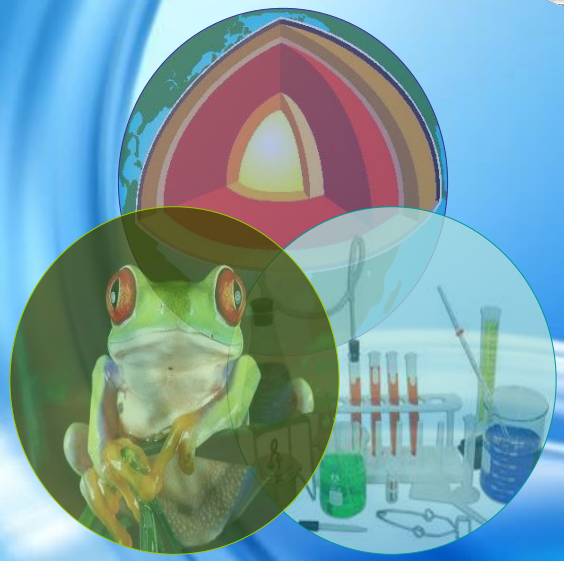
OECS EDUCATION DEVELOPMENT PROJECT (OEDP)

Science

Earth Science



Life Science

Physical Science

CURRICULUM GUIDE

For

Secondary Schools

Grades 7 – 9 (Forms 1-3)

Funded by the Government of
St. Vincent & the Grenadines/World Bank

Contents

ACKNOWLEDGEMENTS

The Government of St. Vincent and the Grenadines and The Ministry of Education wish to express gratitude to the following persons for their invaluable assistance in the creation of the National Curriculum for Science.

Mrs. Lindsay Howard: OECS Education Development Project (OEDP) Consultant
Mrs. Sylvia Jack: Local Consultant
Mrs. Deborah Bacchus: Senior Education Officer/Curriculum Development Unit

in proofreading the document and providing advice regarding its format. Also, we thank them immensely for the patience they exhibited with the production team during the course of the project.

Mr. Ramesh Outar: Mountain View Adventist Academy
Mr. Jovarnie Rose: St. Vincent Grammar School
Mrs. Shanta Debnath: Thomas Saunders Secondary School.

They are all science teachers, who, despite the demands of their jobs, took time to prepare and submit materials that are incorporated in the document. Their work was facilitated by the principals of their respective schools, who allowed them time off to attend meetings pertaining to this project. We are therefore grateful for the co-operation of these principals.

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Special thanks to Miss Delise Jones who was responsible for the refining of the documents from the inception of the project to its completion. *Mention must also be made of Mrs. Nyoka James-Clarke who helped to refine the document for completion.*

Message from the Chief Education Officer

Globalization and the knowledge economy pose numerous challenges to small island developing states. St. Vincent and the Grenadines is no exception.

With the transformation of entire economies and cultures, schools are expected to keep pace, and educators have to rethink and reform the education system to grapple with these challenges by increasing access and providing opportunities for the student population to acquire skills and gain knowledge for living and production.

The curriculum is a powerful instrument through which education reform is pursued. The curriculum has to provide opportunities for personalizing learning by introducing flexibility in what is taught. It has to be relevant and engaging for all pupils. The curriculum should create learning opportunities for each child by considering the range of abilities, aptitudes and diverse backgrounds of all students. The foundation skills - literacy, numeracy and ICT are also of utmost importance but initiative, creativity and problem solving must transform the way of thinking and doing.

The new curriculum and assessment framework makes provision for new approaches and the use of innovative modalities to encourage teachers to change from traditional to interactive approaches; to foster critical thinking and problem-solving while engaging teachers in proper assessment practices which will enable them to provide evidence-based-intervention strategies for all learners.

The framework also allows practitioners to hone the latent energies and abilities of students through the Design and Technology, Physical Education and Creative Arts curricula. This, it is hoped, will provide future citizens with skills and knowledge to be employable, competitive, self-sufficient and to increase civic and democratic responsibility.

Through the use of this curriculum, from Kindergarten to Grade 9, the education received will determine the citizens' capacity to prosper and to help the economy to bloom.

The new thrust to introduce teachers' guides into schools strengthens the initiative to provide the appropriate resources to allow teachers to implement all programmes of learning. I urge teachers to make maximum use of these resources so that the nation's children will continue to benefit from the opportunities provided in all classrooms.

Susan Dougan

Susan Dougan (Mrs.)
Chief Education Officer

FOREWORD

The phased introduction of Universal Secondary Education (USE), completed in 2005, highlighted the need for appropriate curricula to meet the varying needs and interests of the increased, more diverse student population entering secondary schools.

USE led to a further fragmentation of the current curricula as different secondary schools adopt different coping strategies to meet their diverse students' needs.

Hence for USE to be deemed effective there was an urgent need for the Government of St. Vincent and the Grenadines and in particular the Ministry of Education to provide a uniform curriculum framework for all secondary schools, thus providing more equitable access for all.

The Education Act of 1992 and the ESDP (2002-2007), sought to address these issues by providing for the development of a National Curriculum and Assessment Framework (NCAF), which provides flexibility for schools to customize the curriculum, subject to policy requirements, to best meet the needs of their students.

This National Framework, developed through a wide-ranging consultative process and participatory methodologies, led to the development of National Curriculum Programmes of Learning (POLs) and Teachers Guides in nine (9) subject areas: *Creative Arts (Dance, Art, Drama and Music), Design and Technology, Foreign Languages (French and Spanish), Health and Family Life Education, Language Arts, Mathematics, Physical Education and Sports, Science and Social Sciences..*

These Programmes of Learning seek to raise the performance and standards of teachers and students by providing Attainment Targets and basic Learning Outcomes and Achievement Indicators that ALL students are expected to achieve.

The *Attainment Targets* describe what each student should know, be able to do and the desirable attitudes they should display.
The *Learning Outcomes* are derived directly from the Attainment Targets. They indicate the basic depth and breadth of what students should know, be able to do, and the desirable attitudes they should demonstrate.
The *Achievement Indicators* state what the students should know, be able to do and the values and attitudes they must display in order that the teachers and students can know that a Learning Outcome has been achieved.

The Teachers' Guides are designed to enable ALL students to achieve the national goals for secondary education. They aim to illustrate the integration of teaching, learning and assessment.

Each Guide has been designed to suit the particular needs of each subject area. Furthermore, the Guides include sample lesson plans, assessment strategies, activities and the major resources/materials needed to effectively deliver the programmes. These documents should therefore serve as a guide for the development of instructional programmes to be implemented at the classroom level.

These Guides should therefore provide opportunities for the enhancement of teaching and learning at the classroom level and so contribute to the cognitive, affective and psychomotor development of the child.

The teacher, the main user of these Guides is envisaged as someone who:-

- Plans for teaching according to different learning styles and needs of his/her students
- Is flexible and creative
- Is knowledgeable of the subject he/she teaches.

The teacher of the NCAF is therefore someone who is confident in the delivery of the subject matter.

At the Ministry of Education, we are confident that these Guides will significantly enhance teaching and learning in secondary schools and eventually contribute towards the achievement of school graduates who are:

- Literate and numerate in all domains
- Capable of sound moral and ethical judgments
- Confident and emotionally secure
- Capable of working independently and cooperatively
- Lifelong learners
- Hardworking with positive work ethics
- Knowledgeable and appreciative of their creative and artistic expressions

It is our hope that principals and teachers continue to play their roles in ensuring that these Guides are used for the enhanced development of the Nation's children as we work together to produce better citizens in St. Vincent and the Grenadines.

D. Bacchus

Deborah Bacchus (Mrs.)
Senior Education Officer - Curriculum

Vision of the Learner

The graduate of the National Curriculum is envisaged as someone who has learned to:

- communicate effectively through words, numbers, visual images, symbols and sounds.
- be self reliant, act positively and respond appropriately to changing situations.
- be computer competent, skilled in science and technology and able to apply research and evidence based skills appropriately in his/her living.
- be aesthetically and artistically aware, creative, confident, emotionally secure with well developed interpersonal and problem solving skills; capable of sound moral and ethical judgments.
- engage in learning as a lifelong activity and thus be productive, adaptable citizens prepared to take up different employment opportunities to meet personal and national needs.
- evaluate data to make and implement decisions and accept responsibility for those decisions in the home, workplace and wider society.

Developmental Outcomes of Graduates of ES 3

At the end of Education Stage 3; students can:

- apply knowledge, skills and reasoning to their daily lives.
- exhibit positive work attitudes.

- understand and demonstrate a commitment to physical and mental fitness, good healthcare and a productive life style.
- demonstrate a high level of self-worth.
- make sound moral and ethical judgments.
- appreciate and conserve the national environment and cultural heritage.
- respect and value their rights and responsibilities and those of other people as equal citizens in a democratic society.
- demonstrate different life-learning skills for different purposes in their daily lives.
- respect and value their rights and responsibilities and those of other people as equal citizens in a democratic society.
- demonstrate different life-learning skills for different purposes in their daily lives.
- promote a Caribbean identity through regional co-operation, harmonization and integration.

Expectations of a Learning Outcomes Curriculum

A Learning Outcomes Curriculum is a structured hierarchy of integrated learning. It ensures that students experience the Attainment Targets and Learning Outcomes for each subject as inter-related, and linked, both within and across subjects at each grade. It seeks to expand and support the students' opportunities to acquire the desired knowledge, skills, values and attitudes across the whole curriculum. The Learning Outcomes for each subject set out progressively more complex, deeper and broader expectations of learning that shall be

made clear and explicit to all stakeholders, including the students and parents, before teaching and learning begins.

A Learning Outcomes Curriculum expects students to make sense of new knowledge in the context of their existing knowledge and so develop new understandings as learning takes place. It recognizes that learning at school is only truly beneficial when learners draw on learning from their daily lives both in and outside school to learn and then transfer or apply that new learning back into their daily lives in and outside school. The process of learning is therefore considered as important as the final products and it is designed to encourage students to engage in learning as a life-long activity, as an essential pre-requisite to understand and manage their lives in an ever-changing world.

Structure of the Science Curriculum

The curriculum for grades 7 to 9 is comprised of three strands: Earth Science, Life Science and Physical Science. Each of these strands is further divided into sub-strands. The Life Science strand is divided into two sub-strands – Classification of Organisms and Structure, Function and Diversity. Earth Science is divided into three parts – Earth's Weather, Earth's Resources and The Solar System. Similarly, the Physical Science is divided into three sub-strands: Energy; Matter and Materials; and Force, Motion and Structures.

Apart from the division into strands and sub-strands, the curriculum is divided by grade levels, with learning outcomes for each sub-strand specified for each grade level. Moreover, each major topic covered at grade 7 level is revisited at the other two higher levels, with appropriate learning outcomes for the different levels. In essence, the curriculum shows a spiral progression in the learning outcomes. It also includes achievement indicators pertaining to each learning outcome at each grade level.

SUBJECT: SCIENCE AND TECHNOLOGY - EDUCATION STAGE: 3 (ES3)

STRAND 1: LIFE SCIENCE

ATTAINMENT TARGET: The learner should be knowledgeable about living and non-living things and value life.

We will know that learner has achieved this Attainment Target when s/he can	**Theme 1: Characteristics/Classification of Organisms**			
	Grade 7/Form 1		**Grade 8/Form 2**	
	Learning Outcomes	**Achievement Indicators**	**Learning Outcomes**	**Achievement Indicators**
	Realise that animals can be grouped according to their physical characteristics.	1. Appreciate the importance of classification. 2. Identify physical characteristics used by scientists to classify animals. 3. Classify vertebrates and invertebrates into the currently recognized groups according to their characteristics. 4. Construct a simple dichotomous key based on observable features and use it to classify organisms.	**Recognise that plants and parts of a plant can be classified according to observable features**	1. Appreciate the importance of classification. 2. Identify characteristics used by scientists to classify plants. 3. Classify seed plants (higher plants) into angiosperms and gymnosperms (conifers). 4. Differentiate between the two groups of angiosperms. 5. Classify different parts of plants based on observable characteristics (to include modified plant structures).

SUBJECT: SCIENCE AND TECHNOLOGY - EDUCATION STAGE: 3 (ES3)

STRAND 1: LIFE SCIENCE

ATTAINMENT TARGET: The learner should be knowledgeable about living and non-living things and value life.

<table>
<tr><td rowspan="4">We will know that learner has achieved this Attainment Target when s/he can</td><td colspan="2">Theme 1: Characteristics/Classification of Organisms</td></tr>
<tr><td colspan="2">Grade 9/ Form 3</td></tr>
<tr><td>Learning Outcomes</td><td>Achievement Indicators</td></tr>
<tr><td>Understand the role of micro-organisms in the environment.</td><td>1. Appreciate the importance of classification.

2. Identify various micro-organisms in the environment.

3. Classify organisms into beneficial and harmful.

4. Understand how micro-organisms cause food spoilage.

5. Discuss ways to reduce/prevent food spoilage.</td></tr>
</table>

SUBJECT: SCIENCE AND TECHNOLOGY - EDUCATION STAGE: 3 (ES3)

STRAND 1: LIFE SCIENCE

ATTAINMENT TARGET: The learner should be knowledgeable about living and non-living things and value life.

We will know that learner has achieved this Attainment Target when s/he can	**Theme 2: Structure, Function and Diversity**	
	Grade 7/Form 1	
	Learning Outcomes	**Achievement Indicators**
	Realise that living organisms have specialised cells, tissues, organs and systems that carry out specific functions.	1. Describe the basic concept of a cell. 2. Differentiate between plant and animal cells. 3. Realise that a relationship exists between cells, tissues, organs and systems in organisms. 4. Appreciate that variation exists among living things.

SUBJECT: SCIENCE AND TECHNOLOGY - EDUCATION STAGE: 3 (ES3) **STRAND 1: LIFE SCIENCE**

ATTAINMENT TARGET: The learner should be knowledgeable about living and non-living things and value life.

We will know that learner has achieved this Attainment Target when s/he can	**Theme 2: Structure, Function and Diversity**	
	Grade 8/ Form 2	
	Learning Outcomes	**Achievement Indicators**
	Realise that living organisms have specialized structures that carry out specific functions.	1. Relate the characteristics of gas exchange surfaces to their function. 2. Relate the structure of a leaf to its function. 3. Relate the structure of the respiratory system in man to its function. 4. Describe the effects of chemicals on the function of the respiratory system. 5. Relate the structure of the digestive system in man to its function. 6. Understand why animals need a circulatory system. 7. Relate the structure of the circulatory system in man to its function. 8. Recognise that water and nutrients are transported in higher plants and specialized tissues. 9. Demonstrate an understanding that reproduction is both sexual and asexual. 10. Relate the structure of a flower to its function in sexual reproduction. 11. Identify the structures used in asexual reproduction in plants. 12. Relate the structure of the reproductive system in man to its function. 13. Appreciate that disease affect the proper functioning of each system.

SUBJECT: SCIENCE AND TECHNOLOGY - EDUCATION STAGE: 3 (ES3) **STRAND 1: LIFE SCIENCE**

ATTAINMENT TARGET: The learner should be knowledgeable about living and non-living things and value life.

We will know that learner has achieved this Attainment Target when s/he can	**Theme 2: Structure, Function and Diversity**	
	Grade 9/ Form 3	
	Learning Outcomes	**Achievement Indicators**
	Realise that living organisms have specialized structures that carry out specific functions.	1. Demonstrate an understanding that organisms increase in size and complexity during their lives. 2. Investigate the factors which influence plant growth. 3. Understand the relationship between plant growth and agricultural practices. 4. Appreciate the importance of movement in animals. 5. Investigate how movement occurs in different animals. 6. Realise that different animals have specialised structures to facilitate movement in different habitats. 7. Understand why responses to stimuli are important. 8. Identify the sense organs and the stimuli to which they respond. 9. Understand the importance of excretion in living organisms. 10. Relate the structure of the excretory system in man to its function. 11. Appreciate that diseases affect the proper functioning of the system.

SUBJECT: SCIENCE AND TECHNOLOGY - EDUCATION STAGE: 3 (ES3)

STRAND 1: LIFE SCIENCE

ATTAINMENT TARGET: The learner should be knowledgeable about living and non-living things and value life.

We will know that learner has achieved this Attainment Target when s/he can	**Theme 3: Organisms and their Environment**			
	Grade 7/Form 1		**Grade 8/Form 2**	
	Learning Outcomes	**Achievement Indicators**	**Learning Outcomes**	**Achievement Indicators**
	Recognise that organisms are adapted to their environment.	1. Discuss how living things are adapted to their environment. 2. Understand that living organisms require certain conditions for survival. 3. Understand the relationship between organisms in food chains and food webs. 4. Classify organisms found within the environment (producers and consumers).	**Recognise the interaction of the biotic and abiotic factors in the environment**	1. Identify biotic and abiotic components within named environment. 2. Discuss the impact of the biotic and abiotic components in named environment. 3. Discuss how biotic and abiotic factors limit population growth. 4. Examine the impact of human activity on the environment.

SUBJECT: SCIENCE AND TECHNOLOGY - EDUCATION STAGE: 3 (ES3)

STRAND 1: LIFE SCIENCE

ATTAINMENT TARGET: The learner should be knowledgeable about living and non-living things and value life.

We will know that learner has achieved this Attainment Target when s/he can	**Theme 3: Organisms and their Environment**	
	Grade 9/ Form 3	
	Learning Outcomes	**Achievement Indicators**
	Appreciate that organisms and their environment need to be protected, conserved and preserved.	1. Discuss ways in which man's activity can adversely affect organisms and their environment. 2. Discuss the need to protect organisms and their environment. 3. Discuss ways in which man can protect, conserve and/or preserve organisms and the environment. 4. Research policies ad laws developed to protect the environment. 5. Discuss the effectiveness of these policies and laws.

SUBJECT: SCIENCE AND TECHNOLOGY - EDUCATION STAGE: 3 (ES3)

STRAND 2: Earth Science

ATTAINMENT TARGET: The learner should understand that human civilization is influenced by the weather, climate and resources of planet Earth.

We will know that learner has achieved this Attainment Target when s/he can	**Theme 1: Earth's Weather & Climate**			
	Grade 7/Form 1		**Grade 8/Form 2**	
	Learning Outcomes	**Achievement Indicators**	**Learning Outcomes**	**Achievement Indicators**
	Understand that the Earth's Weather & Climate vary from Place to Place.	1. Explain the terms weather and climate. 2. Describe the elements of weather and climate (temperature, rainfall, wind, sunshine). 3. Discuss the concept of climatic zones.	**Understand that Ecosystems vary from climate region to climatic region.**	1. Explain the concept of an ecosystem. 2. Identify the components of an ecosystem. 3. Describe the relationship among the components of an ecosystem. 4. Assess the degree to which climatic characteristics affect the relationships within an ecosystem.

SUBJECT: SCIENCE AND TECHNOLOGY - EDUCATION STAGE: 3 (ES3)

STRAND 2: Earth Science

ATTAINMENT TARGET: The learner should understand that human civilization is influenced by the weather, climate and resources of planet Earth.

We will know that learner has achieved this Attainment Target when s/he can.	**Theme 1: Earth's Weather & Climate**	
	Grade 9/ Form 3	
	Learning Outcomes	**Achievement Indicators**
	Explain the natural phenomena associated with each climatic zone.	1. Identify the different climatic zones. 2. Identify the natural hazards affecting each climatic zone. (tropical storms; hurricanes, typhoons, blizzards). 3. Discuss the effects of each hazard. 4. Discuss the concept of climate change. 5. Describe the effects of climate change on the human & natural environments.

SUBJECT: SCIENCE AND TECHNOLOGY - EDUCATION STAGE: 3 (ES3)

STRAND 2: Earth Science

ATTAINMENT TARGET: The learner should understand that human civilization is influenced by the weather, climate and resources of planet Earth.

We will know that learner has achieved this Attainment Target when s/he can	**Theme 2: Earth's Resources**			
	Grade 7/Form 1		**Grade 8/Form 2**	
	Learning Outcomes	**Achievement Indicators**	**Learning Outcomes**	**Achievement Indicators**
	Appreciate the presence of the natural resources available for use by man.	1. Explain the term "Natural Resources". 2. Differentiate between renewable and non-renewable resources. 3. Discuss the major natural resources utilised by man. 4. Evaluate how the natural resources are utilized.	**Appreciate that man use the resources in his environs for survival.**	1. Describe the major natural resources that are utilised by man. 2. Discuss the importance of each natural resource. 3. Explain how natural resources are used/processed for man's benefit.

SUBJECT: SCIENCE AND TECHNOLOGY - EDUCATION STAGE: 3 (ES3)

STRAND 2: Earth Science

ATTAINMENT TARGET: The learner should understand that human civilization is influenced by the weather, climate and resources of planet Earth.

<table>
<tr><td rowspan="4">We will know that learner has achieved this Attainment Target when s/he can</td><td colspan="2">Theme 2: Earth’s Resources</td></tr>
<tr><td colspan="2">Grade 9/ Form 3</td></tr>
<tr><td>Learning Outcomes</td><td>Achievement Indicators</td></tr>
<tr><td>Understand that there can be adverse consequences associated with man’s use of natural resources.</td><td>1. Describe the adverse effects of man’s activities on the environment.

2. Discuss the measures that can be taken to reduce/ eliminate these adverse effects.</td></tr>
</table>

SUBJECT: SCIENCE AND TECHNOLOGY - EDUCATION STAGE: 3 (ES3)

STRAND 2: Earth Science

ATTAINMENT TARGET: The learner should understand that human civilization is influenced by the weather, climate and resources of planet Earth.

We will know that learner has achieved this Attainment Target when s/he can	**Theme 3: Solar System**			
	Grade 7/Form 1		**Grade 8/Form 2**	
	Learning Outcomes	**Achievement Indicators**	**Learning Outcomes**	**Achievement Indicators**
	Realise that the Universe consists of different components.	1. Identify the components of the universe. 2. Differentiate among the components of the Solar System. 3. Have knowledge of the devices used to determine the location of celestial bodies. 4. Investigate how knowledge of celestial bodies shaped man's civilization over time. 5. Understand that gravity is the force that keeps the planets of the solar system in balance/equilibrium.	**Understand that the movement of the celestial bodies causes predictable and cyclic events.**	1. Understand the processes of rotation and revolution. 2. Differentiate between the processes of rotation and revolution. 3. Recognise the relationships among the relative positions of the Sun, Earth and Moon to include lunar and solar eclipses. 4. Describe the effects of the revolution of the moon around the earth (to include tides and phases of the moon).

SUBJECT: SCIENCE AND TECHNOLOGY - EDUCATION STAGE: 3 (ES3)

STRAND 2: Earth Science

ATTAINMENT TARGET: The learner should understand that human civilization is influenced by the weather, climate and resources of planet Earth.

We will know that learner has achieved this Attainment Target when s/he can	**Theme 3: Solar System**	
	Grade 9/ Form 3	
	Learning Outcomes	**Achievement Indicators**
	Understand how space exploration has influenced human civilization.	1. Investigate how technology has extended man's ability to explore space. 2. Investigate how space research has improved technology. 3. Develop an awareness of the problems associated with space exploration. 4. Discuss the feasibility of space exploration. 5. Understand that space exploration requires specific standards (to include spacecraft, space suit.)

SUBJECT: SCIENCE AND TECHNOLOGY - EDUCATION STAGE: 3 (ES3) **DATE: April, 2009**

STRAND 3: PHYSICAL SCIENCE

ATTAINMENT TARGET: The learner should know that the states of matter are dependant on the energy content and that forces affect the form and function of materials.

We will know that learner has achieved this Attainment Target when s/he can	**Theme 1: Energy**			
	Grade 7/Form 1		**Grade 8/Form 2**	
	Learning Outcomes	**Achievement Indicators**	**Learning Outcomes**	**Achievement Indicators**
	Recognise that energy manifests itself in different forms.	1. Discuss the importance of energy to man. 2. Realise that energy can be converted from one form to another. 3. Distinguish between renewable and non-renewable sources of energy. 4. Recognise energy conversions, which involve heat, light and sound, solar and electrical energy.	**Recognise that energy use must be conserved.**	1. Identify sources of the different forms of energy (to include heat, light, sound, solar and electrical). 2. Discuss the application of different forms of energy by man (to include heat, light, solar, sound and electrical). 3. Identify the different ways by which energy can be transferred. 4. Analyse approaches to energy conservation. 5. Evaluate the impact of energy use on the environment (to include nuclear energy).

SUBJECT: SCIENCE AND TECHNOLOGY - EDUCATION STAGE: 3 (ES3)

STRAND 3: PHYSICAL SCIENCE

ATTAINMENT TARGET: The learner should know that the states of matter are dependant on the energy content and that forces affect the form and function of materials.

We will know that learner has achieved this Attainment Target when s/he can..	**Theme 1: Energy**	
	Grade 9/ Form 3	
	Learning Outcomes	**Achievement Indicators**
	Recognise the impact of electrical energy on man's daily activities.	1. Discuss the everyday activities and applications of magnets. 2. Examine the relationship between magnetism and electricity. 3. Investigate how the production of electricity affects the environment. 4. Construct simple circuits and apply an understanding of circuits to the construction of other devices. 5. Discuss the importance of safety devices used in electrical appliances/circuits. 6. Discuss safety measures to be followed when dealing with electricity. 7. Determine the energy consumption of different appliances. 8. Interpret household electrical bills.

SUBJECT: SCIENCE AND TECHNOLOGY - EDUCATION STAGE: 3 (ES3)

STRAND 3: PHYSICAL SCIENCE

ATTAINMENT TARGET: The learner should know that the states of matter are dependant on the energy content and that forces affect the form and function of materials.

We will know that learner has achieved this Attainment Target when s/he can	**Theme 2: Matter and Materials**			
	Grade 7/Form 1		**Grade 8/Form 2**	
	Learning Outcomes	**Achievement Indicators**	**Learning Outcomes**	**Achievement Indicators**
	Relate the particle arrangement of the states of matter to their physical properties.	1. Demonstrate an understanding of the concept of matter. 2. Illustrate the arrangement of particles in the different states of matter. 3. Compare the properties of the states of matter. 4. Compare solutions, suspensions, colloids and emulsions. 5. Distinguish between aqueous and non-aqueous mixtures. 6. Identify everyday uses of solutions, suspensions, colloids and emulsions.	**Recognise the atomic structure as the underlying basis for the classification of matter.**	1. Describe the differences between elements, compound and mixtures. 2. Describe the differences between metals and non-metals. 3. Describe with illustrations, the structure of atoms of atomic number. 4. Use and interpret such symbols as $^{6}C_{12.}$ 5. Explain the basis of the arrangement of elements in the periodic table. 6. Define the term isotopes and state the uses of isotopes.

SUBJECT: SCIENCE AND TECHNOLOGY - EDUCATION STAGE: 3 (ES3)

STRAND 3: PHYSICAL SCIENCE

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<table>
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<tr><td colspan="2">Grade 9/ Form 3</td></tr>
<tr><td>Learning Outcomes</td><td>Achievement Indicators</td></tr>
<tr><td>Demonstrate and understanding that the behaviour of an element/compound can be predicted based on its properties.</td><td>1. Recognise that all elements can be represented by symbols.

2. Realise that all elements can be arranged in a table based on the atomic structure.

3. Identify trends in elements in the periodic table.

4. Recognise that elements can combine to form compounds.

5. Relate the properties of metals and non-metals to their uses.

6. Distinguish between acids, bases and salts.</td></tr>
</table>

SUBJECT: SCIENCE AND TECHNOLOGY - EDUCATION STAGE: 3 (ES3)

STRAND 3: PHYSICAL SCIENCE

ATTAINMENT TARGET: The learner should know that the states of matter are dependant on the energy content and that forces affect the form and function of materials.

We will know that learner has achieved this Attainment Target when s/he can	**Theme 3: Force, Motion & Structure**			
	Grade 7/Form 1		**Grade 8/Form 2**	
	Learning Outcomes	**Achievement Indicators**	**Learning Outcomes**	**Achievement Indicators**
	Determine how the effects of force on a body is related to its shape and structure.	1. Identify the forces that act on objects. 2. Determine the effects of these forces on objects. 3. Appreciate the effects of forces in everyday life. 4. Evaluate how forces affect the shapes and functions of objects. 5. Evaluate structures for strength and stability. 6. Identify factors that determine the strength of an object. 7. Identify factors that affect stability of objects.	**Demonstrate an understanding that there is a relationship between force and motion.**	1. Differentiate between linear and circular motion. 2. Relate the direction of motion of a body to the direction of the force causing it. 3. Discuss the importance of forces which oppose motion (friction and viscosity.) 4. Investigate how machines make it easier to move objects. 5. Identify different features that facilitate motion of objects. 6. Design and construct objects, which display a variety of motions.

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STRAND 3: PHYSICAL SCIENCE

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<tr><td colspan="2">Grade 9/ Form 3</td></tr>
<tr><td>Learning Outcomes</td><td>Achievement Indicators</td></tr>
<tr><td>Realise that the effect of pressure on fluids dependent on their properties.</td><td>1. Discuss the relationship between force and area.

2. Identify some simple practical applications of the relationship among force, pressure and area.

3. Demonstrate an understanding of the properties of fluids (viscosity and buoyant force).

4. Realise that an external pressure can be transmitted through fluids.

5. Apply the model of the particle theory of matter to explain the behaviour of fluids under pressure.

6. Perform simple experiments to show the relationship between:
a. pressure and area.
b. force and pressure.</td></tr>
</table>

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