle continuously heats the other end of the skewer. Students can record estimated times from class members and compare with actual time. Discussion can take place around the topic of how heat transfers from a hotter to a cooler object.
- Have students investigate the optimum conditions for melting one cube of ice. (How long does it take to melt)? Place in a refrigerator, in a cupboard, on the windowsill, on the playing field etc. Students should record as shown in the **science journal** section in next column.
- Investigation: design an experiment to determine the kind of covering that will keep an ice cube from melting for the longest time. Students can use card, foil, plastic wrap, cloth etc
- Teacher demonstration (for safety): determining the boiling point of water.
- Have students rub their hand to show friction
- Have students examine substances and infer which ones make good conductors and insulators
- Set up experiment using ice cubes, water and heat source to determine freezing and boiling points
- Demonstrate and compare the effects of heat on solid liquids and gases
- Construct thermometer and explain how it works

Recommended Formative Assessment Strategies:

Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.

techniques include:

- **questioning**
  - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching
- **checklists**
  - teachers use these during observations or interactions to note mastery of particular concepts or skills
- **teacher observations**
  - teachers watch students (individuals or groups) during activities, guided and independent practise
- **games and puzzles** (including computer applications)
  - teachers can monitor levels of success at games or puzzles and intervene when necessary
- **mind maps, drawings**
  - teachers can diagnose misconceptions based on accuracy
- **quizzes** (oral and written) **and worksheets**
  - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions
- **science journals**
  - students use these to record details of investigations and a method of reflection .(teacher will review journals regularly and give feedback)
  - investigations : what did I think about?
  - what did I do?
  - what did I see?
  - what did I find out?
  - reflections: what did I learn?
  - what did I like?
  - what else do I want to know?

Module Title: Matter and Energy	**Sequence Reference:** P4 SC-E

Summative Assessment:

Assessments given at the end of a module where the data is used to generate grades.

- Performance based examples:
  - Adapt any activities from previous section e.g. measurement circus
  - Student/group project: Write an illustrated "dictionary" using all the vocabulary (concepts) learned in this topic. Give students the list to be included in the product. Assess students using rubrics for understanding of concept, process and final product
  - Class Project (groups) – design an experiment to determine what type of cup holder is better to keep a cup of hot chocolate hot for the longest time. OR design a container to keep a lollipop frozen from the beginning to the end of the school day. Assess students using rubrics for understanding of concept, process and final product
  - Skills test: measuring mass, volume and temperature accurately
  - Use or adapt the performance assessment tasks at the end of chapter/topics found in this unit
- End of unit test: teacher-made or from Unit 3 *Matter and Energy Topics 1, 2, 4;* Unit 2: *Topics 2 - 4*

Special Resources:

(materials, equipment & community involvement)

- cross curricular connections: English Language Arts, Mathematics, Art
- guest speakers: plumber (inside a hot water heater, heating system for a home), senior or middle school science teacher (show heat transfer experiments), BELCO engineer
- field trips/visits: middle or senior school science laboratory demonstration: chemical and physical changes using the Bunsen burner; BELCO

References - Teacher:

- McGraw-Hill Science. Grade 3
- Unit 3: *Matter and Energy Topics 1, 2 & 4*
- Unit 2: *Topics 2 - 4*

References - Student:

- McGraw-Hill Science. Grade 3
- Unit 3: *Matter and Energy Topics 1, 2 & 4*
- Unit 2: *Topics 2 - 4*

Glossary:

- refer to text

Science - P5
Level Code: P5 SC

MINISTRY OF EDUCATION
Bermuda
2001

PRIMARY SCHOOL
PHASE B OVERVIEW

Subject Title: Science **Subject Code:** P5 SC

Time Allotted: 150 min/wk

RATIONALE

Children from their earliest years are curious about their world; they explore, they ask questions and they enjoy the process of discovery. They develop wonderful ideas to explain phenomena that they observe. The science programme at the preschool and primary levels will use rich learning experiences to help the way that these ideas are formed, tested and modified. All children can then discover that science is part of their world, a fascinating world that they can interact with and understand.

The preschool and primary science programme will not only provide a sound foundation for middle level science, but also foster the development of a lifelong appreciation for learning in a world increasingly influenced by science, technology and challenges to the environment.

PRIMARY FIVE (P5) REQUIREMENTS

The requirements for this level are as follows:

• **Performance Assessment*** - Science investigations and other activities, dances, skits, role-play, skills tests, teacher observations, oral questioning, interviews	**40%**
• **Product Assessment*** - Games, journals, poems, posters, drawings, models, projects, stories, collages, crosswords, reports, letters, scores from interactive computer applications, topic portfolio	**40%**
• **Written Assessment** - ***Selected response***: multiple choice, true-false, matching - ***Constructed response:*** fill in the blank, short answers, label a diagram, visual organizers (web, graph, chart, concept map, illustration)	**20%**
Total	**100%**

*** Product and performance assessment scored by rubric**

MATERIALS OF INSTRUCTION (Adopted Text)

Baptiste, H. et al. McGraw Hill Science. New York: McGraw-Hill School Division, 2000.

PHASE B OUTLINE

P4 Module Titles A - E	P5 Modules Titles A - E	P6 Modules Titles A - E
A. All About Science ..... 2 - reading about science - science as a human endeavour - science process skills - tools of science - scientific investigation	**A. All About Science ..... 2** - reading about science - science as a human endeavour - science process skills - tools of science - scientific investigation	**A. All About Science ..... 2** - reading about science - science as a human endeavour - science process skills - tools of science - scientific investigation
B. Processes of Life..... 10 - life processes - energy for life - systems - reproduction and life cycles - traits	**B. A Closer Look at Living Things ..... 10** - characteristics of living things - cells as building blocks - basic life functions of organisms - a classification system - characteristics and classification of animals - Bermuda's vertebrates and invertebrates	**B. Our Island Home - Interactions of Living Things ..... 10** - interactions of organisms in an ecosystem - cycling of matter - Bermuda's terrestrial habitats - changes in ecosystems - protecting Bermuda's habitats
C. Save Our Earth and Our Island Home ..... 8 - features of the landscape - man and natural resources - reduce, reuse, recycle - rocks - Bermuda's limestone	**C. A Changing World ..... 6** - rocks and fossils - fossils and today's organisms - weathering and erosion - soils	**C. Oceans ..... 8** - characteristics of oceans - importance of oceans and marine ecosystems - desalination - weather and climate - exploration - pollution and protection
D. Earth in Space .....6 - phases of the moon - our solar system - earth's movement - scientists looking at space - space travel	**D. Electricity and Magnetism ..... 8** - importance of electricity - generation of electricity in Bermuda - static and current electricity - magnets and magnetic fields - applications	**D. Weather ..... 8** - the water cycle - clouds - weather patterns - forecasting weather, weather instruments and technology - weather and climate - sun and weather conditions

E. Matter and Energy 8
- measurement and matter
- mass and weight
- changes in matter
- sources of heat energy
- effects of heat and heat transfer
- heating our homes

E. Changes in Matter 8
- states and properties of matter
- measuring matter
- changes in matter
- composition of matter

E. Matter 6
- characteristics of states of matter
- measuring properties of matter
- reversible and irreversible changes
- dissolving materials
- comparing matter

Subtotal	34	Subtotal	34	Subtotal	34
Optional Weeks	4	Optional Weeks	4	Optional Weeks	4
Total Weeks	38	Total Weeks	38	Total Weeks	38

PRIMARY SCHOOL

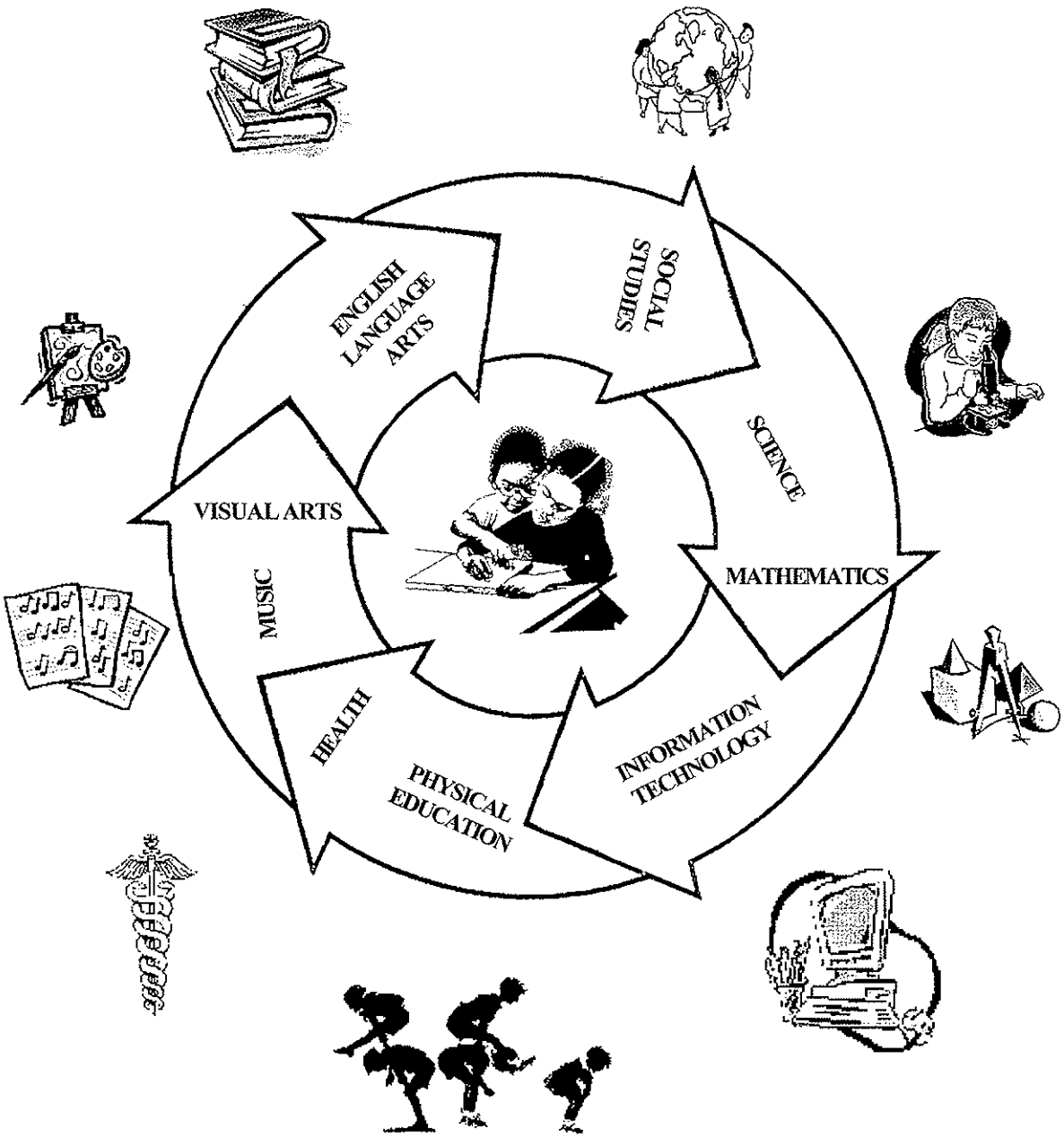
check one: PS ☐ P1 ☐ P2 ☐ P3 ☐ P4 ☐ P5 ☒ P6 ☐

Science

GOALS		SUBGOALS		MODULE & CURRICULUM CORRELATION MATRIX				
1	Conceptualizing the History and Nature of Science	1.1	Contribution/Diversity	x	x	x	x	
		1.2	Connections	x	x	x	x	x
		1.3	Health		x	x	x	x
		1.4	Inter-relationship/Mathematics Science Technology	x	x	x	x	x
		1.5	Problem Solving	x	x	x	x	x
2	Demonstrating Nature of Scientific Inquiry	2.1	Hypothesis	x	x	x	x	x
		2.2	Design	x	x	x	x	x
		2.3	Data Collection	x	x	x	x	x
		2.4	Technology Use	x	x	x	x	x
		2.5	Explanations/limitation	x	x	x	x	x
		2.6	Explanations/alternatives		x	x	x	x
		2.7	Communications/Results		x	x	x	x
		2.8	Research		x	x	x	x
3	Demonstrating Positive Attitudes Towards Science	3.1	Present use of Science	x	x	x	x	x
		3.2	Value, Environment	x	x	x	x	x
		3.3	Ethical, Applications	x	x	x	x	x
		3.4	Career Options	x	x	x	x	x
4	Advocating for Environmental Responsibility	4.1	Environmental Stewardship		x	x		
		4.2	Environmental Applications	x	x	x	x	
CONTENT STRUCTURE		Change		x	x	x	x	x
		Cause & Effect		x	x	x	x	x
		Systems		x	x	x	x	x
		Life Science		x	x			
		Physical Science		x			x	x
		Earth Science		x		x		
		MODULE		**A**	**B**	**C**	**D**	**E**

MODULE KEY

A - All About Science
B - A Closer Look At Living Things
C - A Changing World
D - Electricity and Magnetism
E - Changes in Matter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Module A

SCIENCE

Module Title: All About Science

Sequence Reference: P5 SC-A

PHASE A				PHASE B		
PS	P1	P2	P3	P4	P5	P6
☐	☐	☐	☐	☐	☒	☐

Time allotted: 2 weeks

Subgoal Emphasis:

- 1.1, 1.2, 1.4, 1.5 Nature and History of Science
- 2.1 – 2.5 Scientific Inquiry
- 3.1 – 3.4 Positive Attitude
- 4.2 Advocate for the Environment

Content Focus:

- Change
- Cause and Effect
- Systems
- Physical, Life and/or Earth Science

Curriculum Objectives:

At the end of this module, students will:

- discuss a story or article about science
- appreciate science as a human endeavour
- practise a science process skill
- recognise the use of mathematics and technology as tools of science
- carry out a scientific investigation
- value safety as a priority in science

Content Detail:

- all about science
  - scientific discovery, an invention, current news, history of science etc.
  - magazine or newspaper article [NIE or other]
  - fiction or non-fiction story including science fiction
  - video or other multimedia about science
- science as a human endeavour
  - many people have practised science for a long time in all cultures
  - men and women have contributed to science
  - many people make science a career
  - there is a lot still to be learned about our world
- science process skills
  - observing, measuring, estimating
  - classifying
  - inferring and predicting
  - collecting, recording and analysing data
  - hypothesizing and designing and experiment
  - controlling variables and making models
  - communicating: telling, writing, drawing, showing
  - working in groups
- science tools: mathematics and technology
  - using mathematics: counting, graphing
- science investigation: *Long Arms, Strong Arms (see Appendix)*
- safety in the science classroom
  - handling materials an equipment safely
  - avoid running or playing during an investigation
  - report any accident to the teacher
  - do not taste anything unless directed by the teacher
  - ask for help when necessary

Module Title: All About Science	**Sequence Reference:** P5 SC-A

Recommended Instructional Strategies:

- Story or article about science: read a story or article about science or a scientist. Discuss the events, the characters (scientists), the importance of the invention, event or discovery. Have students recognize that men and women from different cultures have been involved in science from many years ago. Many people choose science as a career. [science as a human endeavour] Students should use their science journal to reflect on what has been discussed in an age appropriate manner (drawing or writing)
- Brainstorm safety rules for science activities. List them, have students decorate them and post them in the classroom.
- Using science tools: students should practise using science equipment, using the computer for science games and interactive simulations; using mathematics in science (measuring, using calculators, reading and making charts and graphs)
- Science process skills: explanations and examples [see appendix]
- Science investigation: *Long Arms, Strong Arms* (refer to appendix for details of investigation)

Recommended Formative Assessment Strategies:

Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.

techniques include:

- **questioning**
  - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching
- **checklists**
  - teachers use these during observations or interactions to note mastery of particular concepts or skills
- **teacher observations**
  - teachers watch students (individuals or groups) during activities, guided and independent practise
- **games and puzzles** (including computer applications)
  - teachers can monitor levels of success at games or puzzles and intervene when necessary
- **mind maps, drawings**
  - teachers can diagnose misconceptions based on accuracy
- **quizzes** (oral and written) **and worksheets**
  - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions
- **science journals**
  - students use these to record details of investigations and a method of reflection (teacher will review journals regularly and give feedback)
  - investigations : what did I think about?
  - what did I do?
  - what did I see?
  - what did I find out?
  - reflections: what did I learn?
  - what did I like?
  - what else do I want to know ?

Module Title: All About Science	**Sequence Reference:** P5 SC-A

Summative Assessment:

Assessment given at the end of a module where data is used to generate grades.

- Possible entries for science journal:
  - reflection on video, article or story
  - description (draw, write or tell) of a scientist
  - evidence of mastery of process skill
  - record of laboratory investigation: *Long Arms, Strong Arms*

Special Resources:
(materials, equipment & community involvement)

- variety of science equipment: measuring cups, measuring cylinders, hand lens, rulers, balances, forcemeters, thermometers
- materials as cited in the investigations in the appendix
- lab safety rules
- stories or videos about scientific endeavours

References - Teacher:

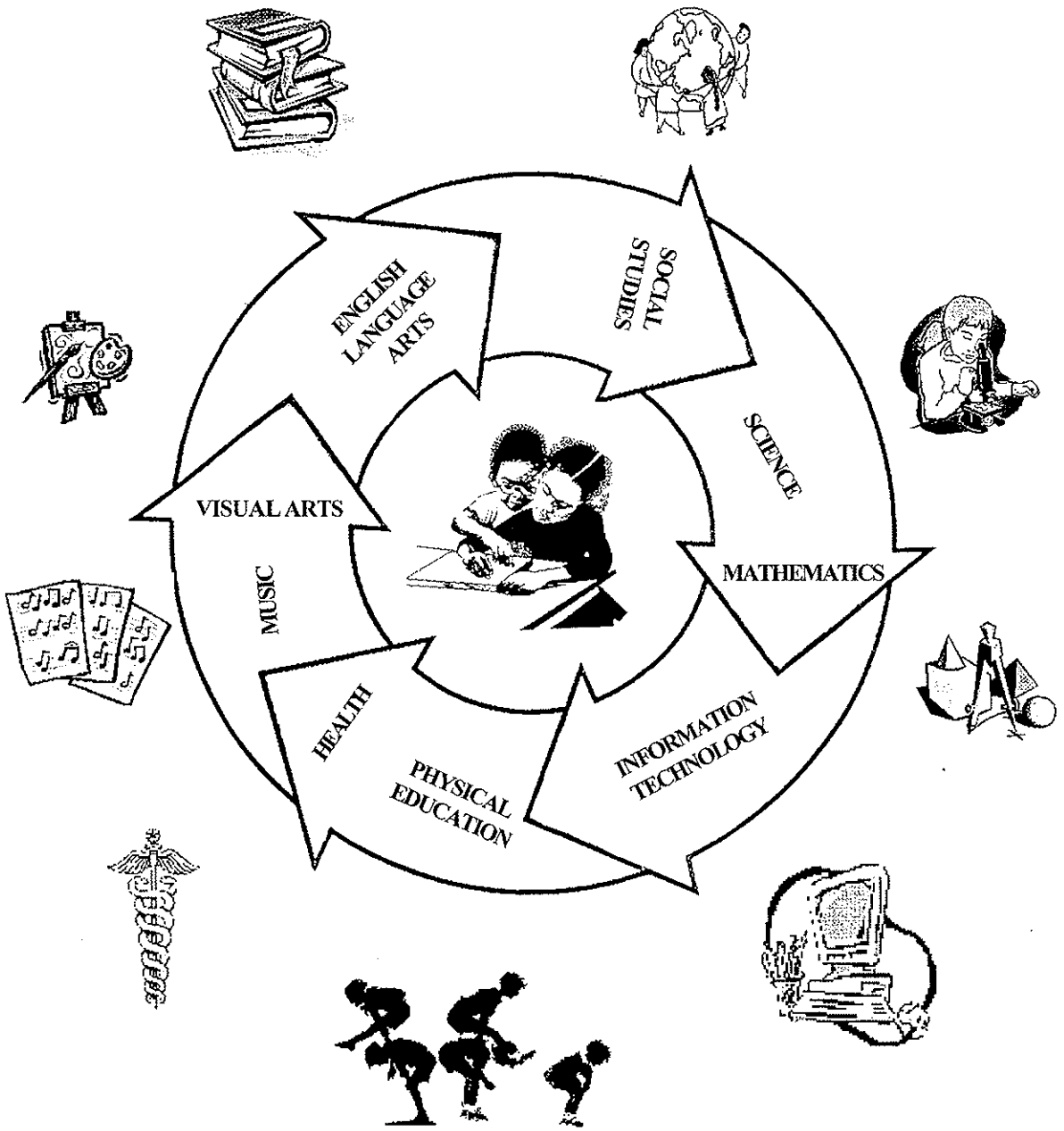
- McGraw-Hill Science. Grade 4
- Unit: *Be A Scientist*
- Reference Section: *Handbook and Glossary*

References - Student:

- McGraw-Hill Science. Grade 4
- Reference Section: *Handbook and Glossary*

Glossary:

- refer to text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Module B

SCIENCE

Module Title: A Closer Look at Living Things

Sequence Reference: P5 SC-B

PHASE A				PHASE B		
PS	P1	P2	P3	P4	P5	P6
☐	☐	☐	☐	☐	☒	☐

Time allotted: 10 weeks

Subgoal Emphasis:

- 1.1 – 1.5 Nature and History of Science
- 2.1 – 2.8 Scientific Inquiry
- 3.1 – 3.4 Positive Attitudes
- 4.1 – 4.2 Advocate for the Environment

Content Focus:

- Change
- Cause and Effect
- Systems
- Life Science

Curriculum Objectives:

At the end of this module, students will:

- appreciate the diversity of living things
- illustrate the characteristics of living things
- recognise cells as building blocks of organisms
- examine how organisms carry out basic life functions
- appreciate the importance of micro-organisms
- interpret a system by which organisms can be classified
- relate the characteristics of animals to those of living things in general
- classify animals as vertebrates or invertebrates
- identify examples of Bermuda's vertebrates and invertebrates

Content Detail:

- diversity of living things – at least 8000 species in Bermuda
  - definition in biodiversity (glossary)
- characteristics of living things
- cells as building blocks
  - cells – tissues- organs - systems
  - plant and animal cells
- micro-organisms
  - harmful micro-organisms: germs-micro-organisms that cause disease
  - micro-organisms in pond water
  - role in decay
  - micro-organisms and food: yeast, yogurt and cheese making
- organisms and organs and organ systems (humans):
  - blood, heart and circulatory system
  - lungs and respiratory system
  - kidneys and excretory system
  - stomach and digestive systems
  - skeletal and muscular system
- classification
  - kingdoms
  - traits
  - classification charts
- classifying fossils
- vertebrates and invertebrates
  - vertebrates: mammals, birds, reptiles, amphibians or fish
  - local examples of each
  - invertebrates: marine or terrestrial (local examples)

Module Title: A Closer Look at Living Things	**Sequence Reference:** P5 SC-B

Recommended Instructional Strategies:

- Students will visit the aquarium or a pet shop. In groups will choose different animals and describe their characteristics. Choose a site near the school with different plants and describe their characteristics. Discuss how the plants and animals chosen were similar and different. Extension: place these organisms in one of the five kingdoms
- Create your own animal critter and classify it based on a simple classification chart
- Classification keys and/or word problems: Teacher gives students indicators of certain organisms e.g. an organism cannot move, makes its own food from sunlight, reproduces by seed. Classify it. Note: classification keys consist of questions with yes/no options similar to flow charts: Does it produce chlorophyll; does it have four legs; does it have a tail etc. This decision making process will result in the identification of a particular animal (pictures could be given as a stimulus)
- Matching Pairs: Students will create review cards to match organs to organ systems e.g. heart /circulatory; lungs/respiratory; stomach/digestive
- Investigating micro-organisms: Students will
  - examine samples of pond water under a microscope
  - investigate live yeast
  - examine the function of yeast in baking
- School nurse visit – KWL activity have students list what they know and want to know about diseases caused by "germs" Have them note the nurses' responses to their questions and journal what they have learned.
- Classify me!
  - Give students 3 animals or organisms to observe. Have them look for ways that they are similar and different. List them in their journals. Look at their characteristics and place them in 1 of the 5 kingdoms of living things.
  - Students are to make a mural of a place where they may find the kingdoms of life e.g. woods. Students can work in groups, each making part of the landscape and adding a variety of organisms, students label each name and the kingdom to which it belongs

Recommended Formative Assessment Strategies:

Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.

techniques include:

- **questioning**
  - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching
- **checklists**
  - teachers use these during observations or interactions to note mastery of particular concepts or skills
- **teacher observations**
  - teachers watch students (individuals or groups) during activities, guided and independent practise
- **games and puzzles** (including computer applications)
  - teachers can monitor levels of success at games or puzzles and intervene when necessary
- **mind maps, drawings**
  - teachers can diagnose misconceptions based on accuracy
- **quizzes** (oral and written) **and worksheets**
  - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions
- **science journals**
  - students use these to record details of investigations and a method of reflection .(teacher will review journals regularly and give feedback)
  - investigations : what did I think about?
  - what did I do?
  - what did I see?
  - what did I find out?
  - reflections: what did I learn?
  - what did I like?
  - what else do I want to know?

Module Title: A Closer at Living Things	**Sequence Reference:** P5 SC-B

Summative Assessment:

Assessments given at the end of a module where the data is used to generate grades.

- Performance based examples:
  - Adapt any activities from previous section e.g. identifying an animal using a classification key
  - Student/group project: Make a set of classification review cards. Choose one local example of each kind of animal. Draw and name it on one side; describe its characteristics and classify it on the other side. Assess students using rubrics for understanding of concept, process and final product
  - Class Project: Assembly presentation: The Five Basic Life Functions. Students will write a skit or choreograph a set of dance movements to represent the topic. Assess students using rubrics for understanding of concept, process and final product.
  - Use or adapt the performance assessment tasks at the end of chapter/topics found in this unit
- End of unit test: teacher-made or from Unit 1 *Classifying Living Things* (Topics 1 – 4) and Unit 4 *Animals*

Special Resources:

(materials, equipment & community involvement)

- cross curricular connections: English Language Arts, Mathematics, Health Education
- guest speakers: health professional, environmental health officer
- visits: Bermuda Aquarium, Museum and Zoo (exhibits and classes), *Dolphin Quest,* Bermuda Underwater Exploration Institute

References - Teacher:

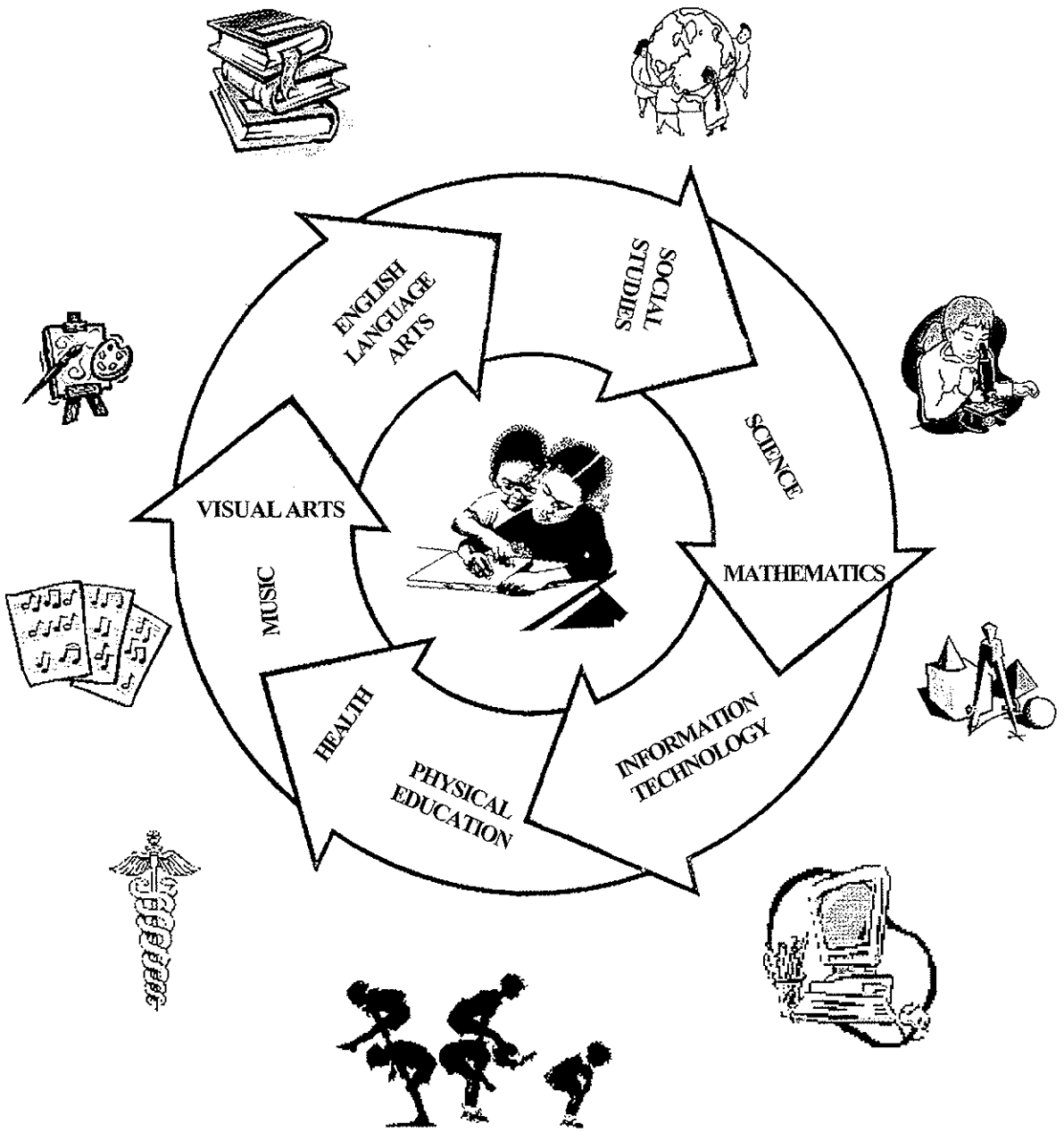
- McGraw-Hill Science. Grade 4
- Unit 1: *Classifying Living Things (Topics 1 – 4)*
- Unit 4: *Animals*

References - Student:

- McGraw-Hill Science. Grade 4
- Unit 1: *Classifying Living Things (Topics 1 – 4)*
- Unit 4: *Animals*

Glossary:

- **Biodiversity:** the variety of life – combination of two words biological and diversity. It includes the different types of plants and animals (species diversity), the different types of homes they live in (habitat diversity), and how individuals of a certain type of plant and animal vary (genetic diversity). examples are:
  - species diversity: cat, bluebird, human being, hibiscus, ant, amoeba (micro-organism)
  - habitat diversity: coral reef, marsh, Bermuda forests
  - genetic diversity: tabby cats, Siamese cats, brown-skinned people, blue-eyed people
- other terms: refer to text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Module C

SCIENCE

Module Title: A Changing World

Sequence Reference: P5 SC-C

PHASE A				PHASE B		
PS	P1	P2	P3	P4	P5	P6
☐	☐	☐	☐	☐	☒	☐

Time allotted: 6 weeks

Subgoal Emphasis:

- 1.1 – 1.5 Nature and History of Science
- 2.1 – 2.8 Scientific Inquiry
- 3.1 – 3.4 Positive Attitude
- 4.1 – 4.2 Advocate for the Environment

Content Focus:

- Change
- Cause and Effect
- Systems
- Earth Science

Curriculum Objectives:

At the end of this module, students will:

- differentiate among the three types of rocks
- differentiate between rocks and minerals
- explore fossil evidence in rocks
- recognize how fossils can be compared to one another and to today's organisms
- explain how weathering and erosion affect the earth's features
- recognize the importance of soil
- recognize the effect of changes to the environment made by humans
  (link to Social Studies "The Environment" P5 SS-D)

Content Detail:

- rocks
  - types : metamorphic (marble); sedimentary (limestone) igneous (granite)
  - formation: the rock cycle
- rocks and minerals
  - minerals composed of one substance
  - rocks composed of two or more minerals
- fossils
  - types of fossils: mold, trace, cast
  - fossils found in Bermuda – trees and shells
  - fossil formation
  - importance of fossils
- fossil evidence and classification of organisms of the past
- weathering and erosion
  - forces in nature (glaciers, waves, heat, pressure, wind)
  - features created by erosion (arches, dunes, canyons) Bermuda examples
- importance of fossil
  - composition (types of soils)
  - permeability etc.
  - preservation
- impact of changes to the environment
  - ruse in global temperature (due to fossil fuel burning, burning of Amazon forest)
  - see level rise (due to global warning), impact in Bermuda
  - climate and weather changes (hotter, stronger hurricane etc.)
  - impact on crops (food shortages)

  (link to Social Studies "The Environment" P5 SS-D)

Module Title: A Changing World	**Sequence Reference:** P5 SC-C

Recommended Instructional Strategies:

- Given several rocks and minerals, student groups will describe properties, then through guided discussion, determine the criteria for classification
- Students will research birthstones and create poster, pamphlet or poem. Students will include name of stone, chemical content, colour, hardness, source and value
- Create a display using soils, rocks and sands from around Bermuda. Have students label source and note particles present. If a bulletin board display, a hand lens could be attached for use by other classes.
- Weathering: Take a visit to a beach and collected examples of weathered rocks (smooth stones) and glass. Discuss how waves polish rocks on the shoreline
- Where does it come from: Teacher provides a list, pictures or actual objects. Students examine these objects and indicate whether they come from rocks. Objects could include: granite steps, a diamond ring, a plastic picnic set of fork, knife, plate and cup, a concrete block etc.

How weathering affects the Earth's surface:

- Use a mound of soil to represent a hill or a mountain and a beaker of water to demonstrate what happens when water falls and flows down the Earth's surface. Have students predict the outcomes before completing the demonstration.
- Have students conduct a field study on school grounds to observe and note evidence of weathering rocks (cracking pavements, eroding embankments etc.).
- **Moving Ice.** Have students make a model of a glacier and observe how these masses of ice affect the land over which they move. Use 1lb box of cornstarch and 1 2/3 cups of water to build glacier. Surround glacier with soil and add "new snow" to the top and observe the movement of the glacier.
- **Dissolve a rock.** Build a topography model using a clear plastic cup, wood glue, sand, and sugar cubes. Have students add water to the model and observe how the water changes the appearance of the model.
- Visit Crystal Caves to see underground rock formation.
- Have students research impact of sea level rise. (how much of Bermuda would be left if the sea level rose?) Information can be obtained from Dept. of Planning, BUEI etc.

Recommended Formative Assessment Strategies:

Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.

techniques include:

- **questioning**
  - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching
- **checklists**
  - teachers use these during observations or interactions to note mastery of particular concepts or skills
- **teacher observations**
  - teachers watch students (individuals or groups) during activities, guided and independent practise
- **games and puzzles** (including computer applications)
  - teachers can monitor levels of success at games or puzzles and intervene when necessary
- **mind maps, drawings**
  - teachers can diagnose misconceptions based on accuracy
- **quizzes** (oral and written) **and worksheets**
  - when used as diagnostic tool (as opposed to summative) the teacher and student can recognize and correct misconceptions
- **science journals**
  - students use these to record details of investigations and a method of reflection.(teacher will review journals regularly and give feedback)
  - investigations : what did I think about?
  - what did I do?
  - what did I see?
  - what did I find out?
  - reflections: what did I learn?
  - what did I like?
  - what else do I want to know?

Module Title: A Changing World	**Sequence Reference:** P5 SC-C

Summative Assessment:

Assessment given at the end of a module where data is used to generate grades.

- Performance based examples:
  - Adapt any activities from previous section
  - Student/group project: Create a illustrated Rock Cycle, Assess students using rubrics for understanding of concept, process and final product
  - Class Project - Create a diorama illustrating the effects of wind water and ice on the landscape. Each group could select a different effect: Ice breaking rocks into soil; wind shaping sand dunes; waves polishing rocks on the shore line. Assess students using rubrics for understanding of concept, process and final product
  - Use or adapt the performance assessment tasks at the end of chapter/topics found in this Unit Learning *About Earth's History*
- End of unit test: teacher-made or from Unit 3: *Learning About Earth's History*

Special Resources:
(materials, equipment & community involvement)

- cross curricular connections: English Language Arts, Mathematics
- field trips/ visits: farms, beaches, Crystal Caves, Blackwatch Pass or other quarried area to examine fossils in limestone, Bermuda Aquarium, Museum and Zoo classes and exhibits ; Bermuda Underwater Exploration Institute (see level rise project)

References - Teacher:

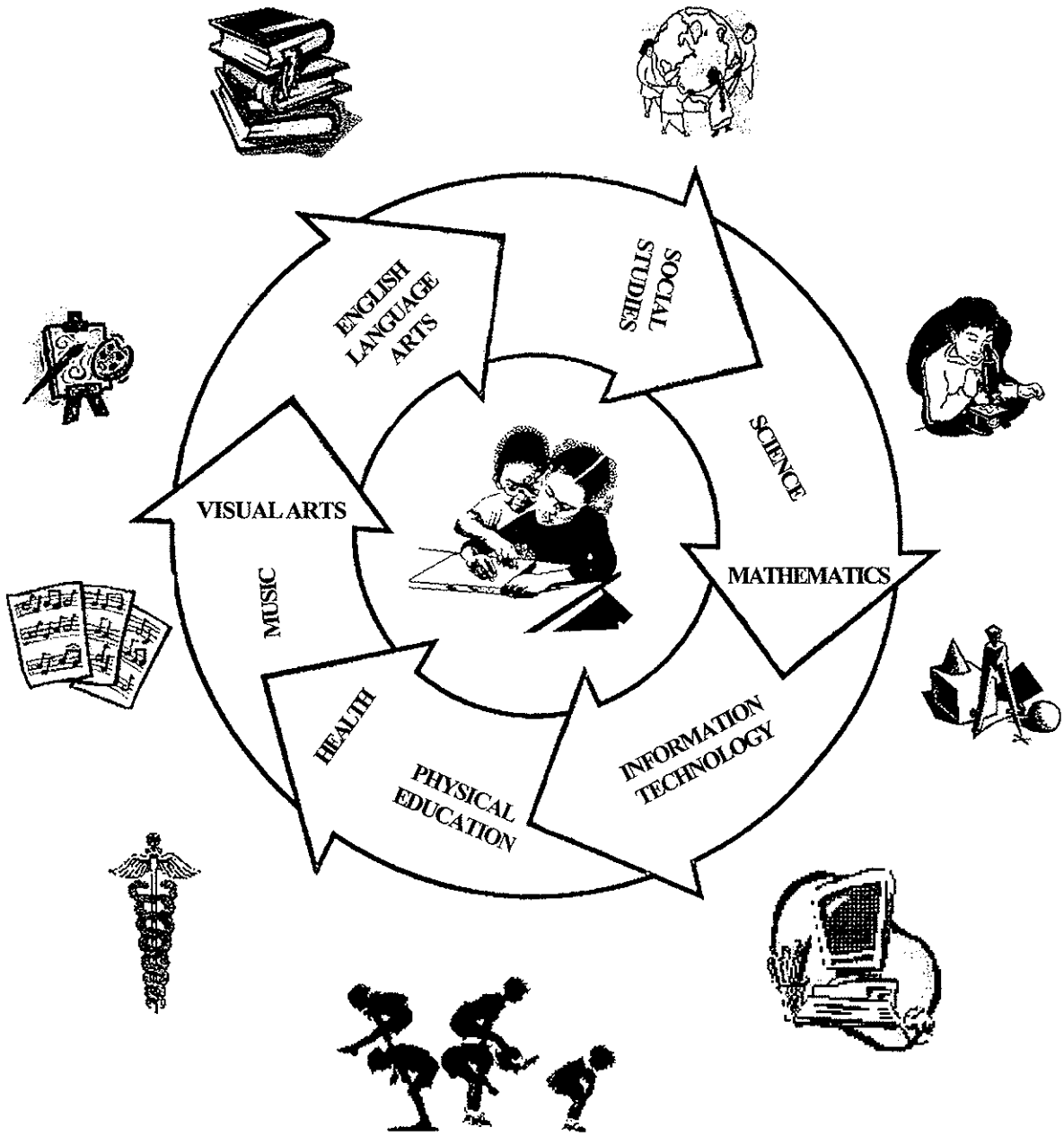
- McGraw-Hill Science. Grade 4
- Unit 3: *Learning About Earth's History*

References - Student:

- McGraw-Hill Science. Grade 4
- Unit 3: *Learning About Earth's History*

Glossary:

- refer to text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Module D

SCIENCE

Module Title: Electricity and Magnetism

Sequence Reference: P5 SC-D

PHASE A				PHASE B		
PS	P1	P2	P3	P4	P5	P6
☐	☐	☐	☐	☐	☒	☐

Time allotted: 8 weeks

Subgoal Emphasis:

- 1.1 -1.5 Nature and History of Science
- 2.1 - 2.8 Scientific Inquiry
- 3.1 – 3.4 Positive Attitude
- 4.2 Advocate for Environment

Content Focus:

- Change
- Cause and Effect
- Systems
- Physical Science

Curriculum Objectives:

At the end of this module, students will:

- recognize the importance of electricity in everyday life
- trace the path of electricity from generation to our home
- compare the conductivity of various materials
- compare the characteristics of static and current electricity
- appreciate the need to reduce the consumption of electricity
- explore and describe the properties of magnets
- explore the relationship between magnetism and electricity

Content Detail:

- electrical energy
  - using electricity in everyday life
  - electricity in nature (lightning)
  - electricity transformed to light, heat and sound
  - hazards of electricity
- generation of electricity in Bermuda
  - BELCO power
  - home generators
  - electricity from Tynes Bay Incinerator
- insulators and conductors; applications
- static and current electricity
  - static: characteristics, positive and negative charges formation, everyday examples
  - simple circuits - series and parallel
- reduction in consumption of electricity
  - reasons – conservation of resources, cost etc
  - alternative sources of energy – wind and wave power, nuclear energy
- properties of magnets
  - attraction and repulsion
  - magnetic fields
- magnetism and electricity:
  - characteristics of magnets and magnetic fields
  - electromagnets
  - electromagnetic forces
  - gravity

Module Title: Electricity and Magnetism	**Sequence Reference:** P5 SC-D

Recommended Instructional Strategies:

- Students develop a plan for reduction of consumption of electricity in the home or school
- Students will investigate the effect of different materials for the production of static electricity on a balloon. They will be expected to use materials such as wool, cotton, paper
- Investigation: Classify substances as conductors or nonconductors using basic understanding of electrical circuit. Students will design, carry out, record and analyze findings. Materials for testing include: strips of wood, aluminium foil, wire, and plastic. Extension:
- Does water conduct electricity in a circuit?
- Students will research the achievements of Benjamin Franklin in which he determined that lightning was a form of electricity. Students can role-play his dangerous experiment of flying a kite in a thunderstorm with a metal key suspended from it.
- Have student brainstorm things they want to know about production of electricity at Bermuda Electric Light Company. These questions will be the basis of a field trip to BELCO or a visit from an engineer from the company.
- Investigation: Which magnet is the strongest? Students will use magnets and paper clips to determine which magnet is the strongest.
- Discuss and demonstrate how electrical charges are produced by the flow of electrons
- Provide materials for demonstration of static electricity e.g. comb, wool and pith ball
- Discuss open and closed circuits and provide materials for students to demonstrate same
- Have students experiment with various materials to develop the concept of conductivity
- Discuss parallels and series circuits and provide materials to demonstrate same
- Demonstrate how electricity is produced by discussing and demonstrating the flow of electrons
- Students examine the mechanism of a door bell to develop the concept of electromagnetism and list places where electromagnets are found
- Students use voltmeter to demonstrate how some fruits and vegetables can produce an electrical charge
- Have students draw a poster or role-play the hazards of electricity for a P1 Health Education class in safety. P1 HE-A.

Recommended Formative Assessment Strategies:

Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.

techniques include:

- **questioning**
  - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching
- **checklists**
  - teachers use these during observations or interactions to note mastery of particular concepts or skills
- **teacher observations**
  - teachers watch students (individuals or groups) during activities, guided and independent practise
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- **science journals**
  - students use these to record details of investigations and a method of reflection .(teacher will review journals regularly and give feedback)
  - investigations : what did I think about?
  - what did I do?
  - what did I see?
  - what did I find out?
  - reflections: what did I learn?
  - what did I like?
  - what else do I want to know ?

Module Title: Electricity and Magnetism	**Sequence Reference:** P5 SC-D

Summative Assessment:

Assessments given at the end of a module where the data is used to generate grades.

- Performance based examples:
  - Adapt any activities from previous section
  - Student/group project: Write a story or skit responding to the following scenario: There has been a terrible storm on the island and the Bermuda Electric Light Company has been destroyed. There will be no electricity for one month. All portable generators have been given to senior citizens' homes and hospitals. Describe how your family will adapt and what you will have to do without during the next month. Assess students using rubrics for understanding of concept, process and final product
  - Class Project- students will design posters for P1 health education class about safety surrounding thunderstorms: Do not Fly a Kite; Do not swim etc. Assess students using rubrics for understanding of concept, process and final product
  - Use or adapt the performance assessment tasks at the end of chapter/topics found in this unit
- End of unit test: teacher-made or from Unit 5: *Electricity and Magnetism*

Special Resources:

(materials, equipment & community involvement)

- cross curricular connections: English Language Arts, Mathematics
- field trips/visits: Bermuda Electric Light Company, Tynes Bay Incinerator (electricity production)

References - Teacher:

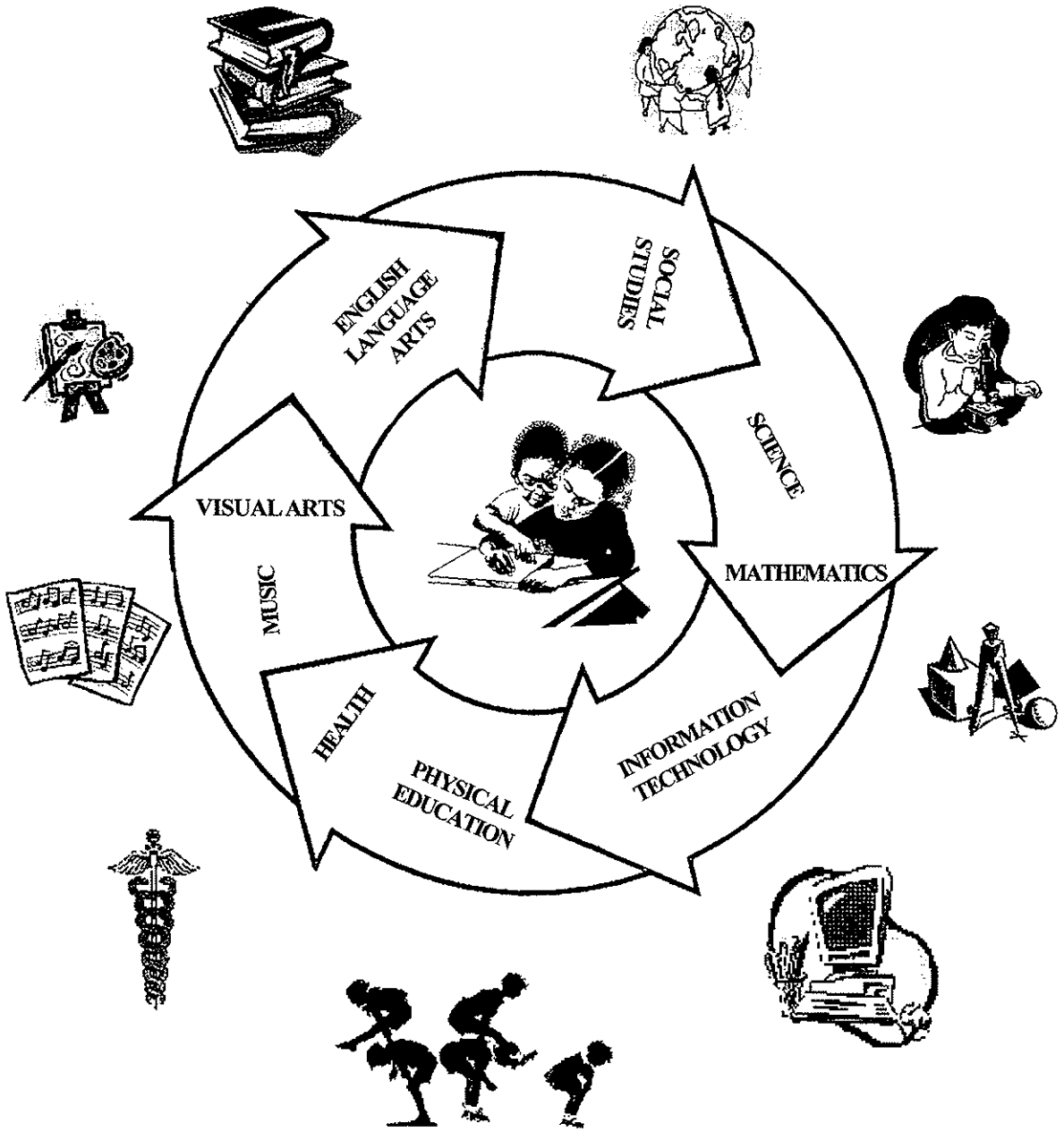
- McGraw-Hill Science. Grade 4
- Unit 5: *Electricity and Magnetism*

References - Student:

- McGraw-Hill Science. Grade 4
- Unit 5: *Electricity and Magnetism*

Glossary:

- refer to text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Module E

SCIENCE

Module Title: Change in Matter

Sequence Reference: P5 SC-E

PHASE A				PHASE B		
PS	P1	P2	P3	P4	P5	P6
☐	☐	☐	☐	☐	☒	☐

Time allotted: 8 weeks

Subgoal Emphasis:

- 1.2 - 1.5 Nature History of Science
- 2.1 - 2.8 Scientific Inquiry
- 3.1 – 3.4 Positive Attitudes

Content Focus:

- Change
- Cause and Effect
- Systems
- Physical Science

Curriculum Objectives:

At the end of this module, students will:

- classify matter based on its properties
- demonstrate how matter can be measured
- explore changes in matter
- investigate the composition of matter

Content Detail:

- matter
  - properties: colour, shape, texture etc.
  - definition of matter
  - states of matter
- measuring matter: length, volume, mass, area, density
- changes in matter
  - effect of heating and cooling
  - changes that produce new things
  - changes that can be reversed
- composition of matter
  - elements
  - separating mixtures

Module Title: Change in Matter	**Sequence Reference:** P5 SC-E
Recommended Instructional Strategies:	**Recommended Formative Assessment Strategies:**
• Show and Tell: students will choose a commonly used object, describe its properties, and then relate the properties to its use. Extend this task by asking students to explain why another kind of material would not work as well. E.g. aluminum or steel as an excellent material for stovetop or oven cookware, but plastic is not. • Group work: students are given a selection of objects. They will draw and write descriptions of them. They will then deduce the categories used for the description and convert their written descriptions into a chart. Characteristics could include: colour, size, shape, texture, use. • Game: the class can play "*I Spy*" or "*What Am I.*" Students and/or teacher can describe characteristics of objects within sight of class member. Students guess the name of the object. • Students can research how raw materials can be transformed into new products • Recycling: students can design uses for discarded objects; garbage critters or foil sculptures. They can write about the importance of recycling or reusing objects. • Have students list solids, liquids and gases in everyday life and discuss their uses • Investigation: Given pieces of steel wool determine what conditions make things rust faster. Students will write what they think, what they should do, record and interpret results. • Devise a scavenger hunt (in the classroom or on the school grounds) for students using properties of objects	**Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.** **techniques include:** • **questioning** - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching • **checklists** - teachers use these during observations or interactions to note mastery of particular concepts or skills • **teacher observations** - teachers watch students (individuals or groups) during activities, guided and independent practise • **games and puzzles** (including computer applications) - teachers can monitor levels of success at games or puzzles and intervene when necessary • **mind maps, drawings** - teachers can diagnose misconceptions based on accuracy • **quizzes** (oral and written) **and worksheets** - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions • **science journals** - students use these to record details of investigations and a method of reflection .(teacher will review journals regularly and give feedback) - investigations : what did I think about? - what did I do? - what did I see? - what did I find out? - reflections: what did I learn? - what did I like; - what else do I want to know?

Module Title: Change in Matter	**Sequence Reference:** P5 SC-E

Summative Assessment:

Assessments given at the end of a module where the data is used to generate grades.

- Performance based examples:
  - Adapt any activities from previous section
  - Student/group project: Measurement circus: mass using balance, length in centimetres, volume of liquid; volume of irregular object using water displacement, density. Assess students using rubric for understanding of concept, checklist for process skills (measures accurately, handles equipment correctly)
  - Class Project - A Changing Bulletin Board: During this topic each group would be made responsible for displaying what they learned about one subtopic. They will use pictures, drawings or artifacts to illustrate one of the four subtopics from **Content Detail**: properties of matter, measuring matter, changes in matter, and composition of matter. For each topic, each student in the class will respond to the questions: what I liked; what I learned. These reflections could be decorated and placed around the bulletin board for each relevant display. Assess students using rubrics for understanding of concept, process and final product.
  - Use or adapt the performance assessment tasks at the end of chapter/ topics found in this unit 2 *Matter on The Move*
- End of unit test: teacher-made or from Unit 2: *Matter on the Move* (topics 1 –4)

Special Resources:

(materials, equipment & community involvement)

- cross curricular connections: English Language Arts, Mathematics, Art
- field trips/ visits: recycling centre, Tynes Bay Incinerator, a compost heap (Pembroke Dump), jeweller, Bermuda Glassworks

References - Teacher:

- McGraw-Hill Science. Grade 4
- Unit 2: *Matter on the Move* (topics 1 –4)

References - Student:

- McGraw-Hill Science. Grade 4
- Unit 2: *Matter on the Move* (topics 1 –4)

Glossary:

- refer to text

Science - P6
Level Code: P6 SC

MINISTRY OF EDUCATION
Bermuda
2001

PRIMARY SCHOOL
PHASE B OVERVIEW

Subject Title: Science **Subject Code:** P6 SC

Time Allotted: 150 min/wk

RATIONALE

Children from their earliest years are curious about their world; they explore, they ask questions and they enjoy the process of discovery. They develop wonderful ideas to explain phenomena that they observe. The science programme at the preschool and primary levels will use rich learning experiences to help the way that these ideas are formed, tested and modified. All children can then discover that science is part of their world, a fascinating world that they can interact with and understand.

The preschool and primary science programme will not only provide a sound foundation for middle level science, but also foster the development of a lifelong appreciation for learning in a world increasingly influenced by science, technology and challenges to the environment.

PRIMARY SIX (P6) REQUIREMENTS

The requirements for this level are as follows:

• **Performance Assessment*** - Science investigations and other activities, dances, skits, role-play, skills tests, teacher observations, oral questioning, interviews	**40%**
• **Product Assessment*** - Games, journals, poems, posters, drawings, models, projects, stories, collages, crosswords, reports, letters, scores from interactive computer applications, topic portfolio	**40%**
• **Written Assessment** - ***Selected response***: multiple choice, true-false, matching - ***Constructed response:*** fill in the blank, short answers, label a diagram, visual organizers (web, graph, chart, concept map, illustration)	**20%**
Total	**100%**

*** Product and performance assessment scored by rubric**

MATERIALS OF INSTRUCTION (Adopted Text)

Baptiste, H. et al. McGraw Hill Science. New York: McGraw-Hill School Division, 2000.

PHASE B OUTLINE

P4 Module Titles A - E	P5 Modules Titles A - E	P6 Modules Titles A - E
A. All About Science ..... 2 - reading about science - science as a human endeavour - science process skills - tools of science - scientific investigation	**A. All About Science ..... 2** - reading about science - science as a human endeavour - science process skills - tools of science - scientific investigation	**A. All About Science ..... 2** - reading about science - science as a human endeavour - science process skills - tools of science - scientific investigation
B. Processes of Life..... 10 - life processes - energy for life - systems - reproduction and life cycles - traits	**B. A Closer Look at Living Things ..... 10** - characteristics of living things - cells as building blocks - basic life functions of organisms - a classification system - characteristics and classification of animals - Bermuda's vertebrates and invertebrates	**B. Our Island Home - Interactions of Living Things ..... 10** - interactions of organisms in an ecosystem - cycling of matter - Bermuda's terrestrial habitats - changes in ecosystems - protecting Bermuda's habitats
C. Save Our Earth and Our Island Home ..... 8 - features of the landscape - man and natural resources - reduce, reuse, recycle - rocks - Bermuda's limestone	**C. A Changing World ..... 6** - rocks and fossils - fossils and today's organisms - weathering and erosion - soils	**C. Oceans ..... 8** - characteristics of oceans - importance of oceans and marine ecosystems - desalination - weather and climate - exploration - pollution and protection
D. Earth in Space .....6 - phases of the moon - our solar system - earth's movement - scientists looking at space - space travel	**D. Electricity and Magnetism ..... 8** - importance of electricity - generation of electricity in Bermuda - static and current electricity - magnets and magnetic fields - applications	**D. Weather ..... 8** - the water cycle - clouds - weather patterns - forecasting weather, weather instruments and technology - weather and climate - sun and weather conditions

E. Matter and Energy 8
- measurement and matter
- mass and weight
- changes in matter
- sources of heat energy
- effects of heat and heat transfer
- heating our homes

E. Changes in Matter 8
- states and properties of matter
- measuring matter
- changes in matter
- composition of matter

E. Matter 6
- characteristics of states of matter
- measuring properties of matter
- reversible and irreversible changes
- dissolving materials
- comparing matter

Subtotal	34	Subtotal	34	Subtotal	34
Optional Weeks	4	Optional Weeks	4	Optional Weeks	4
Total Weeks	38	Total Weeks	38	Total Weeks	38

PRIMARY SCHOOL

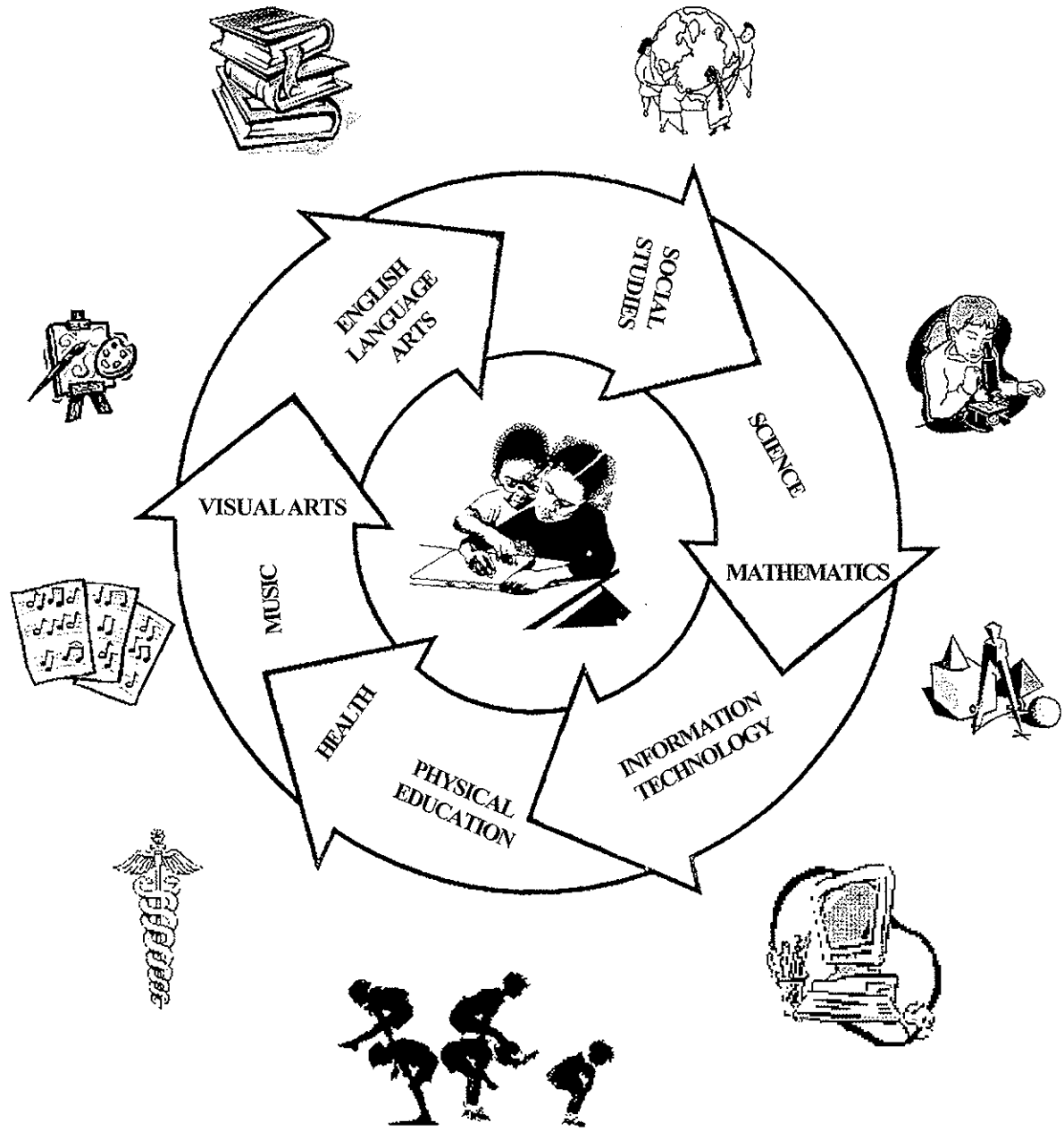
check one: PS ☐ P1 ☐ P2 ☐ P3 ☐ P4 ☐ P5 ☐ P6 ☒

Science

GOALS		SUBGOALS		MODULE & CURRICULUM CORRELATION MATRIX				
1	Conceptualizing the History and Nature of Science	1.1	Contribution/Diversity	x		x	x	
		1.2	Connections	x	x	x	x	x
		1.3	Health			x		
		1.4	Inter-relationship/Mathematics Science Technology	x	x	x	x	x
		1.5	Problem Solving	x	x	x	x	x
2	Demonstrating the Nature of Scientific Inquiry	2.1	Hypothesis	x	x	x	x	x
		2.2	Design	x	x	x	x	x
		2.3	Data Collection	x	x	x	x	x
		2.4	Technology Use	x	x	x	x	x
		2.5	Explanations/Limitation	x	x	x	x	x
		2.6	Explanations/Alternatives		x	x	x	x
		2.7	Communications/Results		x	x	x	x
		2.8	Research		x	x	x	x
3	Demonstrating Positive Attitudes Towards Science	3.1	Present use of Science	x	x	x	x	x
		3.2	Value, Environment	x	x	x	x	x
		3.3	Ethical, Applications	x	x	x	x	x
		3.4	Career Options	x	x	x	x	x
4	Advocating for Environmental Responsibility	4.1	Environmental Stewardship		x	x	x	
		4.2	Environmental Applications	x	x	x	x	
CONTENT STRUCTURE		Change		x	x	x	x	x
		Cause & Effect		x	x	x	x	x
		Systems		x	x	x		x
		Life Science		x	x	x		
		Physical Science		x				x
		Earth Science		x		x	x	
		MODULE		A	B	C	D	E

MODULE KEY

A - All About Science
B - Our Home-Interactions of Living Things
C - Oceans
D - Weather
E - Matter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Module A

SCIENCE

Module Title: All About Science

Sequence Reference: P6 SC-A

PHASE A				PHASE B		
PS	P1	P2	P3	P4	P5	P6
☐	☒	☐	☐	☐	☐	☐

Time allotted: 2 weeks

Subgoal Emphasis:

- 1.1, 1.2, 1.4, 1.5 Nature and History of Science
- 2.1 – 2.5 Scientific Inquiry
- 3.1 – 3.4 Positive Attitude
- 4.2 Advocate for the Environment

Content Focus:

- Change
- Cause and Effect
- Systems
- Physical, Life and/or Earth Science

Curriculum Objectives:

At the end of this module, students will:

- discuss a story or article about science
- appreciate science as a human endeavour
- practise a science process skill
- recognise the use of mathematics and technology as tools of science
- carry out a scientific investigation
- value safety as a priority in science

Content Detail:

- all about science
  - scientific discovery, an invention, current news, history of science etc.
  - magazine or newspaper article [NIE or other]
  - fiction or non-fiction story including science fiction
  - video or other multimedia about science
- science as a human endeavour
  - many people have practised science for a long time in all cultures
  - men and women have contributed to science
  - many people make science a career
  - there is a lot still to be learned about our world
- science process skills
  - observing, measuring, estimating
  - classifying
  - inferring and predicting
  - collecting, recording and data
  - hypothesizing and designing an experiment
  - controlling variables and making models
  - communicating: telling, writing, drawing, showing
  - working in groups
- science tools: mathematics and technology
  - using mathematics: counting, graphing
- science investigation: *How Dense It Is! (see Appendix)*
- safety in the science classroom
  - handling materials and equipment safely
  - avoid running or playing during an investigation
  - report any accident to the teacher
  - do not taste anything unless directed by the teacher
  - ask for help when necessary

Module Title: All About Science	**Sequence Reference:** P6 SC-A

Recommended Instructional Strategies:

- Story or article about science: read a story or article about science or a scientist. Discuss the events, the characters (scientists), and the importance of the invention, event or discovery. Have students recognize that men and women from different cultures have been involved in science from many years ago. Many people choose science as a career. [science as a human endeavour] Students should use their science journal to reflect on what has been discussed in an age appropriate manner (drawing or writing)
- Brainstorm safety rules for science activities. List them, have students decorate them and post them in the classroom.
- Using science tools: students should practise using science equipment, using the computer for science games and interactive simulations; using mathematics in science (measuring, using calculators, reading and making charts and graphs)
- Science process skills: explanations and examples [see appendix]
- Science investigation: *How Dense It Is!*
  (refer to appendix for details of investigation)

Recommended Formative Assessment Strategies:

Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.

techniques include:

- **questioning**
  - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching
- **checklists**
  - teachers use these during observations or interactions to note mastery of particular concepts or skills
- **teacher observations**
  - teachers watch students (individuals or groups) during activities, guided and independent practise
- **games and puzzles** (including computer applications)
  - teachers can monitor levels of success at games or puzzles and intervene when necessary
- **mind maps, drawings**
  - teachers can diagnose misconceptions based on accuracy
- **quizzes** (oral and written) **and worksheets**
  - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions
- **science journals**
  - students use these to record details of investigations and a method of reflection (teacher will review journals regularly and give feedback)
  - investigations : what did I think about?
  - what did I do?
  - what did I see; what did I find out?
  - reflections: what did I learn?
  - what did I like?
  - what else do I want to know ?

Module Title: All About Science	**Sequence Reference:** P6 SC-A

Summative Assessment:

Assessment given at the end of a module where data is used to generate grades.

- Possible entries for science journal:
  - reflection on video, article or story
  - description (draw write or tell) of a scientist
  - evidence of mastery of process skill
  - record of laboratory investigation: *How Dense It Is!*

Special Resources:
(materials, equipment & community involvement)

- variety of science equipment: measuring cups, measuring cylinders, hand lens, rulers, balances, force meters, thermometers
- materials as cited in the investigations in the appendix
- lab safety rules
- stories or videos about scientific endeavours

References - Teacher:

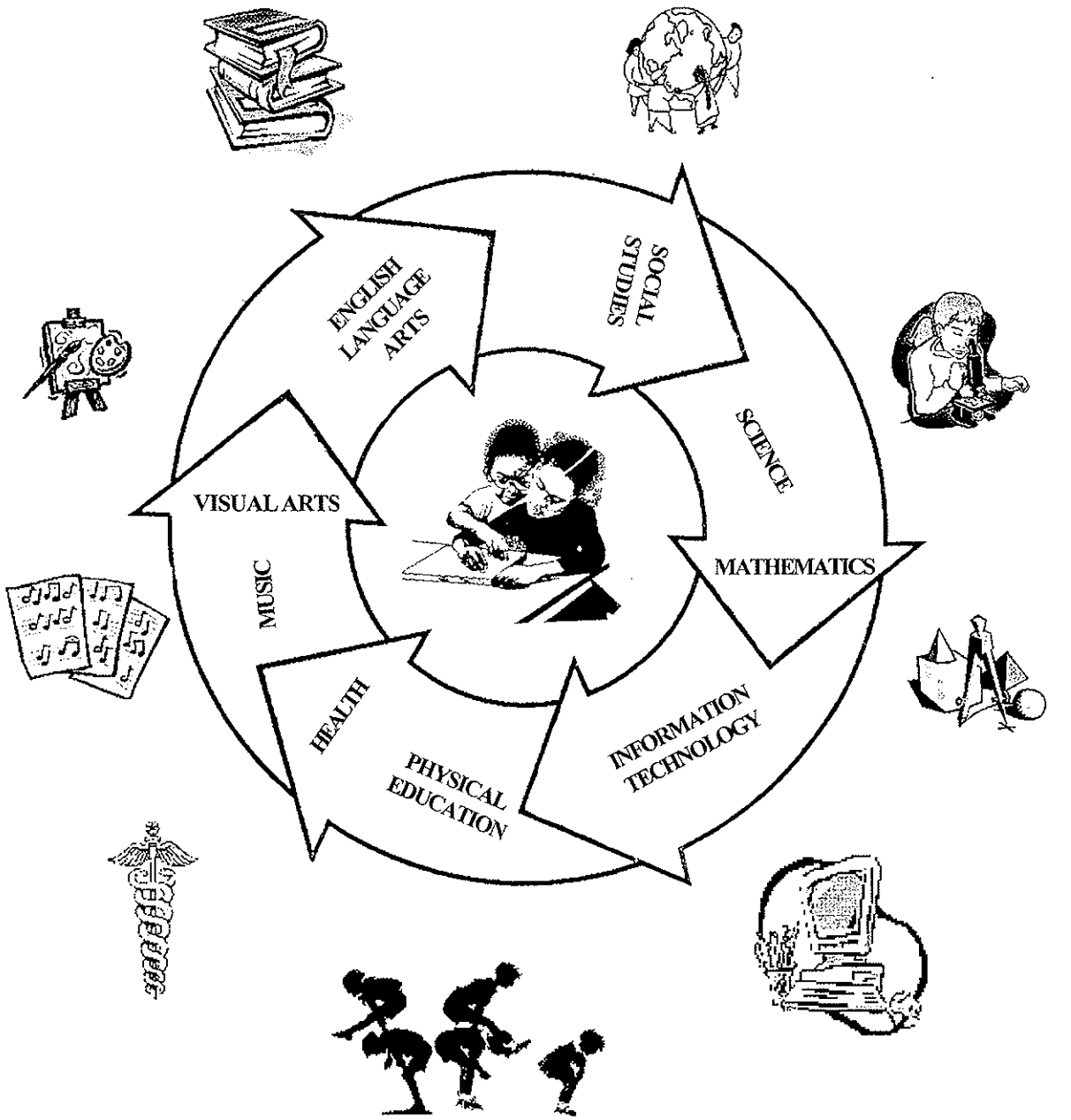
- McGraw-Hill Science. Grade 5
- Unit 6: *Be A Scientist*
- Reference Section: *Handbook and Glossary*

References - Student:

- McGraw-Hill Science. Grade 5
- Reference Section: *Handbook and Glossary*

Glossary:

- refer to text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Module B

SCIENCE

Module Title: Our Island Home – Interactions of Living Things

Time allotted: 10 weeks

Sequence Reference: P6 SC-B

PHASE A				PHASE B		
PS	P1	P2	P3	P4	P5	P6
☐	☐	☐	☐	☐	☐	☒

Subgoal Emphasis:

- 1.2, 1.4, 1.5 Nature and History of Science
- 2.1 – 2.8 Scientific Inquiry
- 3.1 – 3.4 Positive Attitudes
- 4.1 – 4.2 Advocate for the Environment

Content Focus:

- Change
- Cause and Effect
- Systems
- Life Science

Curriculum Objectives:

At the end of this module, students will:

- recognize how organisms interact with non-living things and other living things in an ecosystem
- explore the cycling of water and nutrients in nature
- identify and describe Bermuda's common flora and fauna
- differentiate among the six Bermuda terrestrial habitats
- examine the impact of changes in the ecosystem
- recognize the importance of protecting ecosystems
- be aware of Bermuda's protected areas and agencies that are responsible for them

Content Detail:

- Interaction of organisms in an ecosystem
  - concept of ecosystem
  - non-living (abiotic) factors : soil, water, temperature, sunlight)
  - other living things: populations of the same kind; food chains and food webs;
  - terms: producers, consumers; decomposers
- cycling of matter: water and nutrients
- Bermuda's flora and fauna
  - birds: Longtail, sparrow, bluebird, tern, cardinal, crow, cahow, ground dove (as shown on Birds' Poster)
  - Invertebrates – silk spider, monarch butterfly, common land crab
  - Skink and anole (lizards) toad and whistling frogs
  - Variety of flora: Bermuda cedar, oleander
- Bermuda's terrestrial habitats:
  - Rocky Coast, Beach Dune, Coastal Upland, Upland Forest, Saltwater Marsh, Fresh Water Marsh
  - in depth study of ONE habitat near the school : physical conditions, dominant plants, adaptations of plants to environment, animal community(if possible)
- changes in ecosystems: positive and negative
- importance of protecting habitats in Bermuda
  - Bermuda skink population
  - cahow on Nonsuch Island
  - toads and deformity linked to poisons
- Protected areas in Bermuda
  - Walsingham reserve, Spittal Pond, Paget Marsh
  - Devonshire Marsh, Hog Bay Park, Long Bay Reserve
  - Agencies responsible: Bermuda Government, Bermuda National Trust, Private Trusts

(link to Social Studies Environment P6 SS-D)

Module Title: Our Island Home – Interactions of Living Things	**Sequence Reference:** P6 SC-B

Recommended Instructional Strategies:

- Students will take a walk around the school and identify flora and fauna – noting where they are found
- Choose one of the six terrestrial habitats for in-depth study. Identify characteristics and regularly note changes over the course of study of this topic. Include flora and fauna identification.
- Make models of some animals found in Bermuda. Explain their characteristics. Can present to P1 classroom
- Observe a large tree in or near the school, think about the organisms in the tree and how they interact. Draw a simple food chain.
- Visit the Bermuda Aquarium North Rock Tank and journal information as above.
- Construct food chains for different animals and plants
- Problem solving: illustrate the effects of loss of habitat of certain animals e.g. pigeons taking over the rocky homes of longtails; loss of cahun or skink habitat
- Research ways in which humans are dependent on animals and plants
- Problem solving: the *Aedes aegypti* mosquito can carry a dangerous disease called **dengue fever**. How can we eradicate these mosquitoes? (information from Environmental Health Office 236-0224)
- Problem solving: Hoof and mouth disease could wipe out our diary industry. Research the precautions to stop this disease form entering Bermuda. (information from Environmental Health Office 236-0224)

(refer to strategies in Social Studies P6 SS-D)

Recommended Formative Assessment Strategies:

Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.

techniques include:

- **questioning**
  - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching
- **checklists**
  - teachers use these during observations or interactions to note mastery of particular concepts or skills
- **teacher observations**
  - teachers watch students (individuals or groups) during activities, guided and independent practise
- **games and puzzles** (including computer applications)
  - teachers can monitor levels of success at games or puzzles and intervene when necessary
- **mind maps, drawings**
  - teachers can diagnose misconceptions based on accuracy
- **quizzes** (oral and written) **and worksheets**
  - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions
- **science journals**
  - students use these to record details of investigations and a method of reflection .(teacher will review journals regularly and give feedback)
  - investigations : what did I think about?
  - what did I do?
  - what did I see?
  - what did I find out?
  - reflections: what did I learn?
  - what did I like?
  - what else do I want to know?

Module Title: Our Island Home – Interactions of Living Things	**Sequence Reference:** P6 SC-B

Summative Assessment:

Assessments given at the end of a module where the data is used to generate grades.

- Performance based examples:
  - Adapt any activities from previous section
  - Student/group project: Give students cards with names of various animals and plants and labels (omnivore, carnivore, herbivore, producer, consumer, decompose). Have students use set of cards to demonstrate understanding of food chain as system in which energy is transferred from the sun to animals. Assess students using rubrics for understanding of concept, process and final product
  - Class Project - Create a model of a terrestrial habitat found near the school. Identify living and non-living things found in the habitat. Students should be able to name the habitat and describe interactions in the habitat, adaptation of plants and animals found there. Assess students using rubrics for understanding of concept, process and final product
  - Use or adapt the performance assessment tasks at the end of chapter/topics found in this unit
- End of unit test: teacher-made or from Unit 6: *Ecosystems Topics 1, 2, 3 (Lessons 1 & 2)*

Special Resources:

(materials, equipment & community involvement)

- cross curricular connections: English Language Arts, Mathematics, Social Studies
- field trips/ visits: Bermuda Aquarium Museum and Zoo, chosen habitat with guide, environmental health officer (mosquito control, and Hoop and Mouth disease information)
- videos: *Insects* PANATEL VIDEO
- visitors: Skink research (BAMZ, BZS staff) information about protected areas: planning Dept., National Trust, BZS Biodiversity office, Audubon Society

References - Teacher:

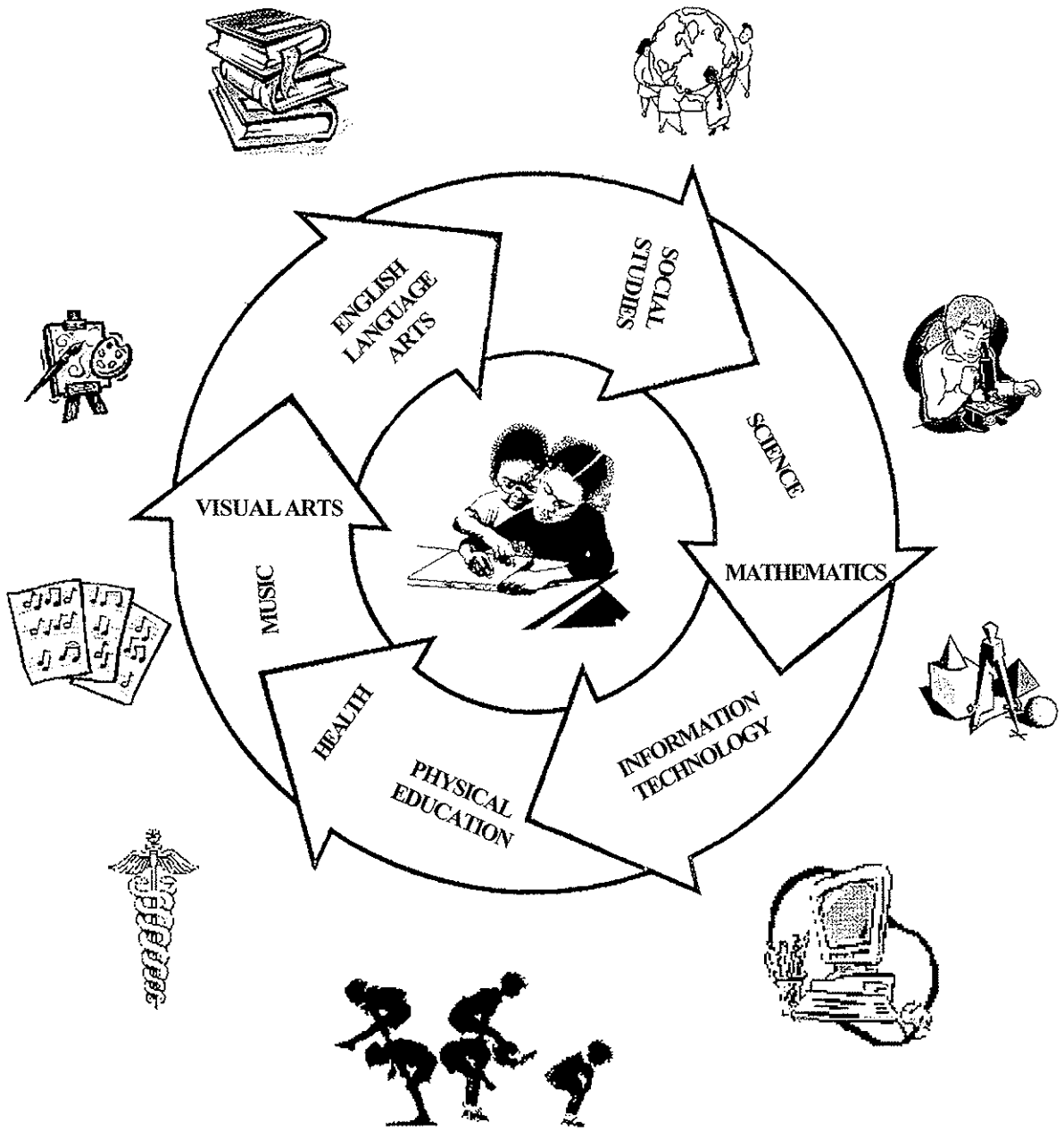
- McGraw-Hill Science. Grade 5
- Unit 6: *Ecosystems*: topics 1, 2, 3, (Lessons 1&2)
- Bermuda Zoological Society:
  - *Project Nature Field Study Guides* (habitats): *Rocky Coasts, Bermuda Forests, Sandy Shore, Bermuda Wetlands)*
  - *Project Nature Info-Sheets – The Eco-File* (see each school library)

References - Student:

- McGraw-Hill Science. Grade 5
- Unit 6: *Ecosystems*: topics 1, 2, 3, (Lessons 1&2)

Glossary:

- **Biodiversity:** the variety of life – combination of two words biological and diversity. It includes the different types of plants and animals (species diversity), the different types of homes they live in (habitat diversity), and how individuals of a certain type of plant and animal vary (genetic diversity). examples are:
  - species diversity: cat, bluebird, human being, hibiscus, ant, amoeba (micro-organism)
  - habitat diversity: coral reef, marsh, Bermuda forests
  - genetic diversity: tabby cats, Siamese cats, brown-skinned people, blue-eyed people
- other terms: refer to text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Module C

SCIENCE

Module Title: Oceans

Sequence Reference: P6 SC-C

PHASE A				PHASE B		
PS	P1	P2	P3	P4	P5	P6
☐	☐	☐	☐	☐	☐	☒

Time allotted: 8 weeks

Subgoal Emphasis:

- 1.1 – 1.5 Nature and History of Science
- 2.1 – 2.8 Scientific Inquiry
- 3.1 – 3.4 Positive Attitude
- 4.1 – 4.2 Advocate for the Environment

Content Focus:

- Change
- Cause and Effect
- Systems
- Earth Science
- Life Science

Curriculum Objectives:

At the end of this module, students will:

- identify the oceans of the world and recognise that most of the earth's water is present in oceans
- explore and describe the characteristics of oceans
- illustrate the effect of the moon's gravitational force on tides
- explain the importance of the oceans
- explore the interdependence of organisms in a marine ecosystem
- describe how fresh water is obtained from salt water
- examine ways in which oceans affect climate and weather
- research the exploration of the oceans
- describe the risks of polluting the oceans and advocate for the protection of our oceans

Content Detail:

- oceans of the world
  - earth's oceans - 97% of earth's water
- characteristics of oceans:
  - currents – deep ocean, surface, warm currents, cold currents, gulf stream
  - waves – effect of waves on the shoreline: erosion, deposition, sandbars
  - salinity
- tides – gravitational pull of the moon, lunar cycle
- importance of oceans
  - habitat to marine organisms
  - new pharmaceuticals
  - contain minerals and fossil fuels
  - weather – an important part of the water cycle
  - Bermuda: transportation and tourism; obtaining drinking water
- Marine ecosystems:
- food chains and food webs
- largest creature- whales
- plankton
- desalination : distillation and reverse osmosis
- ocean currents and climates – sea breezes and wind
- oceans and hurricanes
- oceans and weather: evaporation of water as a part of the water cycle
- oceans and climate: sea breezes and winds
- ocean exploration
  - explorers – Bob Ballard; Teddy Tucker (Bermuda); William Beebe
  - use of technology: Remote operated vehicles, satellite data, etc.
- pollution and protection **(link to Social Studies P6 SS-D)**
  - historical: oceans as garbage dump
  - current: pollution (sewage, garbage, oil spills)

Module Title: Oceans	**Sequence Reference:** P6 SC-C

Recommended Instructional Strategies:

- Research the grounding of a tanker off Bermuda. Explain the circumstances, the response, the effect of the collision and the precautions taken since then
- Have students make a model to show the effect of the moon's gravitational pull on tides.
- Investigation: salt water is denser than fresh water – add food dye to fresh water and carefully pour on salt water. Note that the fresh water floats.
- Research how an ocean mammal such as a dolphin can hear underwater.
- **Waves** - Make a model of the ocean by half filling a rectangular pan with water. Place a straw near one side of pan, and gently blow across the surface of the water. What happens? Observe the height and speed of the waves you make. Record your observations. Repeat several times, blowing a little harder each time. Record your observations.
- **Effect of waves on a beach** – Make a model of a beach using a stream table. The sand for the beach should have a gentle slope. Slowly add water to the steam table. Record your observations. Increase the speed of the water and observe the effect it has on the beach. Record your observations.
- **What causes Ocean Currents?** Fill a plastic bucket 2/3 full of cold water. Fill a drinking glass full of warm water. Add food colouring to the warm water. Using a rubber band, securely fasten a sheet of plastic wrap over the top of the glass. Gently set the glass of warm water upright on the bottom of the bucket, underwater. Use your pencil to poke a small hole in the plastic wrap "lid" of the glass. Observe carefully. Make a three-step diagram in your science journal showing everything you did as well as what you observed.
- **Clean it up!** Which materials might be the most useful in cleaning up oil spilled on water?
  Materials needed: five milk cartons, plastic spoon, food colouring, water vegetable oil, and variety of materials.
  Fill each container half full of water. Add a few drops of blue food colouring. Add a spoonful of vegetable oil to each container.

Recommended Formative Assessment Strategies:

Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.

techniques include:

- **questioning**
  - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching
- **checklists**
  - teachers use these during observations or interactions to note mastery of particular concepts or skills
- **teacher observations**
  - teachers watch students (individuals or groups) during activities, guided and independent practise
- **games and puzzles** (including computer applications)
  - teachers can monitor levels of success at games or puzzles and intervene when necessary
- **mind maps, drawings**
  - teachers can diagnose misconceptions based on accuracy
- **quizzes** (oral and written) **and worksheets**
  - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions
- **science journals**
  - students use these to record details of investigations and a method of reflection.(teacher will review journals regularly and give feedback)
  - investigations : what did I think about?
  - what did I do?
  - what did I see?
  - what did I find out?
  - reflections: what did I learn?
  - what did I like?
  - what else do I want to know ?

Module Title: Oceans	**Sequence Reference:** P6 SC-C

Summative Assessment:

Assessment given at the end of a module where data is used to generate grades.

- Performance based examples:
  - Adapt any activities from previous section
  - Student/group project: Investigation: Design an experiment for P3 students to show the differences between salt water and fresh water. Factors could include: ocean water is saltier and things can float easier; heavier and fresh water will float on it; fresh water freezes faster than salt water [P3 students study Bermuda's water in **Topic P3 SC D**] Assess students using rubrics for understanding of concept, process and final product
  - Class Project- Design a series of posters to show the importance of the ocean to Bermuda Assess students using rubrics for understanding of concept, process and final product
  - Use or adapt the performance assessment tasks at the end of chapter/topics found in this unit
- End of unit test: teacher-made or from Unit 5 *Earth and Its Resources* (Topic 6) and Grade 4 Unit 6 *Earth's Water* (Topic 3)

Special Resources:
(materials, equipment & community involvement)

- cross curricular connections: English Language Arts, Mathematics, Social Studies
- guest speakers: fisherman, pilot, operator of tourist boats (snorkelling, helmet diving, glass bottomed boats),
- field trips/ visits: reverse osmosis plant, Bermuda Underwater Exploration Institute, (marine biodegradation and timeline and beach drift activity) Bermuda Maritime Museum, Bermuda Aquarium Museum and Zoo, Bermuda Biological Station for Research, metal dump at the airport

References - Teacher:

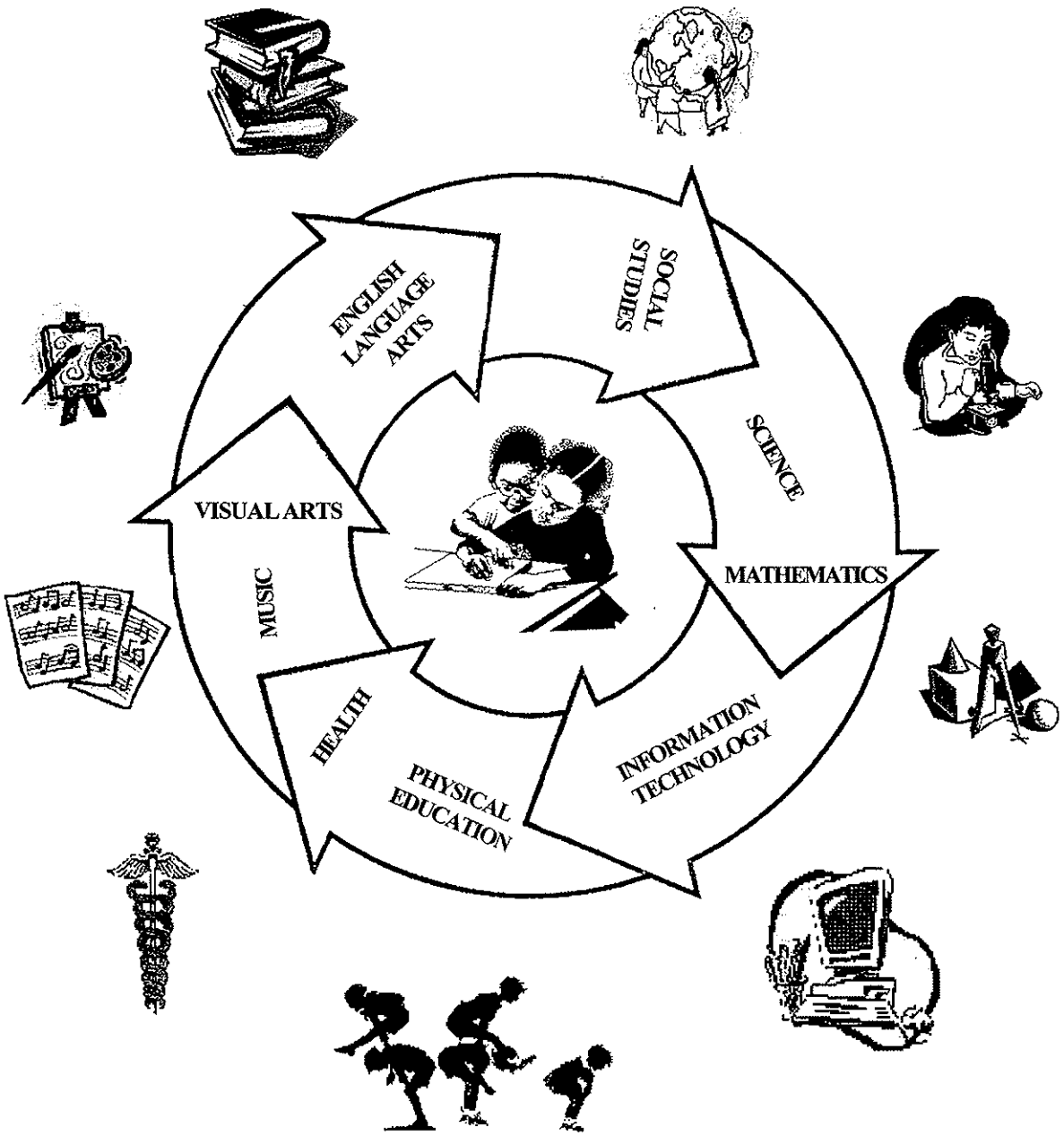
- McGraw-Hill Science. Grade 5
- Unit 5: *Earth and Its Resources* (Topic 6)
- Unit 6: *Earth's Water* (Topic 3) Grade 4

References - Student:

- McGraw-Hill Science. Grade 5
- Unit 5: *Earth and It's Resources* (Topic 6)

Glossary:

- refer to text


ENGLISH LANGUAGE ARTS
SOCIAL STUDIES
SCIENCE
MATHEMATICS
INFORMATION TECHNOLOGY
PHYSICAL EDUCATION
HEALTH
MUSIC
VISUAL ARTS

Module D

SCIENCE

Module Title: Weather

Time allotted: 8 weeks

Sequence Reference: P6 SC-D

PHASE A				PHASE B		
PS	P1	P2	P3	P4	P5	P6
☐	☐	☐	☐	☐	☐	☒

Subgoal Emphasis:

- 1.1, 1.2, 1.4, 1.5 Nature and History of Science
- 2.1 – 2.8 Scientific Inquiry
- 3.1 – 3.4 Positive Attitude
- 4.1 – 4.2 Advocate for the Environment

Content Focus:

- Change
- Cause and Effect
- Systems
- Earth Science

Curriculum Objectives:

At the end of this module, students will:

- explore the effect of temperature changes on water
- demonstrate how water is recycled into the atmosphere continuously
- relate cloud formation to weather
- observe and measure local weather conditions
- use weather maps and weather forecasts to predict local weather
- describe instruments used to observe and measure weather systems
- predict the impact of severe weather on Bermuda
- examine the importance of forecasting weather
- distinguish between weather and climate
- explain how the transfer of energy from the sun affects weather conditions

Content Detail:

- water and temperature changes
  - melting, boiling, freezing, condensing
  - measuring temperature changes
- the water cycle: evaporation, condensation, precipitation, cloud formation
- cloud formation and weather
  - types of clouds, weather patterns
- conditions that change weather patterns
  - wind, air pressure, temperature, fronts
- technology weather instruments and sources of information
  - rain and wind gauge
  - anemometer
  - satellite data
  - the weather channel
- severe weather patterns and Bermuda: thunderstorms, hurricanes
- importance of forecasting weather: (pilots, farmers, events organizers)
- weather and climate
  - common influencing factors: wind, sun, air pressure, humidity, temperature
- sun and weather conditions: sun provides energy for water cycle (evaporation- condensation – precipitation) **(link to Social Studies)**

Module Title: Weather	**Sequence Reference:** P6 SC-D

Recommended Instructional Strategies:

- Groups of students will prepare a weather broadcast using data from the newspaper
- Students will research the effects of a hurricane that has affected Bermuda. They will then create a poem, rap or song about the severe weather and its effects
- Changes in states of matter-Students will observe the three states of matter in which water can exist. Using water students will freeze it to change it to a solid. Then students will remove the ice from the freezer and observe it changing into a liquid. Later students will apply heat and observe the liquid as it changes into a gas. Students can collect the gas using an inverted container and watch it condense into a liquid once more.
- Water cycle-Students will simulate a water cycle in nature using a plastic bag, coloured water, and a sunny window.
- Predicting weather by observing patterns-Students will create a variety of weather instruments using common household materials

Example:

- Anemometer to measure wind speed
- Wind sock to measure strength and direction of the wind
- Humidity tester to predict if wet weather is on the way
- Rain gauge to measure amount of rainfall
- Barometer to measure air pressure

- Have students use their instruments to measure and record various weather patterns for a week. Record data. Use data and compare their findings to that of a local meteorologist.
- Plan a field trip to the weather station at Department of Agriculture and Fisheries
- Using weather maps in the newspaper have students identify different features such as cold fronts, warm fronts, high and low pressure. Have students predict the type of weather that is likely to occur for that area

Recommended Formative Assessment Strategies

Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.

techniques include:

- **questioning**
  - teachers ask students about their understandings whilst they are engaged in activities and during direct teaching
- **checklists**
  - teachers use these during observations or interactions to note mastery of particular concepts or skills
- **teacher observations**
  - teachers watch students (individuals or groups) during activities, guided and independent practise
- **games and puzzles** (including computer applications)
  - teachers can monitor levels of success at games or puzzles and intervene when necessary
- **mind maps, drawings**
  - teachers can diagnose misconceptions based on accuracy
- **quizzes** (oral and written) **and worksheets**
  - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions
- **science journals**
  - students use these to record details of investigations and a method of reflection .(teacher will review journals regularly and give feedback)
  - investigations : what did I think about?
  - what did I do?
  - what did I see?
  - what did I find out?
  - reflections: what did I learn?
  - what did I like;?
  - what else do I want to know?

Module Title: Weather	**Sequence Reference:** P6 SC-D

Summative Assessment:

Assessment given at the end of a module where data is used to generate grades.

- Performance based examples:
  - Adapt any activities from previous section
  - Student/group project: Students will role-play or write a story about the experiences of a raindrop as it goes through the water cycle. Assess students using rubrics for understanding of concept, process and final product
  - Class Project - Chart and graph weather data over the period of this module. Previous data can be obtained from the Department of Agriculture and Fisheries Newsletter. Describe seasonal trends. Assess students using rubrics for understanding of concept, process and final product
  - Use or adapt the performance assessment tasks at the end of chapter/topics found in this unit
- End of unit test: teacher-made or from Unit 2: *Weather and Climate*

Special Resources:
(materials, equipment & community involvement)

- cross curricular connections: English Language Arts, Mathematics, Art, Health Education, Social Studies
- field trips/ visits: local weather station, television station
- Internet sites:
  - Weather page – an Interactive weather page for Kids: www.whnt19.com/kidwx/index.html
  - The weather Channel: www.weather.com/homepage.html

References - Teacher:

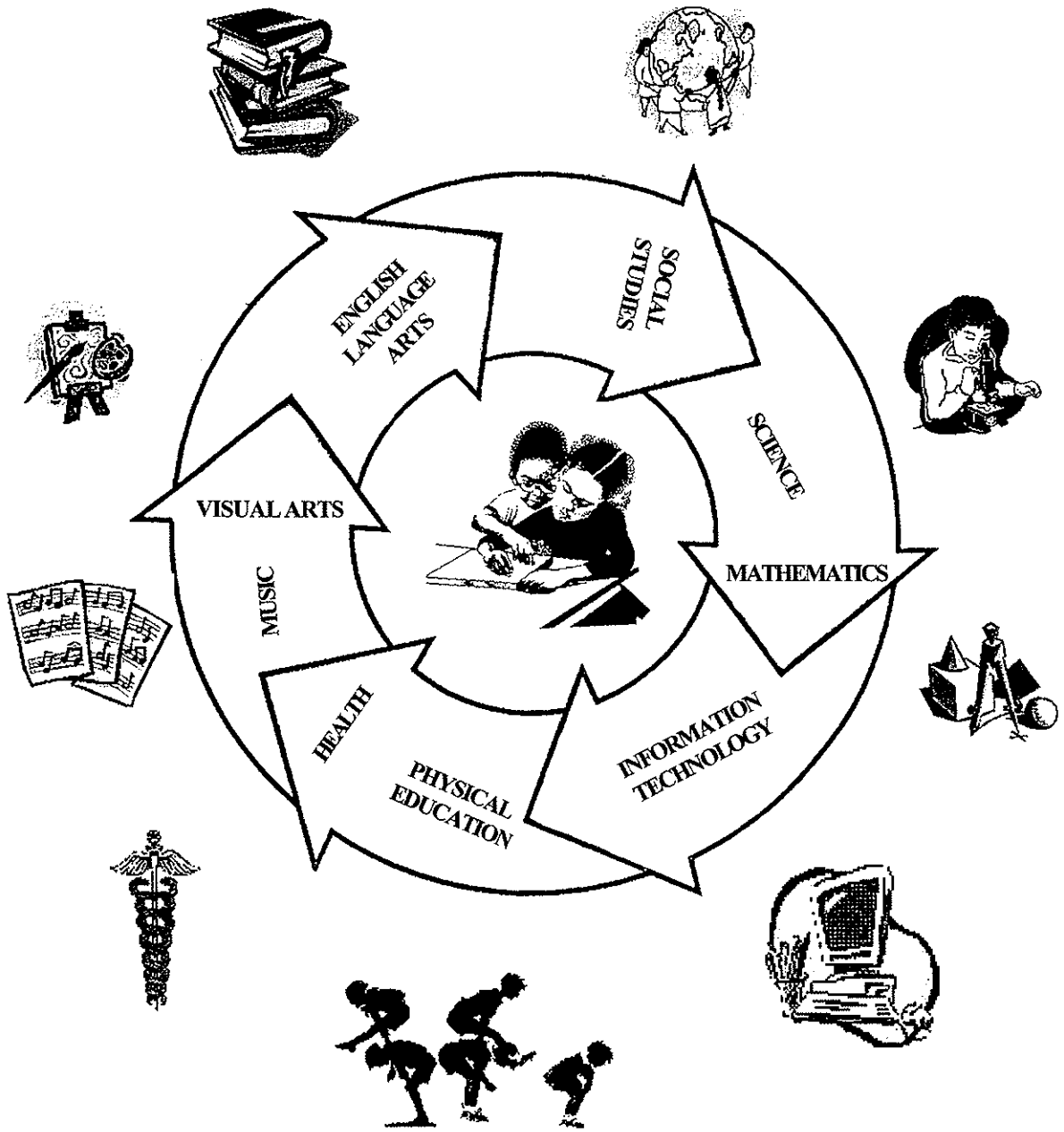
- McGraw Hill Science. Grade 5
- Unit 2: *Weather and Climate*

References - Student:

- McGraw Hill Science. Grade 5
- Unit 2: *Weather and Climate*

Glossary:

- refer to text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PHYSICAL EDUCATION
HEALTH
MUSIC
VISUAL ARTS

Module E

SCIENCE

Module Title: Matter

Sequence Reference: P6 SC-E

PHASE A				PHASE B		
PS	P1	P2	P3	P4	P5	P6
☐	☐	☐	☐	☐	☐	☒

Time allotted: 8 weeks

Subgoal Emphasis:

- 1.2, 1.4, 1.5 Nature and History of Science
- 2.1 - 2.8 Scientific Inquiry
- 3.1 – 3.4 Positive Attitude

Content Focus:

- Change
- Cause and Effect
- Systems
- Physical Science

Curriculum Objectives:

At the end of this module, students will:

- illustrate the characteristics of different states of matter
- investigate and measure properties of matter
- identify and describe reversible and irreversible changes in matter
- investigate the dissolving of materials
- recognize that the mass of a mixture is the sum of the mass of its parts
- infer that matter is made up of small particles

Content Detail:

- characteristics of states of matter
  - solid definite volume and shape
  - liquid- definite volume and take shape of container
  - gas- take the shape of volume and container
- measuring properties of matter: mass, volume, density, boiling point, melting point
- reversible changes(physical) freezing melting, dissolving most solutes
- irreversible changes (chemical) rusting, alka-seltzer and water, baking powder and vinegar or lemon juice; banana skin turning black; limestone and vinegar; burning paper, cooking, bleaching (**care** – asthmatics)
- dissolving materials
  - making solutions
  - effect of temperature on dissolving
  - separating dissolved solids from their solutions
  - substances that do not dissolve
  - separation of mixtures by filtration
- composition of matter: elements and compounds

Module Title: Matter	**Sequence Reference:** P6 SC-E

Recommended Instructional Strategies:

- Have students create a word search puzzle using clues describing concepts learned in this topic. Reproduce the puzzle for use in student groups or whole class
- Investigation: Students are given a number of solids (water, sugar, flour, coffee, salt) and water. Design, carry out and record results showing which substances dissolve in water. Results chart can include name of substance, prediction about solubility and actual result.
- Teacher demonstrates several changes and students record observations and determine whether the changes are reversible or irreversible (chemical or physical)
- Law of conservation of mass: Give students samples of different substances and measure mass before and after changes. e.g. ice cube or other easily melted substance; salt and a beaker of water – measure mass of individual substances, mix , then measure final mass.
- Mime/ charades: Properties of solids, liquids or gases. Have students solve the clues.

Recommended Formative Assessment Strategies:

Assessments that are part of regular teaching and learning in classrooms. Teachers and students use this data to promote student learning and conceptual understanding.

techniques include:

- **questioning**
  - teachers ask students about their understandings whilst they are engaged in activities and during directc teaching
- **checklists**
  - teachers use these during observations or interactions to note mastery of particular concepts or skills
- **teacher observations**
  - teachers watch students (individuals or groups) during activities, guided and independent practise
- **games and puzzles** (including computer applications)
  - teachers can monitor levels of success at games or puzzles and intervene when necessary
- **mind maps, drawings**
  - teachers can diagnose misconceptions based on accuracy
- **quizzes** (oral and written) **and worksheets**
  - when used as diagnostic (as opposed to summative) tool the teacher and student can recognize and correct misconceptions
- **science journals**
  - students use these to record details of investigations and a method of reflection .(teacher will review journals regularly and give feedback)
  - investigations : what did I think about?
  - what did I do?
  - what did I see?
  - what did I find out?
  - reflections: what did I learn?
  - what did I like?
  - what else do I want to know?

Module Title: Matter	**Sequence Reference:** P6 SC-E

Summative Assessment:

Assessments given at the end of a module where the data is used to generate grades.

- Performance based examples:
  - Adapt any activities from previous section
  - Student or group: Create several centers with mini tasks. Have students travel to each center and do the task, record the result, write an observation or conclusion. Assess students using rubrics for understanding of concept, process and final product examples of tasks might include: measuring mass, volume, calculating density; determining whether substances are soluble or insoluble; describing a reaction; deciding whether a change is reversible or irreversible
  - Class Project - Create a class mobile on elements. Each student will be responsible for researching one element. One side of a piece of card, they will describe the physical properties, give the chemical symbol and illustrate a use on the other side. Mobile or individual cards can be hung from ceiling. Assess students using rubrics for understanding of concept, process and final product.
  - Use or adapt the performance assessment tasks at the end of chapter/topics found in this unit
- End of unit test: teacher-made or from Unit 4: *Matter*

Special Resources:

(materials, equipment & community involvement)

- cross curricular connections: English Language Arts, Mathematics, Music
- field trips/ visits: recycling center, Tynes Bay Incinerator, a compost heap (Pembroke Dump), jeweler, Glassworks

References - Teacher:

- McGraw-Hill Science. Grade 5
- Unit 4: *Matter*

References - Student:

- McGraw-Hill Science. Grade 5
- Unit 4: *Matter*

Glossary:

- refer to text

SCIENCE
Generalised Rubrics For Concepts And Communication

	4	3	2	1
	The student consistently:	***The student usually:***	***The student sometimes:***	***The student rarely:***
CONCEPTS	• identifies and describes concepts completely and accurately • shows full understanding of central science concepts, principles and ideas and demonstrates no misconceptions • makes connections, predicts changes, describes relationships with accuracy • applies science concepts and principles accurately to familiar and unfamiliar situations • uses appropriate scientific terminology, representations (diagrams etc.) and correct units of measurement • uses appropriate problem solving/decision making strategies accurately	• identifies and describes concepts completely and accurately • shows understanding of central science concepts, principles and ideas and demonstrates no significant misconceptions • makes connections, predicts changes, describes relationships with accuracy and with little or no assistance • applies science concepts to familiar situations and to unfamiliar situations with some help • uses appropriate science terminology, representations (diagrams etc.) and units of measurement • uses appropriate problem solving/decision making strategies accurately	• shows understanding of the basic concepts • shows partial grasp of central science ideas and demonstrates minor misconceptions • makes connections, predicts some changes and describes relationships with some accuracy or with assistance • applies science concepts to familiar situations • uses appropriate science terminology, representations (diagrams etc.) and units of measurement • uses appropriate problem solving/decision making strategies with assistance	• shows understanding of the basic concepts • grasps central science ideas and usually demonstrates significant misconceptions • makes connections and describes relationships completely or accurately • makes comparisons and usually predicts changes only with considerable assistance • applies science concepts to familiar situations with considerable assistance • uses appropriate science terminology, representations (diagrams etc.) or units of measurement • uses problem solving/ decision making strategies or uses them inaccurately
	The student consistently:	***The student usually:***	***The student sometimes:***	***The student rarely:***
COMMUNICATION	• communicates with clarity and precision • gives fully developed logical and plausible explanation • uses appropriate scientific terminology and units of measurements • presents conclusions that are correct and substantiated • gives explanations, presentations and calculations that meet or exceed requirements	• communicates with clarity or precision • gives explanations that may not be fully developed or has some minor flaws in logic or plausibility • uses appropriate science terminology and units of measurement • presents conclusions that are correct and mostly substantiated • gives explanations, presentations and calculations satisfy most requirements	• communicates with some clarity and precision • gives partial explanation that may be incomplete, misdirected or not clearly presented • uses scientific terms correctly or appropriately • attempts conclusions that are not fully substantiated or correct • gives explanations, presentations and calculations satisfy some requirements	• communicates with clarity and precision • gives complete explanation and usually shows limited understanding of the concept • gives conclusions or they usually show major errors in logic or plausibility • gives explanations, presentations and calculations that satisfy requirements

SCIENCE PROCESS SKILLS

The skills and processes explained below are not unique to science. It is expected that all students will develop such critical thinking skills as they extend and refine their knowledge in all subject areas. The science process skills should be integrated throughout the science programme. Bermuda Science Goals 1 and 2 [Nature of Science & Scientific Inquiry] provide a framework for appropriately developing the process skills across the four learning phases. The question prompts are given to help to guide the student.

PROCESS SKILLS	EXPLANATION	QUESTION PROMPTS
Observing	• using as many of the senses as possible to gather information about the world	• What did you notice? • Did you use all your senses? • Did you use any equipment? • Did you note the similarities, differences, and details?
Measuring	• using non standard then standard (metric) units and appropriate equipment to quantify observations	• Did you select the correct tools? (ruler, balance, thermometer etc.) • Did you measure accurately? • Do you need to repeat your measurements to check them?
Classifying	• putting objects or events in groups	• How did you group the objects? • How many attributes did you use? • Given the groups, how would you identify the properties by which they were sorted?
Inferring	• suggesting additional ideas based on observations and experiences	• What information did you use to support your inference? • Why do you think this event or result happened? • What observations or experiences did you use to justify your conclusion?
Predicting	• forming an idea of a result after studying data	• What do you think will happen? • What might be the possible outcomes? • How do you think this will work? • What scientific knowledge is your prediction based on? • What information would you use to make a better prediction?
Hypothesizing	• making an educated guess that can be tested by experiment	• Is your question testable? • Is it clearly stated?

Designing an Investigation	• identifying the question, the problems, planning the method for testing, identifying and controlling variables and following the procedure	• Have you revised your hypothesis? • How will you find out if your idea is true? • How will you control your variables? • What will you measure or observe? • In what order will you carry out the investigation? • What materials will you need? • What safety precautions should you take? • What is the best way of communicating your conclusions?
Collecting Recording and Analyzing Data	• gathering information in a systematic way; recording information appropriately in graphs, charts, diagrams; explaining information found in graphs, charts and diagrams	• How did you collect the information? • Did you make relevant observations? • What senses did you use to make observations? • Did you record it based on the relevant attributes? • How have you described the attributes? • How will you organise and display your data (diagrams, charts and graphs)? • What did the results/data mean? • How does your data fit your hypothesis?
Communicating	• giving information in a variety of ways: orally, in writing, drawing diagrams, showing using models, charts, graphs, mathematics and technology	• How will you write, draw, tell or show your conclusions? • Is your explanation, plausible and supported by the data? • Can you make a model to explain an idea, events, conclusions or object? • How can you explain your model?
Working in Groups	• interacting appropriately within a group by participating in activities, communicating ideas, listening actively and considering opinions of other members	• Did you help to carry out-group tasks? • Did you participate in-group discussions? • Did you show consideration for others? • Did you cooperate with other group members? • Were you a group leader? • Did you accept the direction or leadership of other members? • Did the group stay on task?

PRIMARY SCIENCE INVESTIGATIONS
OVERVIEW OF SKILL AREAS

The first module for each year level is **All About Science (Module A)**. This module is intended to capture the interest of the student and set the stage for the exciting areas to be studied during the school year. One investigation is outlined for each level from Primary One to Primary Six. These investigations, together with those suggested in the other modules and the materials of instruction, will help students to develop sound science process skills. The key to the investigations and process skills is shown below.

Year	Activity	S	K	I	L	L		A	R	E	A
		1	2	3	4	5	6	7	8	9	10
		Observing	Measuring	Classifying	Inferring	Predicting	Hypo-thesizing	Designing an Investigation	Collecting Recording and Analyzing Data	Communi-cating	Working in Groups
P1	Be A Smartie Scientist	✓	✓	✓	X	X	X	✓	X	✓	✓
P2	Eye Spy	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
P3	Carrier Bags	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
P4	Measuring Circus	✓	✓	X	✓	✓	X	X	✓	✓	✓
P5	Long Arms… Strong Arms	✓	✓	X	✓	✓	✓	✓	✓	✓	✓
P6	How Dense It Is!	✓	✓	X	✓	✓	✓	✓	✓	✓	✓
All Levels	Open-ended Investigations	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Primary One Science Investigation
Be A SMARTIE Scientist

	Activities	Support	Extension
Teacher	• Introduce activity • Explain procedure for each stage (see next section) • Explain how students will record results		
Student	• Students observe the package and make a drawing of it • Students predict the number of SMARTIES (or M & M's) in the tube or package • Students count the number of candies that are in the tube • Students sort the candies by colour • Students complete a bar graph showing results • Students eat candies and describe the taste • Communicating in science journal (exercise book) - What did I think before the investigation? - What did I do? - What did I see? - What did I find out? - What more do I want to know?	• Additional help given to students to clarify terms observe, predict etc. • Additional help may be given for counting • Help may be needed in completing graphs	• Students can be asked to describe shape, colours as well i.e. - give additional detail • Students can draw chart with out assistance
Safety	• Students do not eat candies or taste anything without permission		
Resources	• SMARTIES or M & M's in tubes • Prepared bar graphs • Science journal log for recording results		
I.T. Links	• Students may use word processing tool or prepared spreadsheets • Refer to the website for SMARTIES or M & M's		
Assessment	• Teacher to mark: drawing of tube -(accuracy of shape) • Teacher to mark graph for accuracy of results and completing a graph		

Primary Two Science Investigation
Eye Spy

	Activities	Support	Extension
Teacher	• Introduce activity • Explain terms *observe & predict* • Demonstrate the use of a tally chart • Determine observation area	• Teacher may need to use a tally chart and count objects in classrooms as an example	
Student	• Students go to designated area and count the number of objects such as cars, bikes, trees, and birds • Students use a tally chart to record their results • Students convert tally chart into a bar graph • Communicating in science journal (exercise book) - What did I think before the investigation? - What did I do? - What did I see? - What did I find out? - What more do I want to know?	• Students have additional help with constructing bar graph • Prompting may be needed in making prediction	• Students predict by drawing on a new bar graph or onto an original one – what they would expect to see if the experiment was done at night • Additional hypothesizing based on result given different times of year
Safety	• Students must not stray from designated area • Students must report hazards to teacher (broken glass etc)		
Resources	• Ready made tally charts • Area marked for student observation	• Ready made graphs may be necessary	
I.T. Links	• Plotting results using spreadsheets • Using wordprocessing tools to write up investigation		
Assessment	• Accuracy of students completion of tally charts • Prediction and science journal write up • Can students give a reason for their prediction • Science journal		

Primary Three Science Investigation
How Strong are the Carrier Bags?

	Activities	Support	Extension
Teacher	• Introduce activity • Establish ideas of fair testing - i.e. use same length of carrier bag; same person stretching • Introduce idea of timing so that results can be compared.		
Student	• Students predict and record which bag they think is the strongest • Students (in pairs) measure and cut out strips of carrier bags (e.g. 30cm x 5cm) • Students Stretch carrier bags strips by pulling until it snaps. Students time each stretch to snap • Students record time to snap for each bag • Students plot graphs of bag vs. snap time • Communicating in science journal (exercise book) - What did I think before the investigation? - What did I do? - What did I see? - What did I find out? - What more do I want to know?	• Why it is important to have same length • Help may be needed to cut and measure strips	• Students list all aspects of a fair test • Students could try to link strength of bag to its use. Is there a link? Can they make suggestions?
Safety	• Students must exercise care when using scissors • Students must exercise care when pulling bags		
Resources	• A collection of different carrier bags		
I.T. Links	• Word processing tools for write up • Spreadsheet tools for recording data		• Internet - research - how carrier bags are made - plastics research
Assessment	• Fair test - can students explain demonstrate how they are keeping it fair (same length, same person pulling, same width) • Accuracy of graph plotting • Science journal write up		

Primary Four Science Investigation
Measuring Circus

	Activities	Support	Extension
Teacher	• Introduce Activity • Create a chart for each station e.g. **Item** **Equipment** **Measurement** **(Units)** eraser ruler 4.5 cm • Explain procedure of a circus (i.e. each station will have a different activity, students will more only when directed) • Explain all answers are to be recorded on chart.		TEACHER NOTE • For each station, teacher must set up object to be measured and check reading at the beginning of each session.
Student	• Students move around circus and record results from measurement made at each station. • Students must fill in measurement and unit for each station on prepared worksheet.	• Students might need further instruction on using the various pieces of equipment	
Safety	• Care when using glass beakers & thermometers. • Care if weighing heavy objects		
Resources	• Students results chart (see teacher activity) • Metre ruler • 30cm ruler • Stop clock • Balance • Newton meter • Thermometer • Beaker/measuring cylinder		
I.T. Links	N/A		
Assessment	• Accuracy of measurements.		

Primary Five Science Investigation
Long Arms, Short Arms

	Activities	Support	Extension
Teacher	• Introduce activity • Outline activity and areas that will be covered • Graph class results by collecting data from groups		
Student	• Students estimate the length of their arm • Students measure the length of their arm • Students predict how long they can hold a for on an outstretched arm • Students hypothesize how length of arm will affect the strength of it • Students carry out testing, timing how long they can hold book for • Class results collected and charted • Communicating in science journal (exercise book) - What did I think before the investigation? - What did I do? - What did I see? - What did I find out? Was there a pattern – are longer arms stronger arms? - What more do I want to know?	• Students may need assistance in measuring • Students may need prompting with hypothesize making	• Encourage students to say why they think that. • Students can list fair testing. • Encourage formula of pattern statement.
Safety	• Avoid dropping weights on themselves • Hold weights correctly as directed by the teacher • Do not force themselves to hold weights for too long		
Resources	• Text book, weight, can of fruit etc • Science journal or log book		
I.T. Links	• Class data may be graphed on computer		
Assessment	• Accuracy of measurements • Data collection (graph or chart) • Science journal write up		

Primary Six Science Investigation
How Dense It Is!

	Activities	Support	Extension
Teacher	• In this investigation, students will calculate the density of several objects (marbles, small rocks, balls, a small piece of wood - one of the objects must float) • Introduce activity: Show students objects and have them predict which objects will sink or float. Discuss their predictions and their reasons for their predictions (some are more dense than others) • Explain how density is predicted • Density =Mass of an object /volume of object • Review procedure as shown in the student activity	• Skills in measuring volume and mass might need to be practiced • To understand the idea of density, students may need to use items such as a 4 cm square piece of foil to investigate how it can be made to sink (squeeze it into a tight ball)	
Student	• Have students list objects in order of how dense they are • Measuring density 1. weigh the object and record the measurement 2. place water in a measuring cylinder 3. record volume of water 4. place the object in the cylinder and record the difference in volume. 5. Subtract the two volumes to obtain volume of the object 6. Calculate density: Mass / volume • Repeat using each object • Communicating in science journal (exercise book) - What did I think before the investigation? - What did I do? - What did I see? - What did I find out? - How did my prediction compare to my results	• Students may need assistance in measuring • Students may need prompting when making the list of objects in order of density	• Have students find the pattern for sinking and floating by calculating densities of other objects. As the density of water is 1 gram/ cm3, objects float when their density is less than 1 gram/cm3
Resources	• Various objects, measuring cylinder, water, balance • Science journal or log book		
I.T. Links	• Computer Application Tools may be used		
Assessment	• Accuracy of measurements • Data collection (graph or chart) • Science journal write up		

MY INVESTIGATION PLANNER

My Name: **Teacher:**

Partners' Names: **Date:**

MODULE TITLE:

PART A: PLANNING

My Question
What do I want to find out?

My Prediction:
What do I think will happen?

Why do I think this will happen? (my scientific explanation)

Designing my Investigation
What will I measure or observe?

To make sure this is a fair test, what things must I keep the same?

How will I do the investigation? (write the that you will do in order)

What equipment or materials will I need? (list these)

1. **4**
2. **5.**
3. **6.**

What safety rules must I follow during my investigation? (list these)
1.
2.
3.

Adapted from Allport G et al. The New Sc1 Book Experimental and Investigative Science Northamptonshire: NIAS, 1996

PART B: DOING

Collecting, Recording and Analyzing Data

(hint: make good observations, write full descriptions, measure accurately and use diagrams, graphs and charts to help you)

My Data:

What does my data mean?

Communicating

How did my results compare to my prediction?

How could I have improved this investigation?

Working in groups

How did I work in my group?

(Please use the rating scale and insert a number beside the description):

- **3** I worked really well
- **2** I was OK
- **1** I can do better
- **0** I did not participate

___ helped to carry out group tasks
___ participate in group discussion
___ showed consideration for others
___ was careful with group equipment and
___ cooperated with other group members
___ acted as group leader
___ accepted leadership or opinions of others
___ the group stayed on task

Adapted from Allport G et al. The New Sc1 Book Experimental and Investigative Science Northamptonshire: NIAS, 1996

SCIENCE FIELD TRIP FORM	
SCHOOL:	**TEACHER:**
SUBJECT:	**CLASS:**
DATE OF FIELD TRIP:	**DURATION:**
TIME/ PERIODS:	

1. Field Trip Site / Itinerary

2. Name of External Guide/Contact & Organisation represented

3. Names of other adults accompanying group:

***4. Curriculum Objectives**

***5. Learner Objectives**

***6. Learner preparation for trip:**

***5. Learner tasks/ activities (during trip)**

*** these sections should be referenced to appropriate lesson plan**

***6. Learner tasks/ activities (post trip):**

***7. Assessment:**

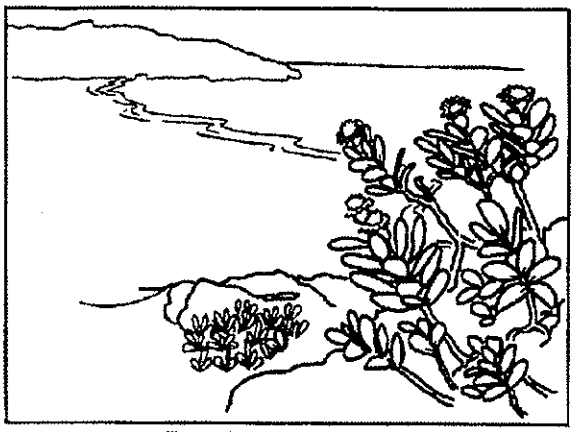
8. Resources needed (include transportation, equipment, materials etc):

9. Potential Risks & Proposal for Risk Management(safety etc):

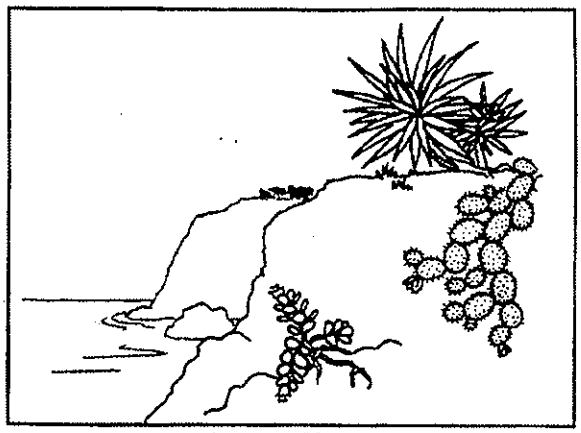
Teacher's Signature: **Date:**

*** these sections should be referenced to appropriate lesson plan**

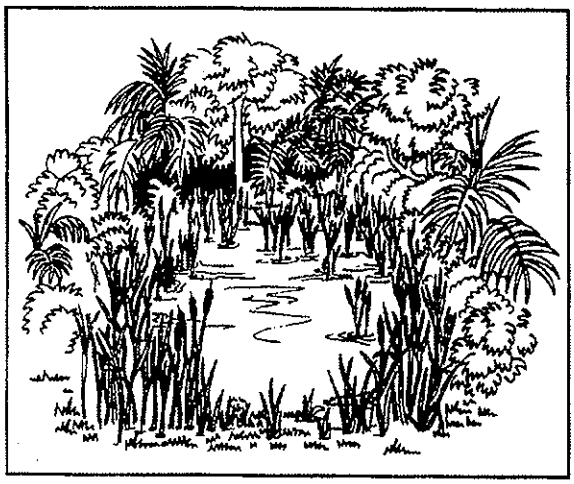
Some Bermuda Habitats



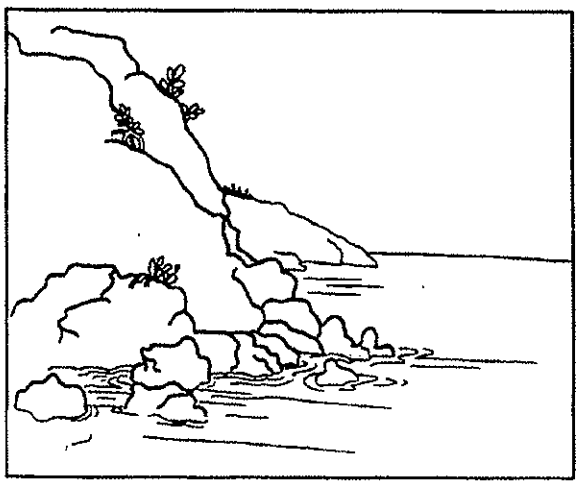
Beach Dune



Coastal Upland



Fresh Water Marsh



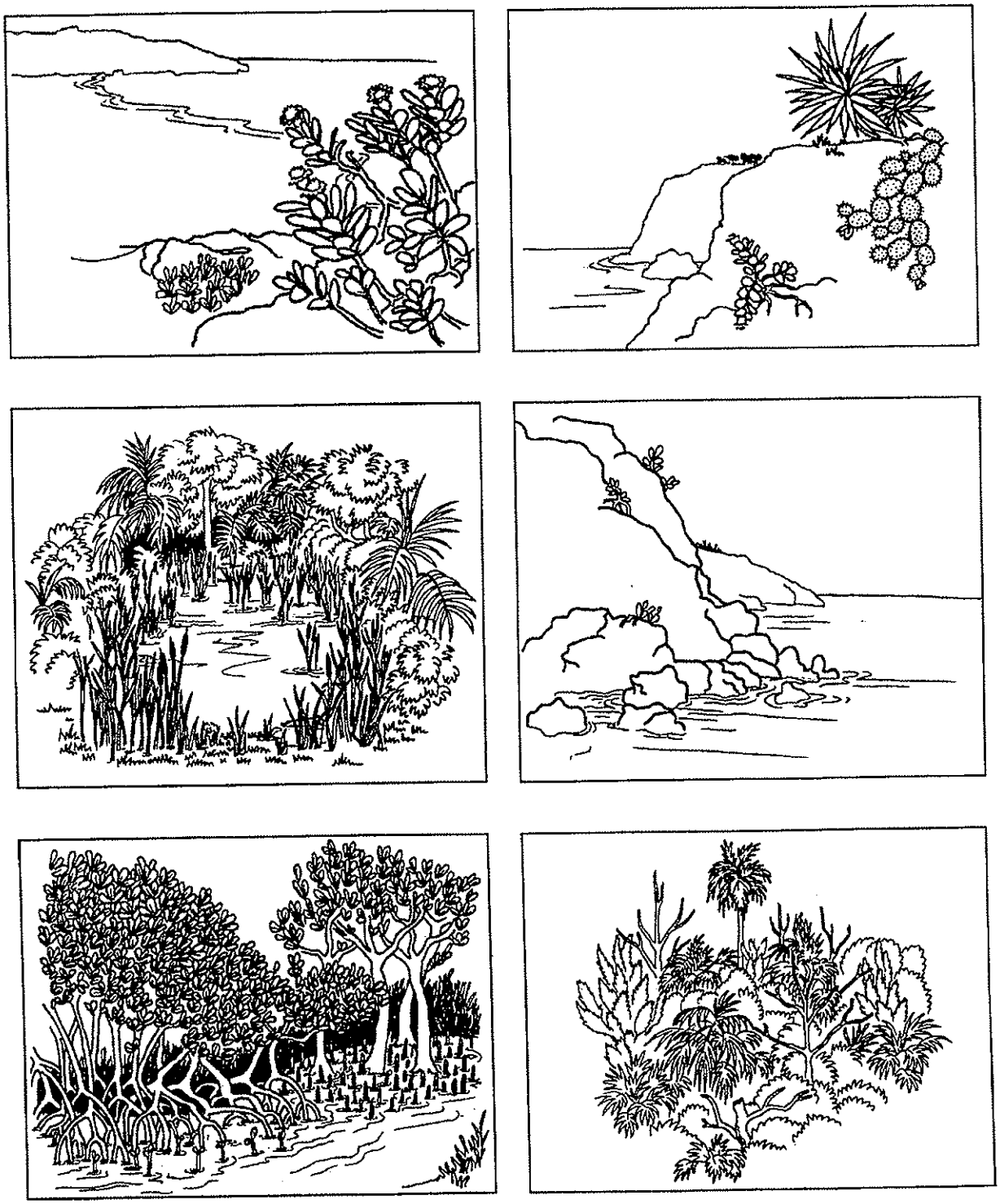
Rocky Coast

Salt Water Marsh

Upland Forest

Illustrations by Michelle Pasquin
Bermuda Zoological Society

Some Bermuda Habitats



Illustrations by Michelle Pasquin
Bermuda Zoological Society

SAFETY AT SCHOOLS

The Ministry of Labour and Home Affairs, Health and Safety at Work Act, 1982 provides standards for Safety at School. As developed by the Advisory Council for Health and Safety, these guidelines and similar ones developed in the future are of paramount importance to the well being of our staff and students. It is expected that all staff members will follow these written guidelines. These are written in the following three documents:

- HSG7 General Advice
- HSG9 Safety in Practical Subjects
- HSG10 Safety in Science Laboratories

These documents suggest safety precautions for all those who work in or attend schools. It is important that teachers, administrators and other users of present school facilities be aware of the dangers, which can arise from the incorrect use of materials and equipment.

In the primary school, no activity should be undertaken unless it can be made reasonably safe. If the resources are not available to ensure safety, then that activity should not be continued and some other means found to safely provide the necessary educational experience. It is expected that teachers of science pay particular attention to advice for safety in this subjects.

PRESCHOOL (PS) SCIENCE
CURRICULUM OBJECTIVES AT A GLANCE
PACING GUIDE

Objectives	Time/ Minutes	Date Completed	Objectives	Time/ Minutes	Date Completed
A. ALL ABOUT US ❑ become aware of their own bodies ❑ appreciate differences and similarities between people ❑ explore and describe objects and materials to help realize that senses tell us about the world ❑ identify some everyday materials **B. ALL ABOUT LIVING THINGS** ❑ be aware of living non-living things in the environment ❑ investigate living things in the outdoors ❑ identify animals by their characteristics ❑ recognize and describe where animals live and how they get their food ❑ recognize that some animals lay eggs and some have live births ❑ recognize that some animal babies look like their mothers and others do not ❑ appreciate the need to care for animals ❑ observe and describe how plants change during the life cycle (seed to seed) **C. ALL ABOUT WATER, WEATHER, AND MY BERMUDA HOME** • be aware of Bermuda as an island formed by a volcano • recognize that water is important to us • identify solids, liquids and gases around us • explore properties of water, sand and soil • recognize characteristics of four seasons • compare and contrast types of clothing used for each season • identify daily weather patterns • observe and describe objects in the sky • be aware of day and night cycle			**D. ALL ABOUT MOVING THINGS** ❑ be aware of the effect of gravity ❑ explore how things more ❑ observe and describe how humans and other animals move ❑ investigate sinking and floating ❑ explore properties of magnets ❑ value safety around moving things		

PRIMARY ONE (P1) SCIENCE
CURRICULUM OBJECTIVES AT A GLANCE
PACING GUIDE

Objectives	Time/ Minutes	Date Completed	Objectives	Time/ Minutes	Date Completed
A. ALL ABOUT SCIENCE ❑ discuss a story or article about science ❑ appreciate science as a human endeavour ❑ practise a science process skill ❑ recognize the use of mathematics and technology as tools of science ❑ carry out a scientific investigation ❑ value safety as a priority in science **B. ALIVE AND WELL** ❑ recognize the process that keep animals and plants alive ❑ recognize the basic requirements of living things ❑ recognize that animals, including humans, move, feed, grow, use their senses and reproduce ❑ recognize the diversity of animals and plant life in the world ❑ identify some Bermuda animals and plants ❑ relate structure to function of external animals learn about the world through their senses ❑ distinguish between actual plants and animals and those in stories that can have characteristics that are not possible ❑ recognize their role in taking care of the earth			**C. OUR ISLAND HOME – WATER AND WEATHER** ❑ observe and identify water in our environment ❑ recognize that water is important to all living things ❑ explore the properties of water ❑ recognize how water can be changed by weather ❑ explore where water goes and who used it up ❑ recognize that the sun warms the earth and provides light ❑ identify the cyclical patterns of seasons and of day and night ❑ identify daily weather patterns ❑ identify the appropriate way to dress related to the type of weather **D. MATTER AND MOTION** ❑ observe, explore describe different properties of matter ❑ recognize familiar materials ❑ explain why objects are made from different materials ❑ sort objects based on features ❑ explore and describe the way things move ❑ recognize that things fall to the ground unless something holds them up		

PRIMARY TWO (P2) SCIENCE
CURRICULUM OBJECTIVES AT A GLANCE
PACING GUIDE

Objectives	Time/ Minutes	Date Completed	Objectives	Time/ Minutes	Date Completed
A. ALL ABOUT SCIENCE ❑ discuss a story or article about science ❑ appreciate science as a human endeavour ❑ practise a science process skill ❑ recognize the use of mathematics and technology as tools of science ❑ carry out a scientific investigation ❑ value safety as a priority in science **B. OUR ISLAND HOME -LIVING THINGS GROWING AND CHANGING** ❑ identify the main parts of a plant and explain their functions ❑ demonstrate the conditions for healthy growth of plants ❑ identify some Bermuda plants, their fruit and seeds ❑ (caution - some Bermuda plants and seeds are poisonous - make sure children wash hands after handling) ❑ categorize a selection of seeds and make predictions on how they disperse ❑ recognize the importance of plants ❑ explore a typical Bermuda pond habitat ❑ recognize the importance of conserving our pond habitats ❑ compare the life cycle of an animal hatched from an egg and one born live including humans ❑ describe changes in themselves since birth and suggest ways in which they may change as they get older ❑ describe how offspring are like their parents and each other - but different			**C. SUN, MOON AND STARS** ❑ identify and describe things that can be seen in the sky ❑ recognize that the sun as the source of heat and light ❑ observe and describe patterns of changes in the sky that occur during day and night ❑ be aware of the changes in the moon over one month ❑ describe how animals (including humans) respond to daily and seasonal changes **D. PUSHES AND PULLS** ❑ describe the position of objects relative to themselves or other objects ❑ investigate and describe the motion of various living things and objects ❑ predict whether objects will be moved with a push and/or a pull ❑ compare very fast moving objects to slow moving ones ❑ recognize that sound can be made by vibrating objects **E. MATERIALS AND THEIR CHANGES** ❑ recognize and describe characteristics of different materials ❑ distinguish between man-made and natural materials ❑ investigate and describe the properties of solids, liquids and gases ❑ measure physical properties of objects ❑ explore and describe ways in which materials can be changed ❑ recognize the importance of conserving our natural resources		

PRIMARY THREE (P3) SCIENCE
CURRICULUM OBJECTIVES AT A GLANCE
PACING GUIDE

Objectives	Time/ Minutes	Date Completed	Objectives	Time/ Minutes	Date Completed
A. ALL ABOUT SCIENCE ❑ discuss a story or article about science ❑ appreciate science as a human endeavour ❑ practise a science process skill ❑ recognize the use of mathematics and technology as tools of science ❑ carry out a scientific investigation ❑ value safety as a priority in science **B. ADAPTION - SURVIVAL** ❑ recognize that different animals and plants live in different places and that they are adapted to their environment ❑ relate external features of animals and plants to their survival in their particular habitat ❑ explore and describe habitats of animals and plants near the school grounds ❑ recognize their role in taking care of habitats of living things ❑ explain why some animals and plants are endangered or become extinct ❑ identify the endangered species of Bermuda ❑ identify some of the animals that have become extinct in earth's history **C. OUR ISLAND HOME – LAND AND WATER** ❑ observe and describe features of our environment ❑ compare features of Bermuda with those of other countries ❑ examine and describe rocks, soils and water from the environment ❑ describe how Bermuda was formed ❑ recognize the impact of plants, humans and weather on our island ❑ recognize and describe the characteristics of the ocean and seashore ❑ identify and describe various living things from the ocean habitat ❑ advocate for the protection of our natural resources			**D. FORCES AND MAGNETS** ❑ recognize that force is a push or a pull ❑ explore how simple machines help to move heavy things ❑ be aware that gravity is a force ❑ investigate how magnets make some things move without being touched ❑ compare the strengths of different magnets ❑ research where magnets are used in everyday life research **E. ENERGY IN OUR LIVES** ❑ identify where heat light and sound energy are found in everyday lives ❑ explore how heat energy makes things change ❑ classify materials based on how well light passes through them ❑ explain that light cannot pass through some materials and shadows are formed ❑ examine how light is reflected from surfaces ❑ identify a variety of sources of sounds ❑ identify that sounds are made when objects vibrate ❑ explore methods of changing pitch and loudness of sounds ❑ recognize that sound travels through a medium ❑ appreciate our eyes as an organ of sight ❑ distinguish between noise and sound ❑ appreciate our ears as an organ of hearing		

PRIMARY FOUR (P4) SCIENCE
CURRICULUM OBJECTIVES AT A GLANCE
PACING GUIDE

Objectives	Time/ Minutes	Date Completed	Objectives	Time/ Minutes	Date Completed
A. ALL ABOUT SCIENCE ❑ discuss a story or article about science ❑ appreciate science as a human endeavour ❑ practise a science process skill ❑ recognize the use of mathematics and technology as tools of science ❑ carry out a scientific investigation ❑ value safety as a priority in science **B. PROCESSES OF LIFE** ❑ recognize the importance of life processes ❑ explain that energy is needed for organisms to survive and grow ❑ describe structures that help living things survive and grow ❑ recognize the importance of reproduction to survival of species ❑ compare and contrast plant and animal life cycles ❑ recognize that human traits can be inherited or learned **C. SAVE OUR EARTH AND OUR ISLAND** ❑ distinguish between the natural landscape of Bermuda and the parts that are created by humans ❑ identify the resources available to humans ❑ investigate the impact of man's use of resources ❑ appreciate the importance of conserving natural resources ❑ suggest methods by which Bermuda can reduce the impact of the large amount of waste produced here ❑ examine and describe rock samples ❑ determine the properties of Bermuda limestone from different parts of the island ❑ describe how Bermuda limestone was used to build houses			**D. EARTH IN SPACE** ❑ describe how Earth's movement in space is related to days, months, years, and seasons ❑ explain how the moon moves in space and how the moon appears to change shape ❑ name the planets in our solar system and state their position in relation to the sun. ❑ distinguish between stars and planets and ❑ recognize that the sun is the centre of our ❑ universe ❑ recognize the patterns of the stars during different seasons and describe how they appear to move across the sky ❑ research how scientists view space from earth ❑ be aware of the history of technology in the exploration of space **E. MATTER AND ENERGY** ❑ recognize heat as a form of energy and identify sources of heat ❑ compare materials according to the degree to which they conduct heat ❑ examine the effects of heat on various substances ❑ explore the concept of heat transfer ❑ be able to suggest solutions to the problems of heating homes in the winter ❑ measure the volume and mass of various objects ❑ recognize the difference between mass and weight ❑ describe how matter can change		

PRIMARY FIVE (P5) SCIENCE
CURRICULUM OBJECTIVES AT A GLANCE
PACING GUIDE

Objectives	Time/ Minutes	Date Completed	Objectives	Time/ Minutes	Date Completed
A. ALL ABOUT SCIENCE ❑ discuss a story or article about science ❑ appreciate science as a human endeavour ❑ practise a science process skill ❑ recognise the use of mathematics and technology as tools of science ❑ carry out a scientific investigation ❑ value safety as a priority in science **B. A CLOSER LOOK AT LIVING THINGS** ❑ appreciate the diversity of living things ❑ illustrate the characteristics of living things ❑ recognise cells as building blocks of organisms ❑ examine how organisms carry out basic life functions ❑ appreciate the importance of micro-organisms ❑ interpret a system by which organisms can be classified ❑ relate the characteristics of animals to those of living things ❑ classify animals as vertebrates or invertebrates ❑ identify examples of Bermuda's vertebrates and invertebrates **C. THE CHANGING WORLD** • differentiate among the three types of rocks • differentiate between rocks and minerals • explore fossil evidence in rocks • recognize how fossils can be compared to one another and to today's organisms • explain how weathering and erosion affect the earth's features • examine the composition of the soil • compare types of soils • appreciate the importance of soil			**D. ELECTRICITY AND MAGNETISM** ❑ recognize the importance of electricity in everyday life ❑ trace the path of electricity from generation to our home ❑ compare the conductivity of various materials ❑ compare the characteristics of static and current electricity ❑ appreciate the need to reduce the consumption of electricity ❑ explore and describe the properties of magnets ❑ explore the relationship between magnetism and electricity **E. CHANGE IN MATTER** ❑ classify matter based on its properties ❑ demonstrate how matter can be measured ❑ explore changes in matter ❑ investigate the composition of matter		

PRIMARY SIX (P6) SCIENCE
CURRICULUM OBJECTIVES AT A GLANCE
PACING GUIDE

Objectives	Time/ Minutes	Date Completed	Objectives	Time/ Minutes	Date Completed
A. ALL ABOUT SCIENCE ❑ discuss a story or article about science ❑ appreciate science as a human endeavour ❑ practise a science process skill ❑ recognise the use of mathematics and technology as tools of science ❑ carry out a scientific investigation ❑ value safety as a priority in science **B. OUR ISLAND HOME - INTERACTIONS OF LIVING THINGS** ❑ recognize how organisms interact with non-living things and other living things in an ecosystem ❑ explore the cycling of water and nutrients in nature ❑ identify and describe Bermuda's common flora and fauna ❑ differentiate among the six Bermuda terrestrial habitats ❑ examine the impact of changes in the ecosystem ❑ recognize the importance of protecting ecosystems ❑ be aware of Bermuda's protected areas and agencies that are responsible for them			**C. OCEANS** ❑ identify the oceans of the world and recognize that most of the earth's water is present in oceans ❑ explore and describe the characteristics of oceans ❑ illustrate the effect of the moon's gravitational force on tides ❑ explain the importance of the oceans ❑ explore the interdependence of organisms in a marine ecosystem ❑ describe how fresh water is obtained from salt water ❑ examine ways in which oceans affect climate and weather ❑ research the exploration of the oceans ❑ describe the risks of polluting the oceans and advocate for the protection of our oceans **D. WEATHER** ❑ explore the effect of temperature changes on water ❑ demonstrate how water is recycled into the atmosphere continuously ❑ relate cloud formation to weather ❑ observe and measure local weather conditions ❑ use weather maps weather forecasts to predict local weather ❑ predict the impact of severe weather on Bermuda ❑ examine the importance of forecasting weather ❑ distinguish between weather and climate ❑ explain how the transfer of energy from the sun affects weather conditions **1 of 2**		

PRIMARY SIX (P6) SCIENCE
CURRICULUM OBJECTIVES AT A GLANCE
PACING GUIDE

Objectives	Time/ Minutes	Date Completed	Objectives	Time/ Minutes	Date Completed
E. MATTER ❑ illustrate the characteristics of different states of matter ❑ investigate and measure properties of matter ❑ identify and describe reversible and irreversible changes in matter ❑ investigate the dissolving of materials ❑ recognize that the mass of mixture is the sum of the mass of its parts ❑ infer that matter is made up of small particles			**2 of 2**		

ASSESSMENT

SUPPORTS LEARNING

IN

BERMUDA SCHOOLS

CURRICULUM, INSTRUCTION & EVALUATION
Department of Education

BERMUDA

BERMUDA ASSESSMENT PLAN

The Ministry of Education provides schools with several types of tests to monitor students' progress towards becoming life-long learners and good citizens. Different measures are used to collect a full range of assessment evidence about students' capabilities to analyze information, to evaluate charts and graphs, and to devise solutions to problems.

People who can communicate well and have the ability to interpret complex problems will be highly valued in the future workplace. Testing results are one of the ways that the Ministry informs young learners and their parents about their progress towards developing the capabilities that will enable them to succeed.

Annual Assessment Schedule

Each June students write *TerraNova* Assessments for Primary School students in year 3 through 6. These measures include a full range of achievement tests covering Reading, Language and Mathematics. School principals evaluate the results as part of their School Improvement Plans looking for year-level and school wide weakness to guide curriculum plans for the year and identify areas of focus for staff development.

In June the Ministry requires schools to administer the Bermuda Educational Assessment Programme for P3 and P5 as a performance indicator for Mathematics and English Language Arts achievement. These tests are all developed in Bermuda by curriculum specialists with the assistance of classroom teachers. In Language Arts, students write an essay and take a spelling test. In Mathematics, students solve problems and answer sets of questions that ask them to calculate and apply mathematical concepts.

OUR BELIEFS ABOUT ASSESSMENT

Assessment strategies are the plans that teachers use to collect evidence about students' achievement in school. When teachers have a good understanding of how far students have come, then teachers are in a better position to guide them, as they become more able learners.

When teachers collect assessment information they may have different purposes in mind, but learning is the primary focus. There are seven basic assessment guidelines for educators:

1. The primary purpose of assessment is to improve student learning.

2. Assessment practices and policies are fair to all students.

3. Assessment supports learning even when it is designed for other purposes, such as accountability.

4. Teachers support learning by working together to improve assessment.

5. Community representatives participate in developing assessments.

6. There is a schedule to communicate clear assessment information.

7. Educators review progress toward assessment goals along with community people.

DEFINITIONS

Educators use the term, "assessment" to describe any plans and activities they use to monitor student achievement. Measuring, evaluating, and reporting are three components of assessment.

Assessment

For our system we define assessment to mean gathering information systematically to determine:

- What students know,
- What they are able to do,
- and what goals they are working toward.

Evaluation

We define evaluation to mean judging information systematically to determine student progress toward intended curriculum objectives. When teachers evaluate, they interpret assessment evidence compared to the intended curriculum and to the taught curriculum, so they may judge student progress. Evaluation helps students improve their learning when educators show learners their strengths and direct them in ways that develop their competencies.

Reporting

We define reporting to mean communicating information on student progress, especially to parents. In order to support student learning, parents need regular assessment updates on what their children have learned, what they can do, and what they are working toward. This communication may be verbal in personal interviews or in telephone conversations, but some reports must be in writing. Parents can be effective learning guides when educators give them clear information about student progress.

EXEMPLAR SCORING GUIDE*
Primary Levels 3-6
(0 - 4 Scale)

Level	Definition	EQUIVALENT	
		Letter	% mark
4	**A very good performance** • focuses on the purpose of the task • meets or exceeds all the requirements of the task • organizes content and ideas in a logical way • presents information clearly • includes appropriate detail to support ideas or conclusions • demonstrates creativity, originality and/or initiative	**A (VG)**	**80-100**
3	**A good performance** • focuses on purpose of the task • meets all the requirements of the task • organizes content and ideas in a logical way • presents information clearly • includes some detail to support ideas or conclusions	**B (G)**	**70-79**
2	**A satisfactory performance** • has some awareness of the purpose of the task • meets most of the requirements of the task • organizes content and ideas in a logical way • presents information in an understandable way • may not include significant details to support ideas or conclusions	**C (S)**	**60-69**
1 (R)	**A fair performance** • does not fit the purpose of the task • does not meet the requirements of the task • presents information in an unorganized or confused way • does not include details to support ideas or conclusions • Remediation required	**D (NI)**	**50-59**
0 (R)	**An unscorable performance** • does not demonstrate the required knowledge, skills or capabilities • is not understandable, is incomplete or 'defiant' (e.g. "I won't do this"). • Extensive remediation is required.	**F (NI)**	**Below 50**

'R' – Extensive Remediation required: student may need to repeat or restart work, or teaching method may need to be altered.
An '0' student may be one who refuses to work or needs specialist help.

*** Adapted from British Columbia**

This new perspective on assessment implies a **shift** in our practice

Decreasing emphasis on ----------->Increasing emphasis on	
Delivering curriculum	*Enhancing learning*
Summative assessment which discounts further learning	Formative assessment which supports further learning
The assumption that learning can be represented or demonstrated in one way	The assumption that learning can and should be represented in a variety of ways
Teachers directing all curriculum planning and assessment	Learners participating in assessing their own progress and learning
Quantitative assessment and reporting (e.g., letter grades, test scores)	Qualitative assessment and reporting (e.g., conferences, systematic observations, conferences)
Comparing learners to each other and/or in relation to a pre-determined norm or standard	Learner's individual progress is based on pre-determined and explicit criteria

ASSESSMENT IN THE CLASSROOM

Assessment drives instruction. We must devise procedures and instruments which are "intelligence-fair" and which allow us to look directly at the kinds of learning in which we are interested.

- Howard Gardner

A. Developing and Choosing Appropriate Assessment Methods

Valid assessments provide students with achievement information that enables them to monitor their own progress toward learning objectives. Experienced educators develop their assessment plans at the same time that they plan how to teach. This coordinated planning helps ensure that the assessment methods chosen match both the instruction and the purpose.

- **Assessment methods selected should connect directly to students' knowledge, skills, behaviour, and attitudes.**

- **Assessments should be clearly related to the goals and objectives of instruction, and be compatible with instructional strategies.**

- **Teachers consider possible consequences when they choose or develop an assessment.**

- **Differentiating instruction means that teachers use more than one assessment method to indicate student progress.**

- **Assessment methods match students' heritage, their learning style, and learning experiences.**

- **Assessments chosen avoid language and content that express bias.**

- **When teachers borrow a method from some other context or location they have evidence that the assessment will be valid for Bermudian students.**

B. Collecting Assessment Information

Before assessment information is collected, students need sufficient opportunity to experience the activities designed for the curriculum objectives. They also need to be informed of how they will be expected to demonstrate the knowledge, skills, behaviours, and attitudes to be assessed.

- **Students should be told why teachers are assessing and how teachers and the Ministry will use that information.**
- **Assessment conditions should suit both the purpose and the style.**
- **When using observations, checklists, or rating scales only a few characteristics should be assessed at one time. Each characteristic should be clearly defined.**
- **Directions given to students should be clear, complete, and phrased correctly for their age and grade level.**
- **There should be no penalty for guessing.**
- **While collecting assessment information, teacher-student interactions should be consistent.**
- **Keep written records of all unanticipated assessment circumstances.**
- **Decisions about alternative practices for special needs students should be guided by a written policy.**

> *"If tests determine what teachers actually teach*
> *and what students will study for*
> *-- and they do --*
> *then test those capacities and habits we think are essential*
> *and test them in context"*
>
> *-- Grant Wiggins*

C. Evaluating and Scoring Student Performance

Procedures to evaluate and score student performance should match the assessment method and educators should monitor these procedures to ensure that they are applied consistently. The best way to ensure students will feel that they have been treated fairly and consistently is to integrate assessment planning with instructional strategies. This plan will detail procedures for how the evidence will be scored so that students are aware of the contribution that each portion of their work will make towards a final grade.

- **Scoring procedures should be developed before the assessment method is used.**
- **Students should be told about how the scoring will proceed to allow them to prepare for the assessment.**
- **Relevant factors are included in scoring.**
- **Students need to be able to understand any comments included as feedback.**
- **Scoring procedures should be changed when faults are detected in the initial system.**
- **A written appeal process should be explained to students at the start of each year.**

> *"I want to be evaluated on what*
> *I can do,*
> *not on what someone else*
> *can do better"*
>
> *-- Middle School Student*

D. Summarizing and Interpreting Results

Summarizing and interpreting are the procedures used to combine assessment results into grades that will appear on report cards. This includes comments about performance as well as letter or number grades. Any procedures used should accurately represent the student's performance and be connected to the planned instructional objectives.

- **A written policy guides teachers at each school in their plans to summarize and interpret results.**
- **Explain to parents and students the procedures that teachers will use to generate and interpret grades.**
- **Describe the process used to derive summary comments and grades.**
- **Different results should be combined carefully.**
- **A broad sample of learning outcomes requires more than one assessment.**
- **Combine assessment results according to their weight of the taught curriculum.**
- **Describe and justify the basis for each interpretation.**
- **Differentiate interpretations according to the student's background and learning experiences.**
- **Create accurate records and store assessment information in a secure place.**
- **Consider how an assessment method might limit the way you interpret the work a student has achieved.**

> *"Whenever people are classified on the basis of cutoff scores misclassifications are bound to occur.*
> *The solution is --to avoid making decisions about anyone's future solely on the basis of one imperfect instrument"*
> *-- Bernard Gifford*

E. Reporting Assessment Findings

Clarity and accuracy are necessary for quality assessment reports, but educators who write these documents should also think how the reader will use the information. Consider the audience for the assessment report, so that these people can use your report to guide their interpretations of student learning. Since the primary purpose of assessment is to improve student achievement, the primary audience for the report is the student. Students, and their parents interpret the information in their report to make decisions about themselves, their capabilities, their achievements, and their potential achievements.

- **Write a school assessment policy that guides reporting.**
- **Describe instructional objectives used as standards for reports, written and oral.**
- **Describe strengths and weaknesses completely in reports.**
- **Provide conferences for parents.**
- **Define and describe appeal procedures to students and parents each year.**
- **Ensure that appropriate people have access to assessment information.**
- **Ensure that reports are secure when transferred.**

> *"The key question is -*
> *What information provides the most accurate depiction of students' learning at this time?"*
> *-- Tom Guskey*

F. Promotion and Retention

Children enter school with other learners approximately their own age. They are expected to make reasonable learning progress and advance along with their peers. In the first few levels of primary school students should not repeat a year, but as they get into the higher grades there may be instances where students are asked to repeat a grade or course. The principal makes these decisions after consulting with teachers, counsellors, and the parents.

Whenever students are retained, every effort is made to differentiate instructional strategies to provide learners with opportunities they need to advance.

Some factors considered when students might be retained.

- Repeating a grade is no guarantee that students will be more successful with the same material.
- Students' attitude to school may become more negative if they are retained.
- Retained students may develop social and personal problems.
- Students who are retained are less likely to complete school.

There is always a concern that students need to be accountable for their achievements, or lack of achievements. When weighing these concerns it is worthwhile to consider how far the student's responsibility extends. If the learner has not had appropriate opportunities that enable learning to occur, then it would not be fair to hold the child fully accountable for the outcome. In addition to learning opportunities, it is also worthwhile to consider assessment opportunities. Is it possible that an alternate assessment strategy may have permitted the student to show what they really know?

"School is a complex experience;
by breaking apart
all of the ways we
learn, rehearse, and assess
we can uncover how to do
a better job."
-- Eric Jensen

Assessment Activity	Description
Records over time: • Journals • Diaries • Learning Logs	• Recordings that reflect students' perceptions of their progress, difficulties, understanding and feelings
Computer Assisted Learning	• Using carefully selected software to lead students from one level of difficulty to another, building on what they know and as they are tested.
Demonstrations • Live • Video • Multimedia	• Opportunities for students to display knowledge, skills and attitudes
Discussions • Small or large group • Panel	• Oral representations
Conversations and Conferences • Teacher/Student • Student/other person	• Verbal exchanges to uncover/clarify what a student has learned or understands that might not have been demonstrated through other means of assessment.
Pictorial Displays • Posters • Photographs • Collages, picture collections, scrap-books	• Visual presentations
Laboratory • Application • Laboratory Projects • Experimental	• Hands-on experiences that allow students to experiment, replicate, produce, and/or create.

Use the table below to plan your assessment programme for your subject. Under the column Curriculum objective, decide which objectives will be tested and then decide how best to assess each of these objectives. At the end of this exercise you should be able to group the various objectives under the assessment types.

CURRICULM OBJECTIVE NO./NAME	**TYPE OF ASSESSMENT**				
	M/C TEST	SHORT ANSWER	ESSAY	PRACTICAL TEST	PROJECT/ PRESENTATION
TOTAL					

Self/Peer Checklist for Students
HUMAN AND SOCIAL DEVELOPMENT STUDENT PROFILE

PROFILE OF: _____

COMPILED BY: _____ DATE: _____

1. Never 2. Seldom 3. Occasionally 4. Usually 5. Frequently 6. Always	1	2	3	4	5	6
1. I am able to form an opinion about what I am asked to consider.						
2. I am able to express my opinion about what I am asked to consider.						
3. I can interpret and appreciate what I know in different ways.						
4. I want to learn more about things and issues that I don't know.						
5. I accept and appreciate other people's ideas.						
6. I am able to make connections between ideas and things that contribute to larger issues.						
7. I am able to see my personal strengths and work toward increasing them.						
8. I am able to see my personal weaknesses and work toward decreasing them.						
9. I am able to evaluate objectively and accurately.						
10. I am able to take an unpopular stand without fear of ridicule by my peers.						
11. I am able to balance the demands of my life and school without feeling overwhelmed.						
12. I am able to identify and understand other students' situations.						
13. I am able to actively support others.						
14. I am able to accept and appreciate other students' values, expression and capabilities.						
15. I am able to function as a contributing member of a working group.						
16. I am able to make and maintain friendships without difficulty.						
17. I am able to take responsibility for my actions.						
18. I am able to see the consequences of my actions.						
19. I am able to approach problems calmly and realistically.						
20. I am able to handle conflicts in a mature and responsible manner.						
21. I am able to consult with others when I need help or support.						
22. I am able to function effectively as a member of a democratic society.						
23. I am able to see how my actions affect our environment and our world.						
24. I am able to see how the actions of others affect our environment and our world.						
25. I am able to apply my knowledge and understandings to my life away from school.						
26. I am curious about and willing to use new technologies when searching for information.						
27. I am able to consider and weigh the implications of potential change.						
28. I am flexible and able to adapt to change.						
29. I am an open-minded listener.						
30. I am a good citizen.						

PLANNING FOR INTEGRATED CURRICULUM IN THE PRIMARY SCHOOLS

When you walk through the Botanical Gardens, you don't hear kiskadees for ten minutes, then the wind rustling for five minutes, and then smell the flowers for three minutes. All of this impact on you at once and you make the experience into a meaningful whole.

> *"Young people are interested in the entire world around them - it doesn't make sense to them to say, 'Mathematics', 'Science' or 'Social Studies'. When instruction jumps from one discipline to another every 45 minutes, learning is fragmented unnecessarily."*

By Susan Krog,
Professor of Education
Western Washington University

Where Are We Now?

If we consider a continuum from parallel connections across each discipline to a blending of all subject areas, teachers may be at different stages of integrating curriculum.

Simplest Stage: Parallel teachers realign content so that related topics are taught concurrently.

More Ambitious Stage: Teachers begin to link subjects by scrutinizing what they teach, reinforcing overlapping concepts and avoiding needless repetition.

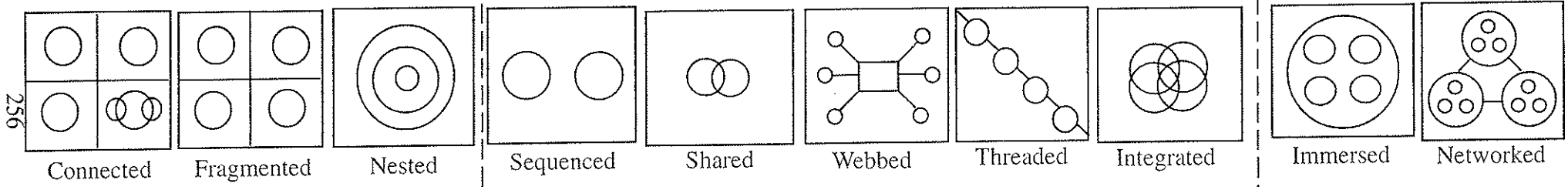
Most Ambitious Stage: Teachers create interdisciplinary modules that focus on a theme or project.

The process of collaboration at the building level will strengthen integrated curriculum and give a vital tool for professional growth of teachers. Appropriate and meaningful staff development; perusal of professional literature, and/or university training on approaches to integrating curriculum is vital to any significant change in education practice. Teachers should find ways to naturally integrate subjects and develop meaningful instruction.

Design Options (see next page)

Techniques for designing an integrated curriculum include mapping the curriculum and planning an integrated module. To design an integrated curriculum, teachers need to know what is taught in other subject areas and at other grade levels - information that is traditionally not shared.

How to Integrate the Curriculum



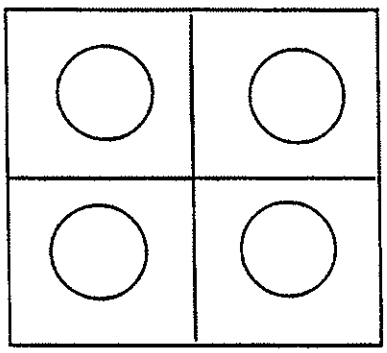
Within single disciplines

Across several disciplines

Inside the mind of the learner

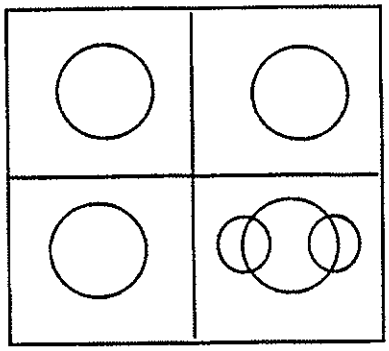
Design options for curriculum might include:

Disciplined-based



Description
The traditional model of separate and distinct disciplines which fragments the subject areas.

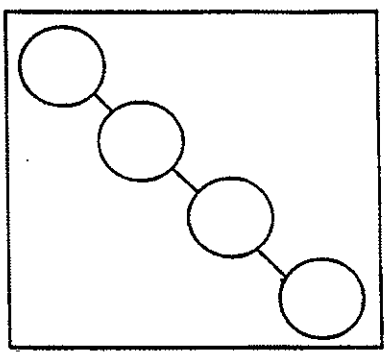
Example
Teacher applies this view in mathematics, science and social studies, etc.



Description
Within each subject area, course content is connected topic to topic, concept to concept, one year's work to the next and relates idea(s) explicitly.

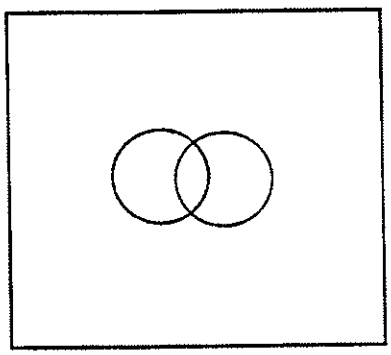
Example
Teacher relates the concept of fractions to decimals, which in turn relates to money, grades, etc.

Parallel Disciplines



Description
The metacurricular approach threads thinking skills, multiple technology and study skills through various disciplines.

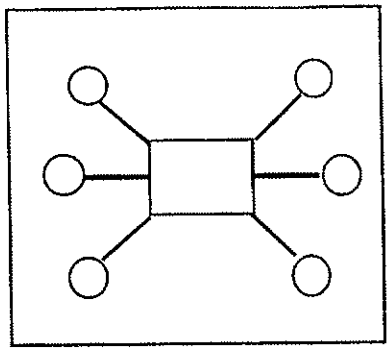
Example
Teaching staff targets prediction in reading, mathematics and science experiments while teaching social studies the teacher targets forecasting current events and thus threads the skill (prediction) across all disciplines.



Description
Shared planning and teaching take place in two disciplines in which over-lapping concepts or ideas emerge as organizing elements.

Example
Science and mathematics teachers use data collection, charting and graphing as shared concepts that can be team-taught.

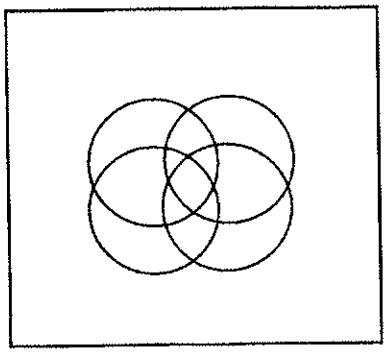
Multidisciplinary



Description
The fertile theme is webbed to curriculum contents and disciplines; use the theme to sift out appropriate concepts, topics and ideas.

Example
Teacher presents a simple topical theme, such as the circus and webs it into the subject areas. A conceptual theme, such as conflict, can be for more depth in the theme approach.

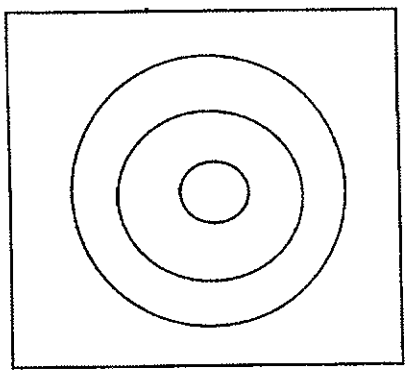
Interdisciplinary



Description
This interdisciplinary approach matches subjects for overlaps in topics and concepts with some team teaching in an authentic integrated model.

Example
In science, music, visual arts and health education, teachers look for patterning models and approach content through these patterns.

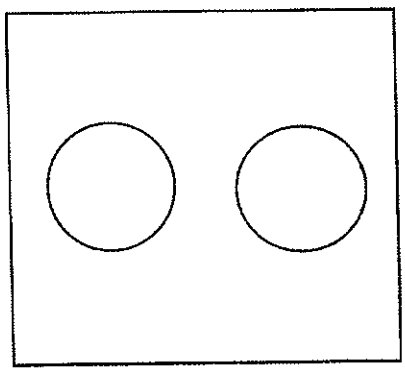
Disciplined-based



Description
Within each subject area, the teacher targets multiple skills: a social skill, a thinking skill and a concept-specific skill.

Example
Teacher designs the unit on photosynthesis to simultaneously target consensus seeking (social skill), sequencing (thinking skill) and plant life cycle (science skill).

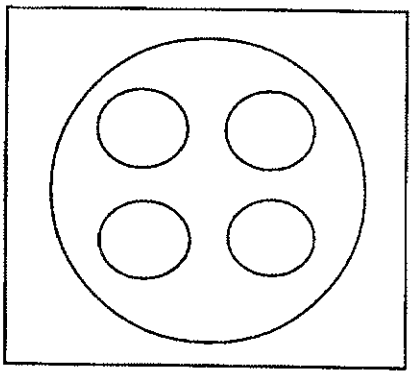
Parallel-based



Description
Topics or units of study are rearranged and sequenced to coincide with one another. Similar ideas are taught in concert while remaining separate subjects.

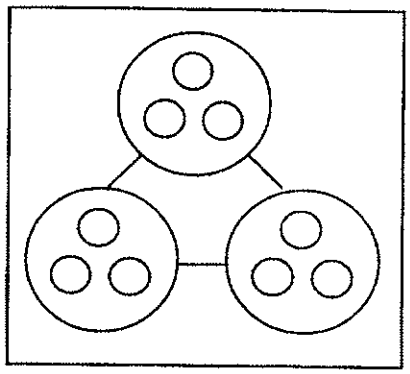
Example
In English language arts the teacher will teach an historical novel depicting a particular period while in social studies the teacher could cover the same period.

Immersed



Description
The disciplines become part of the learner's lens of expertise: the learner filters all content through this lens and becomes immersed in his or her own experience.

Networked



Description
Learner filters all learning through the expert's eye and makes internal connections that lead to external networks of experts in related fields.

Choosing a Theme

In the initial development of primary schools, four disciplines have been identified as core subjects:

- English Language
- Mathematics
- Science
- Social Studies

Year level teachers, along with teachers of other discipline areas should utilize related materials located in their professional library, modifying these as appropriate to their students' needs and interests.

It is important that primary school teachers keep abreast of current research and trends on integrating curriculum. Teachers are encouraged to take part in related staff development workshops, read professional literature and/or take university courses.

Teachers should:

- take inventory of what is already being done - writing across the curriculum, etc.
- design a curriculum map by listing the content of all subjects and then identify a theme or umbrella
- design an integrated module and develop related lesson plans
- decide on the length of time for completion and an appropriate title
- discover student interest - ask them what they want to know!
- decide whether the theme has substance and application to the real world
- display student work
- celebrate success!

PROFESSIONAL ASSOCIATIONS

SCIENCE

Name:	The Science Teachers Association of Ontario
Address:	P.O. Box 771 Toronto, ON NOP 1 MO CANADA
Telephone:	(800) 461 2264
Name:	The Association for Science Education
Address:	College Lane, Hatfield Hertfordshire AL 109AA ENGLAND
Telephone: Fax:	0707 267411 0707 266532
Name:	National Science Education Leadership Association
Address:	P.O. Box 5556 Reston, VA 22205-3000 U.S.A.
Telephone:	(703) 524 8646
Name:	National Science Teachers Association
Address: Country:	1840 Wilson Boulevard Arlington, VA 22201-3000 U.S.A.
Telephone: Fax;	(703) 243-7100 (703) 243-7177

National Science Teachers Association Conference Dates:

2001	March 22 – 25	St. Louis MO
2002	March 27 – 30	San Diego, CA
2003	March 27 – 30	Philadelphia, PA
2004	April 1 – 4	Atlanta, GA

Name:	National Association of Biology Teachers
Address:	11250 Roger Bacon Drive Suite #19 Reston, VA 22090 U.S.A.
Telephone:	(703) 471 1134
Name:	Institute for Chemical Education

National Association of Biology Teachers Conference Dates:

2001	November 7 – 10	Montreal QU
2002	October 30 – November 2	Cincinnati OH

Address:	University of Wisconsin-Madison 1101 University Avenue Madison, WS 53706 U.S.A.
Name:	National Marine Educators Association
Address:	P.O. Box 51215 Pacific Grove, CA 93950 U.S.A.
Telephone:	(406) 648 4841
Name:	American Association of Physics Teachers
Address:	One Physics Ellipse College Park, MD 20740 U.S.A.
Telephone:	(301) 209 3300
Name:	American Chemical Society Education Division
Address:	1155 16th St. NW Washington, DC 20036 U.S.A.
Telephone:	(202) 872 4388

Name:	Bermuda Association for the Advancement of Science and Technology
Address:	Bermuda College P.O. Box PG 297 Paget PG BX Bermuda
Telephone:	(414) 236-9000

CURRICULUM ABBREVIATIONS

School Level Abbreviations

Preschool	PS
Primary School	P1-P6
Middle School	M1-M3
Senior School	S1-S4

Subject Area Abbreviations

Business Studies	BS
Dance	DN
Design & Technology	DT
English Language Arts	EL
Family Studies	FM
Foreign Languages	FL
Health Education	HE
Information Technology	IT
Mathematics	MT
Music	MU
Physical Education	PE
Science	SC
Social Studies	SS
Theatre	TH
Visual Arts	VR

Subject Code

e.g. PreSchool English Language Arts
PS EL-B

Year Level	Subject Area	Module Sequence
(PS-P6) representing PreSchool to Primary Six	abbreviated subject area	(A-G) representing sequence of module at any level
PS	**EL**	**B**
PreSchool	English Language Arts	(2nd module in the sequence of 7 modules)

Curriculum Framework & Course Abbreviations

Philosophy	PHL
Goals & Sub Goals	GLS
Performance Indicators	PI
Scope & Sequence	SAS
References	REF
Course Overview	OVW
Correlation Matrix	MTX
Modules	MDL
Teacher Resources	TRS
Student Resources	SRS
Exemplar Scoring Guide	SCO
Rubrics	RUB
Objectives at a Glance	OBJ
Infusing Across the Curriculum	INF
Glossary	GRY
Health and Safety	HAS
Professional Association Directory	PAD
Curriculum Abbreviations	ABR
Appendix	APX

Programme Abbreviations

Advisory Programme	ADV
Career Education Programme	CED
Functional Skills Programme	FUN
Guidance and Counselling Programme	GUI
Library Information Programme	LIB

Ministry of Education
P.O. Box HM 1185
Hamilton HM EX
Bermuda
September 2001