SCIENCES

QATAR ACADEMY SCIENCES CURRICULUM

Contents

Qatar Academy Vision

Qatar Academy provides the highest possible standard of education, fostering academic excellence in each student, and striving to develop independent critical thinkers, lifelong learners and responsible citizens.

Qatar Academy Mission

It is the mission of Qatar Academy (QA) to provide internationally accepted, comprehensive, English medium programs plus Arabic and Islamic studies from pre-school through to secondary graduation. QA develops independent critical thinkers, lifelong learners, responsible citizens, and empowers students to gain entrance to elite universities and colleges.

Statement of Beliefs about Teaching and Learning

Sciences at Qatar Academy are taught through the International Baccalaureate (IB) Primary Years Programme (PYP), Middle Years Programme (MYP) and the Diploma Programme (DP). As an IB world school we believe that learning science is an active, life-long discovery process for all students.

The Qatar Academy Science curriculum is integrated, hands-on and reflects high standards of learning. The coherent, sequenced set of concepts, principles, facts and theories equip students with a firm foundation to foster:

scientific literacy

scientific inquiry

active participation

critical thinking

problem solving

informed decision-making.

Teaching methodology is inquiry-based and supported by a range of collaborative and individual assignments.

Formative and summative assessment is used to provide information to guide learning and teaching. A variety of assessment strategies and tools are used to assess learning. These include such tools as checklists, criterion-based rubrics, performance assessments and portfolio assessment. Formative assessment occurs on a daily basis to guide learning and teaching. Summative assessment takes place periodically to assess student performance at key points in the learning process.

The Role of 21st Century Learning in Sciences

Qatar Academy has established expectations about the role of 21st Century Learning throughout the school. The full text of these expectations is available at http://elearning.qataracademy.wikispaces.net/21st+Century+Learning-+Qatar+Academy. Within Sciences and all subjects, teachers and students ensure that technology is used to create an atmosphere which supports

- Creativity and Innovation
- Communication and Collaboration
- Research and Information Fluency
- Critical Thinking, Problem Solving, and Decision Making
- Digital Citizenship
- Technology Operations and Concepts.

PYP Banded Objectives
Primary School
Pre-School 3 – Grade 5

Yearly Objective Pre-School 3 and 4

Students will:

1. Develop their observational skills by using their senses to gather and record information.
2. Use their observations to identify simple patterns, make predictions and discuss their ideas.
3. Explore the way objects and phenomena function.
4. Recognize basic cause and effect relationships.
5. Examine change over varying time periods and know that different variables and conditions may affect change.
6. Be aware of different perspectives, and show care and respect for themselves, other living things and the environment.
7. Communicate their ideas or provide explanations using their own scientific experience and vocabulary.

Kindergarten and Grade 1

Students will:

1. Develop their observational skills by using their senses to gather and record information.
2. Use their observations to identify patterns, make predictions and refine their ideas.
3. Explore the way objects and phenomena function, identify parts of a system, and gain an understanding of cause and effect relationships.
4. Examine change over varying time periods, and recognize that more than one variable may affect change.
5. Be aware of different perspectives and ways of organizing the world.
6. Show care and respect for themselves, other living things and the environment.
7. Communicate their ideas or provide explanations using their own scientific experience.

Grades 2 and 3

Students will:

1. Develop their observational skills by using their senses and selected observational tools.
2. Gather and record observed information in a number of ways, and reflect on these findings to identify patterns or connections, make predictions, and test and refine their ideas with increasing accuracy.
3. Explore the way objects and phenomena function, identify parts of a system, and gain an understanding of increasingly complex cause and effect relationships.

4. Examine change over time, and recognize that change may be affected by one or more variables.
5. Examine how products and tools have been developed through the application of science concepts.
6. Be aware of different perspectives and ways of organizing the world, and be able to consider how these views and customs may have been formulated.
7. Consider ethical issues in science-related contexts and use their learning in science to plan thoughtful and realistic action in order to improve their welfare and that of other living things and the environment.
8. Communicate their ideas or provide explanations using their own scientific experience and that of others.

Grades 4 and 5

Students will:

1. Develop their observational skills by using their senses and selected observational tools.
2. Gather and record observed information in a number of ways, and reflect on these findings to identify patterns or connections, make predictions, and test and refine their ideas with increasing accuracy.
3. Explore the way objects and phenomena function, identify parts of a system, and gain an understanding of increasingly complex cause and effect relationships.
4. Examine change over time, and recognize that change may be affected by one or more variables.
5. Reflect on the impact that the application of science, including advances in technology, has had on themselves, society and the environment.
6. Be aware of different perspectives and ways of organizing the world, and be able to consider how these views and customs may have been formulated.
7. Examine ethical and social issues in science-related contexts and express their responses appropriately.
8. Use their learning in science to plan thoughtful and realistic action in order to improve their welfare and that of other living things and the environment.
9. Communicate their ideas or provide explanations using their own scientific experience and that of others.

These overall expectations will be accessed through yearly objectives outlined in the unit planner outlines, which may change over time. Please see Appendix A for more details.

MYP Aims and Objectives

Qatar Academy follows the MYP Sciences Aims and Objectives. These are outlined in the MYP Sciences Guide as follows:

Aims

The aims of any MYP subject and of the personal project state in a general way what the teacher may expect to teach or do, and what the student may expect to experience or learn. In addition, they suggest how the student may be changed by the learning experience.

The aims of the teaching and study of MYP sciences are to encourage and enable students to:

1. Develop curiosity, interest and enjoyment towards science and its methods of inquiry
2. Acquire scientific knowledge and understanding
3. Communicate scientific ideas, arguments and practical experiences effectively in a variety of ways
4. Develop experimental and investigative skills to design and carry out scientific investigations and to evaluate evidence to draw a conclusion
5. Develop critical, creative and inquiring minds that pose questions, solve problems, construct explanations, judge arguments and make informed decisions in scientific and other contexts
6. Develop awareness of the possibilities and limitations of science and appreciate that scientific knowledge is evolving through collaborative activity locally and internationally
7. Appreciate the relationship between science and technology and their role in society
8. Develop awareness of the moral, ethical, social, economic, political, cultural and environmental implications of the practice and use of science and technology
9. Observe safety rules and practices to ensure a safe working environment during scientific activities
10. Engender an awareness of the need for and the value of effective collaboration during scientific activities

Objectives

The objectives of any MYP subject and of the personal project state the specific targets that are set for learning in the subject. They define what the student will be able to accomplish as a result of studying the subject.

The objectives relate directly to the assessment criteria found in the 'Sciences assessment criteria' section.

A One World

This objective refers to enabling students to gain a better understanding of the role of science in society. Students should be aware that science is a global endeavor and that its

development and applications can have consequences for our lives.

One world should provide students with the opportunity to critically assess the implications of scientific developments and their applications to local and/or global issues.

At the end of the course, students should be able to:

- Explain the ways in which science is applied and used to address specific problems or issues
- Discuss the effectiveness of science and its application in solving problems or issues
- Discuss and evaluate the moral, ethical, social, economic, political, cultural and environmental implications of the use of science and its application in solving specific problems or issues

B Communication in science

This objective refers to enabling students to become competent and confident when communicating information in science. Students should be able to use scientific language correctly and a variety of communication modes and formats as appropriate. Students should be aware of the importance of acknowledging and appropriately referening the work of others when communicating in science.

At the end of the course, students should be able to:

- Use scientific language correctly
- Use appropriate communication modes such as verbal (oral, written), visual (graphic, symbolic) and communication formats (laboratory reports, essays, presentations) to effectively communicate theories, ideas and findings in science
- Acknowledge the work of others and the source of information used by appropriately documenting them using a recognized referencing system.

C Knowledge and understanding of science

This objective refers to enabling students to understand scientific knowledge (facts, ideas, concepts, processes, laws, principles, models and theories) and it apply it to construct scientific explanations, solve problems and formulate scientifically supported arguments.

At the end of the course, students should be able to:

- Recall scientific knowledge and use scientific understanding to construct scientific explanations
- Apply scientific knowledge and understanding to solve problems set in familiar and unfamiliar situations
- Critically analyse and evaluate information to make judgments supported by scientific understanding.

D Scientific inquiry

While the scientific method may take on a wide variety of approaches, it is the emphasis on experimental work that characterized MYP scientific inquiry.

This objective refers to enabling students to develop intellectual and practical skills to design and carry out scientific investigations independently and to evaluate the experimental design (method).

At the end of the course, students should be able to:

- State a focused problem or research question to be tested by a scientific investigation
- Formulate a testable hypothesis and explain it using scientific reasoning
- Design and carry out scientific investigations that include variables and controls, materials and/or equipment needed, a method to be followed and the way in which the data is to be collected and processed
- Evaluate the validity and reliability of the method
- Judge the validity of a hypothesis based on the outcome of the investigation
- Suggest improvements to the method or further inquiry, when relevant.

E Processing data

This objective refers to enabling students to collect, process and interpret sufficient qualitative and/or quantitative data to draw appropriate conclusions. Students are expected to develop analytical thinking skills to interpret data and judge the reliability of the data.

At the end of the course, students should be able to:

- Collect and record data using units of measurement as and when appropriate
- Organize, transform and present data using numerical and visual forms
- Analyse and interpret data
- Draw conclusions consistent with the data and supported by scientific reasoning.

F Attitudes in science

This objective refers to encouraging students to develop safe, responsible and collaborative working practices in practical science.

During the course, students should be able to:

- Work safely and use material and equipment competently
- Work responsibly with regards to the living and non-living environment
- Work effectively as individuals and as part of a group by collaborating with others.

(MYP Sciences Guide, 2010, pages 4-6)

MYP Sciences Yearly Objectives
Grades 6 – 10

A One world

Students should be able to:

- explain the ways in which science is applied and used to address a specific problem or issue
- discuss the effectiveness of science and its application in solving the problem or issue
- discuss and evaluate the moral, ethical, social, economic, political, cultural and environmental implications of the use of science and its application in solving specific problems or issues.

At the end of the given year, students should be able to:

Year 1	*Year 2*	*Year 3*	*Years 4 & 5*
give examples and make comments on the ways in which science is applied and used to address a specific problem or issue	describe the ways in which science is applied and used to address a specific problem or issue	describe and explain the ways in which science is applied and used to address a specific problem or issue	explain the ways in which science is applied and used to address a specific problem or issue
make comments on the effectiveness of science and its application in solving the problem or issue	describe the effectiveness of science and its application in solving the problem or issue	discuss the effectiveness of science and its application in solving the problem or issue	discuss the effectiveness of science and its application in solving the problem or issue
make comments on how science and its application interact with life, society and the world	describe how science and its application interact with one or two factors: moral, ethical, social, economic, political, cultural and environmental	discuss how science and its application interact with one or two factors: moral, ethical, social, economic, political, cultural and environmental	discuss and evaluate the moral, ethical, social, economic, political, cultural and environmental implications of the use of science and its application in solving specific problems or issues

B Communication in Science

Students should be able to:

- use scientific language correctly
- use appropriate communication modes and formats
- acknowledge the work of others and the sources of information used by appropriately documenting them using a recognized referencing system.

At the end of the given year, students should be able to:

Year 1	*Year 2*	*Year 3*	*Years 4 & 5*
use scientific language correctly			
with guidance, use appropriate communication modes and communication formats	with minimal guidance, use appropriate communication modes and communication formats	use appropriate communication modes and formats	
with guidance, acknowledge the work of others and the sources of information used by documenting them	with guidance, acknowledge the work of others and the sources of information used by documenting them using MLA formatting*	with minimal guidance, acknowledge the work of others and the sources of information used by documenting them using MLA formatting	acknowledge the work of others and the sources of information used by appropriately documenting them using a recognized referencing system

communication modes include - verbal (oral, written)

- visual (graphic, symbolic)

communication formats include - laboratory reports, essays presentations

C Knowledge and understanding of science

Students should be able to:

- recall scientific knowledge and use scientific understanding to construct scientific explanations
- apply scientific knowledge and understanding to solve problems set in familiar and unfamiliar situations
- critically analyse and evaluate information to make judgments supported by scientific understanding.

At the end of the given year, students should be able to:

<table>
<tr><th>Year 1</th><th>Year 2</th><th>Year 3</th><th>Years 4 & 5</th></tr>
<tr><td>with guidance, recall scientific knowledge and use scientific understanding to construct scientific explanations</td><td>with minimal guidance, recall scientific knowledge and use scientific understanding to construct scientific explanations</td><td colspan="2">recall scientific knowledge and use scientific understanding to construct scientific explanations</td></tr>
<tr><td>apply scientific knowledge and understanding to solve problems in familiar and slightly unfamiliar situations</td><td colspan="3">apply scientific knowledge and understanding to solve problems set in familiar and unfamiliar situations</td></tr>
<tr><td>analyse scientific information by identifying components, relationships and patterns, and with guidance, make comments on the validity and quality of the information</td><td>with guidance, analyse and evaluate information to make judgments supported by scientific understanding</td><td colspan="2">critically analyse and evaluate information to make judgments supported by scientific understanding</td></tr>
</table>

D Scientific inquiry

Students should be able to:

- state a focused problem or research question to be tested by a scientific investigation
- formulate a testable hypothesis and explain it using scientific reasoning
- design and carry out scientific investigations that include variables and controls, material and/or equipment needed, a method to be followed, and the way in which the data is to be collected and processed
- evaluate the validity and reliability of the method
- judge the validity of the hypothesis based on the outcome of the investigation
- suggest improvements to the method or further inquiry, when relevant.

At the end of the given year, students should be able to:

<table>
<tr><th>Year 1</th><th>Year 2</th><th>Year 3</th><th>Years 4 & 5</th></tr>
<tr><td>with guidance, state the problem or research question to be tested by a scientific investigation</td><td colspan="3">state a focused problem or research question to be tested by a scientific investigation</td></tr>
<tr><td>ask questions and make predictions using scientific reasoning</td><td colspan="3">formulate a testable hypothesis and explain it using scientific reasoning</td></tr>
<tr><td>with minimal guidance, carry out investigations, identify relevant variables, materials and/or equipment needed; describe a simple method</td><td>with guidance, design and carry out scientific investigations that include variables and controls, materials and/or equipment needed, a method to be followed, and the way in which the data is to be collected and processed</td><td colspan="2">design and carry out scientific investigations that include variables and controls, material and/or equipment needed, a method to be followed, and the way in which the data is to be collected and processed</td></tr>
<tr><td>with guidance, make comments on the method and the quality of the data collected</td><td>with minimal guidance, make comments on the validity and reliability of the method</td><td>make comments on the validity and reliability of the method</td><td>evaluate the validity and reliability of the method</td></tr>
</table>

with guidance, make comments on how the outcome of the investigation helps to answer the research question	with minimal guidance, make comments on how the outcome of the investigation helps to answer the hypothesis	make comments on the validity of the hypothesis based on the outcome of the investigation	judge the validity of the hypothesis based on the outcome of the investigation
with guidance, suggest improvements to the method	with minimal guidance, suggest improvements to the method	suggest improvements to the method or further inquiry, when relevant	

Guidance where needed is given prior to the assessment.

E Processing data

Students should be able to:

- collect and record data using units of measurement as and when appropriate
- organize, transform and present data using numerical and visual forms
- analyse and interpret the data
- draw conclusions consistent with the data and supported by scientific reasoning.

At the end of the given year, students should be able to:

Year 1	*Year 2*	*Year 3*	*Years 4 & 5*
with guidance, collect and record data using units of measurement as and when appropriate	with minimal guidance, collect and record data using units of measurement as and when appropriate	collect and record data using units of measurement as and when appropriate	
with guidance, organize, transform and present data using numerical and visual forms	with minimal guidance, organize, transform and present data using numerical and visual forms	organize, transform and present data using numerical and visual forms	
with guidance, analyse data to identify trends, patterns and relationships, and use the data to convey understanding	with minimal guidance, analyse data to identify trends, patterns and relationships, and use the data to convey understanding	analyse and interpret the data	
with guidance, draw conclusions based on the analysis and interpretation of the data	with minimal guidance, draw conclusions based on the analysis and interpretation of the data	draw conclusions consistent with the data and supported by scientific reasoning	

F Attitudes in science

During the course students are expected to:

- work safely and use material and equipment competently
- work responsibly with regards to the living and non-living environment
- work effectively as individuals and as part of a group by collaborating with others.

During the course, students should be able to:

Year 1	*Year 2*	*Year 3*	*Years 4 & 5*
work safely and use material and equipment competently			
work responsibly with regard to the living and non-living environment			
work effectively as individuals and as part of a group by collaborating with others			

Appendix A: PYP Sciences Unit and Skills Outlines

Sciences in the PYP are taught through the six transdisciplinary themes, and arranged into four different strands: Living things, Earth and space, Materials and matter, and Forces and energy.

The outlines below are a bridge between the PYP banded and yearly objectives, and day-to-day teaching and learning. They describe the units that will be used to teach the Sciences objectives. It is expected that the document will change regularly; changes will be purposeful. When a teaching team considers an adjustment in one area, the PYP Coordinator is responsible for considering the related adjustments needed in other areas to maintain a balanced delivery of the full Sciences program. The PYP Coordinator is responsible for final decisions about needed adjustments, and for maintaining an up-to-date document. The outlines below are current as of June 13, 2012. For a current document at any time, contact the PYP Coordinator.

<table>
<tr><th colspan="3">Pre-School 3</th></tr>
<tr><td colspan="2">Learning will include the development of the following knowledge, concepts and skills</td><td>Possible learning outcomes in science</td></tr>
<tr>
<td>Transdisciplinary theme:
Sharing the Planet:
An inquiry into the rights and responsibilities in the struggle to share finite resources with other people and with other living things; communities and the relationships within and between them; access to equal opportunities; peace and conflict resolution.

Central Idea:
Living things have certain needs to grow and stay healthy.

Key Concepts:
Form
Causation
Responsibility
Related Concepts:
Animals
Plants
Growth
Classification
Lines of inquiry:
Characteristics of living things
Our needs and the needs of other living things
Our responsibility for the well-being of other living things</td>
<td>Science strand(s):
Living Things

Science skills
1. Observe carefully in order to gather data.
2. Use a variety of instruments and tools to measure data accurately.
3. Use scientific vocabulary to explain their observations and experiences.
4. Identify or generate a question or problem to be explored.
5. Plan and carry out systematic investigations, manipulating variables as necessary.
6. Make and test predictions.
7. Interpret and evaluate data gathered in order to draw conclusions.
8. Consider scientific models and applications of these models (including their limitations)</td>
<td>The student will be able to:
• Observe and describe the characteristics of living and non-living things
• Observe the needs of living things that enable them to stay healthy
• Take responsibility for living things found in his or her environment</td>
</tr>
</table>

<table>
<tr><th colspan="3">Pre-School 3</th></tr>
<tr><td colspan="2">Learning will include the development of the following knowledge, concepts and skills</td><td>Possible Learning Outcomes in science</td></tr>
<tr><td>Transdisciplinary Theme
How The World Works
An inquiry into the natural world and its laws; the interaction between the natural world (physical and biological) and human societies; how humans use their understanding of scientific principles; the impact of scientific and technological advances on society and the environment.

Central Idea
Water can be used in many different ways and can change its form.

Key Concepts
• Form
• Function
• Change

Related Concepts
• Changes of state
• Liquids
• Properties and uses of materials

Lines of Inquiry
• The different forms water can take
• The different uses of water</td><td>Science Strand(s)
Materials and Matter

Science Skills
1. Observe carefully in order to gather data.
2. Use a variety of instruments and tools to measure data accurately.
3. Use scientific vocabulary to explain their observations and experiences.
4. Identify or generate a question or problem to be explored.
5. Plan and carry out systematic investigations, manipulating variables as necessary.
6. Make and test predictions.
7. Interpret and evaluate data gathered in order to draw conclusions.
8. Consider scientific models and applications of these models (including their limitations)</td><td>The student will be able to:
• Practice personal and group safety when engaged in science in school
• Communicate findings to others either alone or as part of a team
• Explore, identify and describe properties of rock, soil, and water
• Describe how properties of objects can be changed.
• Use observations to construct reasonable explanations</td></tr>
</table>

<table>
<tr><th colspan="3">Pre-School 4</th></tr>
<tr><td colspan="2">Learning will include the development of the following knowledge, concepts and skills</td><td>Possible Learning Outcomes in science</td></tr>
<tr><td>Transdisciplinary Theme
Who We Are
An inquiry into the nature of the self; beliefs and values; personal, physical, mental, social and spiritual health; human relationships including families, friends, communities, and cultures; rights and responsibilities; what it means to be human.

Central Idea
Our five senses help us to experience the world around us.
Key Concepts
• Form
• Function
Related Concepts
• senses
Lines of Inquiry
• the five senses
• how we use our senses
• how we appreciate our senses</td><td>Science Strand (s)
Living Things

Science Skills
1. Observe carefully in order to gather data.
2. Use a variety of instruments and tools to measure data accurately.
3. Use scientific vocabulary to explain their observations and experiences.
4. Identify or generate a question or problem to be explored.
5. Plan and carry out systematic investigations, manipulating variables as necessary.
6. Make and test predictions.
7. Interpret and evaluate data gathered in order to draw conclusions.
8. Consider scientific models and applications of these models (including their limitations)</td><td>The student will be able to:
• Demonstrate curiosity, initiative, and persistence in thinking about and doing science
• Communicate scientific explorations investigations and explanations through speaking, drawing and writing
• Understand the interaction of our senses as a means to observing and explaining our environment
• Recognise that people use science and technology to answer questions and problem solve</td></tr>
</table>

<table>
<tr><th colspan="3">Pre-School 4</th></tr>
<tr><td colspan="2">Learning will include the development of the following knowledge, concepts and skills</td><td>Possible learning outcomes in science</td></tr>
<tr>
<td>Transdisciplinary theme:
How The World Works
An inquiry into the natural world and its laws; the interaction between the natural world (physical and biological) and human societies; how humans use their understanding of scientific principles; the impact of scientific and technological advances on society and the environment.

Central Idea:
Food comes from different sources and it can be changed.

Key Concepts:
• Form
• Change
• Causation

Related concepts:
• Food
• Sources
• Plants
• Animals
• Growth
• Changes in state

Lines of Inquiry
• Different sources of food
• Food can change</td>
<td>Science strand(s):
Materials and matter
Living things

Science skills
1. Observe carefully in order to gather data.
2. Use a variety of instruments and tools to measure data accurately.
3. Use scientific vocabulary to explain their observations and experiences.
4. Identify or generate a question or problem to be explored.
5. Plan and carry out systematic investigations, manipulating variables as necessary.
6. Make and test predictions.
7. Interpret and evaluate data gathered in order to draw conclusions.
8. Consider scientific models and applications of these models (including their limitations)</td>
<td>The student will be able to:
• Recognize that food comes from plants and animals
• Use observations to construct reasonable explanations
• Communicate scientific explorations, investigations and explanations through speaking and drawing
• Compare and contrast properties of objects
• Describe how properties of objects can be changed</td>
</tr>
</table>

<table>
<tr><th colspan="3">Kindergarten</th></tr>
<tr><td colspan="2">Learning will include the development of the following knowledge, concepts and skills</td><td>Possible learning outcomes in science</td></tr>
<tr>
<td>Transdisciplinary theme:

Where We Are in Place and Time

An inquiry into orientation in place and time; personal histories; homes and journeys; the discoveries, explorations and migrations of humankind; the relationships between and the interconnectedness of individuals and civilizations, from local and global perspectives.

Central Idea:

People make their homes in different places and in different ways.

Key Concepts:

• Form
• Function
• Causation

Related concepts:

• Homes
• Geography
• Settlements

Lines of Inquiry

• The human need for a home
• Our own homes
• Environments affecting the types of homes we live in</td>
<td>Science strand(s):

Forces and energy

Science skills

1. Observe carefully in order to gather data.
2. Use a variety of instruments and tools to measure data accurately.
3. Use scientific vocabulary to explain their observations and experiences.
4. Identify or generate a question or problem to be explored.
5. Plan and carry out systematic investigations, manipulating variables as necessary.
6. Make and test predictions.
7. Interpret and evaluate data gathered in order to draw conclusions.
8. Consider scientific models and applications of these models (including their limitations)</td>
<td>The student will be able to:

• Ask questions about objects, materials, organisms, events and relationships in the environment
• Use observations to construct reasonable explanations
• Plan and conduct explorations and investigations to shed light on their questions and explanations</td>
</tr>
</table>

<table>
<tr><th colspan="3">Kindergarten</th></tr>
<tr><td colspan="2">Learning will include the development of the following knowledge, concepts and skills</td><td>Possible learning outcomes in science</td></tr>
<tr>
<td>Transdisciplinary theme:

Sharing the Planet:

An inquiry into the rights and responsibilities in the struggle to share finite resources with other people and with other living things; communities and the relationships within and between them; access to equal opportunities; peace and conflict resolution.

Central Idea:

We can be responsible for the animals in our environment.

Key Concepts:

• Responsibility
• Connection
• Causation

Related Concepts:

• Animals
Lines of inquiry:

• What animals are and why they are important
• What an environment is
• The animals that can be found in our environment
• What does it mean to be responsible</td>
<td>Science strand(s):

Living Things

Science skills

1. Observe carefully in order to gather data.
2. Use a variety of instruments and tools to measure data accurately.
3. Use scientific vocabulary to explain their observations and experiences.
4. Identify or generate a question or problem to be explored.
5. Plan and carry out systematic investigations, manipulating variables as necessary.
6. Make and test predictions.
7. Interpret and evaluate data gathered in order to draw conclusions.
8. Consider scientific models and applications of these models (including their limitations)</td>
<td>The student will be able to:

• Ask questions about characteristics of animals
• Communicate understanding of animals through speaking, drawing and writing.
• Describe what an environment is
• Describe what it means to be responsible</td>
</tr>
</table>

<table>
<tr><th colspan="3">Kindergarten</th></tr>
<tr><td colspan="2">Learning will include the development of the following knowledge, concepts and skills</td><td>Possible Learning Outcomes in science</td></tr>
<tr>
<td>Transdisciplinary Theme

How We Express Ourselves

An inquiry into the ways in which we discover and express ideas, feelings, nature, culture, beliefs and values; the ways in which we reflect on, extend and enjoy our creativity; our appreciation of the aesthetic.

Central Idea

People communicate through language, music, art and movement.

Key Concepts

• Form
• Function
• Reflection

Related Concepts

• Senses

Lines of Inquiry

• How and why different art forms are used to communicate

• How people use language to communicate</td>
<td>Science Strand(s)

Living Things

Science Skills

1. Observe carefully in order to gather data.
2. Use a variety of instruments and tools to measure data accurately.
3. Use scientific vocabulary to explain their observations and experiences.
4. Identify or generate a question or problem to be explored.
5. Plan and carry out systematic investigations, manipulating variables as necessary.
6. Make and test predictions.
7. Interpret and evaluate data gathered in order to draw conclusions.
8. Consider scientific models and applications of these models (including their limitations)</td>
<td>The student will be able to:

• Use observations to explain how people use language to communicate
• Use recorded data to predict and explain how people communicate through language, art, music and movement
• Use senses as a means for observing and explaining how people communicate in our environment
• Communicate findings to others either alone or as part of a team</td>
</tr>
</table>

<table>
<tr><th colspan="3">Kindergarten</th></tr>
<tr><td colspan="2">Learning will include the development of the following knowledge, concepts and skills</td><td>Possible learning outcomes in science</td></tr>
<tr>
<td>Transdisciplinary theme:
How The World Works
An inquiry into the natural world and its laws; the interaction between the natural world (physical and biological) and human societies; how humans use their understanding of scientific principles; the impact of scientific and technological advances on society and the environment.

Central Idea:
The properties of materials determine how they are used.

Key Concepts:
• Form
• Function
• Connection

Related concepts:
• Properties and uses of materials
• Interactions
• Predictions

Lines of Inquiry
• Properties of different materials.
• How the use of materials depends on its properties.</td>
<td>Science strand(s):
Materials and matter
Living things

Science skills
1. Observe carefully in order to gather data.
2. Use a variety of instruments and tools to measure data accurately.
3. Use scientific vocabulary to explain their observations and experiences.
4. Identify or generate a question or problem to be explored.
5. Plan and carry out systematic investigations, manipulating variables as necessary.
6. Make and test predictions.
7. Interpret and evaluate data gathered in order to draw conclusions.
8. Consider scientific models and applications of these models (including their limitations)</td>
<td>The student will be able to:
• Ask questions about objects and materials relationships in the environment
• Use observations to construct reasonable explanations
• Use independent inquiry to find answers to questions
• Use a range of presentation skills, including speaking, drawing and writing to communicate their findings
• Compare and contrast properties of objects
• Describe how properties of objects can be changed
• Apply understanding of basic properties of materials in order to match materials to purpose (for example, waterproofing, insulating)</td>
</tr>
</table>

<table>
<tr><th colspan="3">Grade 1</th></tr>
<tr><td colspan="2">Learning will include the development of the following knowledge, concepts and skills</td><td>Possible learning outcomes in science</td></tr>
<tr>
<td>Transdisciplinary theme:

Sharing the Planet:

An inquiry into the rights and responsibilities in the struggle to share finite resources with other people and with other living things; communities and the relationships within and between them; access to equal opportunities; peace and conflict resolution.

Central Idea:

Plants have a purpose in our community and world.

Key Concepts:
• Form
• Function
• Causation
• Responsibility

Related Concepts:
• Plants
• Environment
• Conservation

Lines of inquiry:
• What plants need to live
• How we can be responsible for plants
• Plants are important to the environment</td>
<td>Science strand(s):

Living Things

Science skills
1. Observe carefully in order to gather data.
2. Use a variety of instruments and tools to measure data accurately.
3. Use scientific vocabulary to explain their observations and experiences.
4. Identify or generate a question or problem to be explored.
5. Plan and carry out systematic investigations, manipulating variables as necessary.
6. Make and test predictions.
7. Interpret and evaluate data gathered in order to draw conclusions.
8. Consider scientific models and applications of these models (including their limitations)</td>
<td>The student will be able to:
• Use observation to construct reasonable explanations
• Ask questions about objects, materials, organism, events and relationships in the environment
• Plan and conduct explorations and investigations to shed light on their questions and explanations
• Use systems and tools to systematically gather and record data
• Communicate scientific explorations, explorations, and explanations through speaking, drawing and writing
• Use recorded data to construct reasonable explanations and make predictions
• Describe how properties of objects can be changed
• Recognize that food comes from plants and animals
• Recognize that humans have basic needs of food and water to survive
• Ask questions about characteristics of organisms
• Communicate understanding of organisms through speaking, drawing and writing</td>
</tr>
</table>

		• Make reasonable predictions about organisms and their relationships in the environment • Demonstrate curiosity, initiative and persistence in thinking about and doing science • Communicate findings to others either alone or as part of a team

<table>
<tr><th colspan="3">Grade 1</th></tr>
<tr><td colspan="2">Learning will include the development of the following knowledge, concepts and skills</td><td>Possible Learning Outcomes in science</td></tr>
<tr>
<td>Transdisciplinary Theme
How The World Works
An inquiry into the natural world and its laws; the interaction between the natural world (physical and biological) and human societies; how humans use their understanding of scientific principles; the impact of scientific and technological advances on society and the environment.

Central Idea
Weather influences our way of life.

Key Concepts
Form
Connection
Causation
Related Concepts
Atmosphere
Climate
Erosion
Seasons
Weather systems
Lines of Inquiry
What is weather and what causes it
Predicting and measuring weather
How weather changes and seasons can affect us (compare and contrast)</td>
<td>Science Strand (s)
Earth and Space

Science Skills
Observe carefully in order to gather data.
Use a variety of instruments and tools to measure data accurately.
Use scientific vocabulary to explain their observations and experiences.
Identify or generate a question or problem to be explored.
Plan and carry out systematic investigations, manipulating variables as necessary.
Make and test predictions.
Interpret and evaluate data gathered in order to draw conclusions.
Consider scientific models and applications of these models (including their limitations)</td>
<td>The student will be able to:
Describe factors that contribute to weather and its changes (eg: temperature, wind, precipitation)
Explain how changes in the earth and sky cause seasonal and weather changes
Uses recorded data to construct reasonable explanations and make predictions
Employs equipment and tools to systematically gather and record data
Communicates scientific explorations, investigations, and explanations through speaking drawing and writing</td>
</tr>
</table>

<table>
<tr><th colspan="3">Grade 2</th></tr>
<tr><td colspan="2">Learning will include the development of the following knowledge, concepts and skills</td><td>Possible Learning Outcomes in science</td></tr>
<tr>
<td>Transdisciplinary Theme
How The World Works
An inquiry into the natural world and its laws; the interaction between the natural world (physical and biological) and human societies; how humans use their understanding of scientific principles; the impact of scientific and technological advances on society and the environment.

Central Idea
Our home planet is unique in the solar system

Key Concepts
• Form
• Function
• Connection

Related Concepts
• Atmosphere
• Gravity
• Space
• Evidence

Lines of Inquiry
• The solar system
• The unique properties of the Earth
• How we know that Earth is unique</td>
<td>Science Strand (s)
Earth and Space

Science Skills
1. Observe carefully in order to gather data.
2. Use a variety of instruments and tools to measure data accurately.
3. Use scientific vocabulary to explain their observations and experiences.
4. Identify or generate a question or problem to be explored.
5. Plan and carry out systematic investigations, manipulating variables as necessary.
6. Make and test predictions.
7. Interpret and evaluate data gathered in order to draw conclusions.
8. Consider scientific models and applications of these models (including their limitations)</td>
<td>The student will be able to:
• Identify the composition of Earth (plate tectonics, core, atmosphere)
• Observe and identify changes in the Earth and sky
• Identify and describe features of objects in the solar system (eg sun / moon / stars / planets)
• Discuss how life can be sustained on Earth
• Compare and explain changes between Earth and solar system</td>
</tr>
</table>

<table>
<tr><th colspan="3">Grade 2</th></tr>
<tr><td colspan="2">Learning will include the development of the following knowledge, concepts and skills</td><td>Possible learning outcomes in science</td></tr>
<tr>
<td>Transdisciplinary theme:

Sharing the Planet:

An inquiry into the rights and responsibilities in the struggle to share finite resources with other people and with other living things; communities and the relationships within and between them; access to equal opportunities; peace and conflict resolution.

Central Idea:

Our personal choices can change our environment.

Key Concepts:

• Causation
• Change
• Responsibility

Related Concepts:

• Sustainability
• Environment
• Conservation
• Interdependence
• Pollution

Lines of inquiry:

• How our personal choices can affect the environment
• How waste can be reduced
• Action we can take at home and at school to reduce, reuse and recycle</td>
<td>Science strand(s):

Living Things

Earth and Space

Science skills

1. Observe carefully in order to gather data.
2. Use a variety of instruments and tools to measure data accurately.
3. Use scientific vocabulary to explain their observations and experiences.
4. Identify or generate a question or problem to be explored.
5. Plan and carry out systematic investigations, manipulating variables as necessary.
6. Make and test predictions.
7. Interpret and evaluate data gathered in order to draw conclusions.
8. Consider scientific models and applications of these models (including their limitations)</td>
<td>The student will be able to:

• Examine the basic needs of a community as it relates to their environment and resources
• Practice conservation of resources
• Make reasonable predictions about organisms and their relationships in the environment</td>
</tr>
</table>

<table>
<tr><th colspan="3">Grade 3</th></tr>
<tr><td colspan="2">Learning will include the development of the following knowledge, concepts and skills</td><td>Possible Learning Outcomes in science</td></tr>
<tr>
<td>Transdisciplinary Theme
How The World Works
An inquiry into the natural world and its laws; the interaction between the natural world (physical and biological) and human societies; how humans use their understanding of scientific principles; the impact of scientific and technological advances on society and the environment.

Central Idea
Materials can undergo permanent or temporary changes.

Key Concepts
• Form
• Change
• Causation

Related Concepts
• Changes of state
• Chemical and physical changes
• Gases
• Liquids
• Properties and uses of materials
• Solids

Lines of Inquiry
• The properties of solids, liquids and gases
• Changes in states of matter
• The scientific process</td>
<td>Science Strand (s)
Materials and matter

Science Skills
1. Observe carefully in order to gather data.
2. Use a variety of instruments and tools to measure data accurately.
3. Use scientific vocabulary to explain their observations and experiences.
4. Identify or generate a question or problem to be explored.
5. Plan and carry out systematic investigations, manipulating variables as necessary.
6. Make and test predictions.
7. Interpret and evaluate data gathered in order to draw conclusions.
8. Consider scientific models and applications of these models (including their limitations)</td>
<td>The student will be able to:
• State a problem or formulate a question on a particular issue and identify the main variables involved
• Suggest a hypothesis of some relevance
• Suggest some procedures and apparatus for collecting relevant data
• Communicate findings using scientific language, writing and mathematics
• Use data to construct reasonable conclusions, explanations and to make predictions
• Explain how materials may be composed of parts that are too small to be seen without magnification
• Explore the characteristics and composition of matter
• Describe and explain physical changes when substances are combined
• Describe and explain chemical changes when substances are combined
• Understand the basic role of scientists and model themselves working in teams and alone to solve problems</td>
</tr>
</table>

<table>
<tr><th colspan="3">Grade 3</th></tr>
<tr><td colspan="2">Learning will include the development of the following knowledge, concepts and skills</td><td>Possible learning outcomes in science</td></tr>
<tr>
<td>Transdisciplinary theme:

Sharing the Planet:

An inquiry into the rights and responsibilities in the struggle to share finite resources with other people and with other living things; communities and the relationships within and between them; access to equal opportunities; peace and conflict resolution.

Central Idea:

Humans have a responsibility to ensure that habitats are protected.

Key Concepts:

• Causation
• Form
• Responsibility

Related Concepts:

• Conservation
• Habitats
• Animals
• Interdependence

Lines of inquiry:

• different animal habitats
• the impact of humans on animal habitats
• Human responsibility</td>
<td>Science strand(s):

Living things

Science skills

1. Observe carefully in order to gather data.
2. Use a variety of instruments and tools to measure data accurately.
3. Use scientific vocabulary to explain their observations and experiences.
4. Identify or generate a question or problem to be explored.
5. Plan and carry out systematic investigations, manipulating variables as necessary.
6. Make and test predictions.
7. Interpret and evaluate data gathered in order to draw conclusions.
8. Consider scientific models and applications of these models (including their limitations)</td>
<td>The student will be able to:

• Describe the natural features of habitats
• Recognise that living things (eg animals) need certain resources to survive
• Identify the parts of habitats (plants and environments) that are used by other living things (for example for food, shelter, tools)</td>
</tr>
</table>

<table>
<tr><th colspan="3">Grade 3</th></tr>
<tr><td colspan="2">Learning will include the development of the following knowledge, concepts and skills</td><td>Possible Learning Outcomes in science</td></tr>
<tr>
<td>Transdisciplinary Theme
Who We Are
An inquiry into the nature of the self; beliefs and values; personal, physical, mental, social and spiritual health; human relationships including families, friends, communities, and cultures; rights and responsibilities; what it means to be human.

Central Idea
Understanding the importance of our attitudes and the way we learn helps us to reach our potential.

Key Concepts
• Reflection
• Responsibility

Related Concepts

Lines of Inquiry
• The different ways we can learn
• How we can build on our strengths and improve on weaknesses
• How our attitudes can affect ourselves and others</td>
<td>Science Strand (s)
Forces and energy

Science Skills
1. Observe carefully in order to gather data.
2. Use a variety of instruments and tools to measure data accurately.
3. Use scientific vocabulary to explain their observations and experiences.
4. Identify or generate a question or problem to be explored.
5. Plan and carry out systematic investigations, manipulating variables as necessary.
6. Make and test predictions.
7. Interpret and evaluate data gathered in order to draw conclusions.
8. Consider scientific models and applications of these models (including their limitations)</td>
<td>The student will be able to:
• Understand that science requires varying human abilities, interests and habits of mind
• Understand the basic role of scientists and model themselves in teams and alone to solve problems
• Explain how men and women in science have made contributions that impact the quality of life</td>
</tr>
</table>

<table>
<tr><th colspan="3">Grade 4</th></tr>
<tr><td colspan="2">Learning will include the development of the following knowledge, concepts and skills</td><td>Possible learning outcomes in science</td></tr>
<tr>
<td>Transdisciplinary theme:

How The World Works

An inquiry into the natural world and its laws; the interaction between the natural world (physical and biological) and human societies; how humans use their understanding of scientific principles; the impact of scientific and technological advances on society and the environment.

Central Idea:

Human survival is connected to understanding the continual changing nature of the Earth.

Key Concepts:

• Causation
• Change
• Connection

Related concepts:

• Cycles
• Transformation
• Geology
• Erosion
• Tectonic plate movement
• Force

Lines of Inquiry

• How the different components of the earth are interrelated.
• How and why the earth has changed and is</td>
<td>Science strand(s):

Earth and Space

Science skills

1. Observe carefully in order to gather data.
2. Use a variety of instruments and tools to measure data accurately.
3. Use scientific vocabulary to explain their observations and experiences.
4. Identify or generate a question or problem to be explored.
5. Plan and carry out systematic investigations, manipulating variables as necessary.
6. Make and test predictions.
7. Interpret and evaluate data gathered in order to draw conclusions.
8. Consider scientific models and applications of these models (including their limitations)</td>
<td>The student will be able to:

• State a problem or formulate a question on a particular issue and identify the main variables involved
• Communicate findings using scientific language, writing, and mathematics
• Explore the characteristics and composition of matter
• Investigates and describes the composition and structure of the lithosphere
• Classify rocks/minerals and their associated fossils
• Utilize a systematic approach to analyze risks and benefits associated with natural and personal hazards</td>
</tr>
</table>

continuing to change. • Human responses to the earth's changes		

<table>
<tr><th colspan="3">Grade 4</th></tr>
<tr><td colspan="2">Learning will include the development of the following knowledge, concepts and skills</td><td>Possible learning outcomes in science</td></tr>
<tr>
<td>Transdisciplinary theme:

Sharing the Planet:

An inquiry into the rights and responsibilities in the struggle to share finite resources with other people and with other living things; communities and the relationships within and between them; access to equal opportunities; peace and conflict resolution.

Central Idea:

Humans have an impact on the Earth’s water.

Key Concepts:

• Causation
• Perspective
• Responsibility

Related Concepts:

• Water cycle
• Sustainability
• Resources
• Conservation
• Consumption
• Distribution

Lines of inquiry:

• Human impact on the Earth’s water
• Human responsibilities related to the Earth’s water</td>
<td>Science strand(s):

Living Things

Earth and Space

Science skills

1. Observe carefully in order to gather data.
2. Use a variety of instruments and tools to measure data accurately.
3. Use scientific vocabulary to explain their observations and experiences.
4. Identify or generate a question or problem to be explored.
5. Plan and carry out systematic investigations, manipulating variables as necessary.
6. Make and test predictions.
7. Interpret and evaluate data gathered in order to draw conclusions.
8. Consider scientific models and applications of these models (including their limitations)</td>
<td>The student will be able to:

• Employ appropriate tools and techniques to systematically collect data communicates findings using scientific language, writing and mathematics
• Use data to construct reasonable conclusions, explanations and to make predictions
• Ask questions about the effectiveness of their procedure and about scientific knowledge
• Understand all living things require food and water
• Identify the benefits and practices of appropriate health, nutrition, and resource conservation</td>
</tr>
</table>

<table>
<tr><th colspan="3">Grade 4</th></tr>
<tr><td colspan="2">Learning will include the development of the following knowledge, concepts and skills</td><td>Possible learning outcomes in science</td></tr>
<tr>
<td>Transdisciplinary theme:

Where We Are in Place and Time

An inquiry into orientation in place and time; personal histories; homes and journeys; the discoveries, explorations and migrations of humankind; the relationships between and the interconnectedness of individuals and civilizations, from local and global perspectives.

Central Idea:

Explorations and discoveries lead to change.

Key Concepts:

• Perspective
• Change
• Form
• Causation

Related concepts:

• Chronology
• Discovery
• Exploration

Lines of Inquiry

• The differences between exploration and discovery
• Reasons for exploration
• Impact of exploration and discoveries</td>
<td>Science strand(s):

Forces and energy

Science skills

1. Observe carefully in order to gather data.
2. Use a variety of instruments and tools to measure data accurately.
3. Use scientific vocabulary to explain their observations and experiences.
4. Identify or generate a question or problem to be explored.
5. Plan and carry out systematic investigations, manipulating variables as necessary.
6. Make and test predictions.
7. Interpret and evaluate data gathered in order to draw conclusions.
8. Consider scientific models and applications of these models (including their limitations)</td>
<td>The student will be able to:

• Examine examples of how new discoveries have impacted on existing theories
• Explain how men and women in science have made contributions that impact the quality of life</td>
</tr>
</table>

<table>
<tr><th colspan="3">Grade 5</th></tr>
<tr><td colspan="2">Learning will include the development of the following knowledge, concepts and skills</td><td>Possible Learning Outcomes in science</td></tr>
<tr>
<td>Transdisciplinary Theme

How The World Works

An inquiry into the natural world and its laws; the interaction between the natural world (physical and biological) and human societies; how humans use their understanding of scientific principles; the impact of scientific and technological advances on society and the environment.

Central Idea

Changes in our society and environment lead to a shift in the way we use energy.

Key Concepts

• Function
• Causation
• Change

Related Concepts

• Forms of energy
• Consumption
• Technological advances
• Interdependence

Lines of Inquiry

• Where energy comes from and its different forms.
• How energy can be changed from one form to another
• How we use energy.
• The impact energy use has on the environment</td>
<td>Science Strand(s)

Earth and Space

Forces and Energy

Science Skills

1. Observe carefully in order to gather data.
2. Use a variety of instruments and tools to measure data accurately.
3. Use scientific vocabulary to explain their observations and experiences.
4. Identify or generate a question or problem to be explored.
5. Plan and carry out systematic investigations, manipulating variables as necessary.
6. Make and test predictions.
7. Interpret and evaluate data gathered in order to draw conclusions.
8. Consider scientific models and applications of these models (including their limitations)</td>
<td>The student will be able to:

• Suggest procedures and apparatus for collecting data
• Identify characteristics and composition of matter
• Describe chemical changes
• Investigate electricity as a possible form of energy
• Understand that energy transfer comes in different forms</td>
</tr>
</table>

<table>
<tr><th colspan="3">Grade 5</th></tr>
<tr><td colspan="2">Learning will include the development of the following knowledge, concepts and skills</td><td>Possible Learning Outcomes in science</td></tr>
<tr>
<td>Transdisciplinary Theme

How We Express Ourselves

An inquiry into the ways in which we discover and express ideas, feelings, nature, culture, beliefs and values; the ways in which we reflect on, extend and enjoy our creativity; our appreciation of the aesthetic.

Central Idea

Senses are used in the appreciation of creativity.

Key Concepts

• Form
• Function
• Reflection

Related Concepts

• Behaviours of humans
• Systems (nervous) - senses

Lines of Inquiry

• The different ways of expressing ourselves
• How the senses work
• How elements of creativity appeal to the senses</td>
<td>Science Strand (s)

Living Things

Science Skills

1. Observe carefully in order to gather data.
2. Use a variety of instruments and tools to measure data accurately.
3. Use scientific vocabulary to explain their observations and experiences.
4. Identify or generate a question or problem to be explored.
5. Plan and carry out systematic investigations, manipulating variables as necessary.
6. Make and test predictions.
7. Interpret and evaluate data gathered in order to draw conclusions.
8. Consider scientific models and applications of these models (including their limitations)</td>
<td>The student will be able to:

• Identify the five senses
• Describe the biology of the five senses
• Reflect on how the senses help to perceive the environment
• Describe how our senses help create knowledge</td>
</tr>
</table>

<table>
<tr><th colspan="3">Grade 5</th></tr>
<tr><td colspan="2">Learning will include the development of the following knowledge, concepts and skills</td><td>Possible Learning Outcomes in science</td></tr>
<tr>
<td>Transdisciplinary Theme
Who We Are
An inquiry into the nature of the self; beliefs and values; personal, physical, mental, social and spiritual health; human relationships including families, friends, communities, and cultures; rights and responsibilities; what it means to be human.

Central Idea
A healthy lifestyle is an individual’s responsibility.

Key Concepts
• Reflection
• Responsibility
• Causation

Related Concepts
• improvement

Lines of Inquiry
• The different factors that contribute to a healthy person
• The need for a balance between these factors
• Choice and responsibility</td>
<td>Science Strand (s)
Living things
Science Skills
1. Observe carefully in order to gather data.
2. Use a variety of instruments and tools to measure data accurately.
3. Use scientific vocabulary to explain their observations and experiences.
4. Identify or generate a question or problem to be explored.
5. Plan and carry out systematic investigations, manipulating variables as necessary.
6. Make and test predictions.
7. Interpret and evaluate data gathered in order to draw conclusions.
8. Consider scientific models and applications of these models (including their limitations)</td>
<td>The student will be able to:
• Identify the benefits and practices of appropriate health, nutrition, and resource conservation
• Understand all living things require food and water</td>
</tr>
</table>

<table>
<tr><th colspan="3">Grade 5</th></tr>
<tr><td colspan="2">Learning will include the development of the following knowledge, concepts and skills</td><td>Possible learning outcomes in science</td></tr>
<tr>
<td>Transdisciplinary theme:

Where We Are in Place and Time

An inquiry into orientation in place and time; personal histories; homes and journeys; the discoveries, explorations and migrations of humankind; the relationships between and the interconnectedness of individuals and civilizations, from local and global perspectives.

Central Idea:

Evidence, like puzzle pieces, help us reconstruct the past.

Key Concepts:

• Perspective
• Change
• Connection

Related concepts:

• Chronology
• Discovery
• History
• Artifacts
• Civilizations

Lines of Inquiry

• What the past is
• How we know things have changed
• Why things changed the way they did</td>
<td>Science strand(s):

Forces and energy

Science skills

1. Observe carefully in order to gather data.
2. Use a variety of instruments and tools to measure data accurately.
3. Use scientific vocabulary to explain their observations and experiences.
4. Identify or generate a question or problem to be explored.
5. Plan and carry out systematic investigations, manipulating variables as necessary.
6. Make and test predictions.
7. Interpret and evaluate data gathered in order to draw conclusions.
8. Consider scientific models and applications of these models (including their limitations)</td>
<td>The student will be able to:

• Suggest procedures and apparatus for collecting relevant data
• Communicates findings using scientific language, writing
• Compare positive and negative aspects of technological advances on society
• Science requires varying abilities, interests and habits of mind</td>
</tr>
</table>

Appendix B: Old Standards and New Objectives

Qatar Academy's former Science standards and benchmarks were based on the National Science Education Standards. In order for the standards and benchmarks to fit the requirements of QA and the IB programs, information was adapted from a variety of sources. These sources include the IB; Beyond 2000: Science for the future; DoDEA Science Content Standards; AERO Science Standards; and McREL Science standards; and the standards and benchmarks in the States of Nebraska; North Dakota and Western Australia. The school also considered the Science Standards and Benchmarks of two other international schools, namely Cairo American College and Beijing International School. Qatar Academy again thanks all these sources for their contributions to our previous work.

The table below shows the former Qatar Academy Science standards.

Strand	Standard Number	Standard
	1	The student demonstrates an ability to identify an opportunity for scientific investigation and to suggest a route it might take
	2	The student demonstrates an ability to carry out the practical phase of a scientific investigation – collecting data (information) whether qualitative or quantitative
	3	The student demonstrates an ability to reflect upon investigations in 2 key ways: considering the meaning of the results and considering the effectiveness of the procedure
	4	The student demonstrates an understanding of the physical properties of matter
	5	The student demonstrates an understanding of the chemical properties of matter
	6	The student demonstrates an understanding of the motion of objects and the forces between them
	7	The student demonstrates an understanding of how energy and matter interact

	8	The student demonstrates an understanding of energy conservation
	9	The student demonstrates an understanding of the microscopic (and sub-microscopic) nature of living organisms, including aspects of their structure and their products
	10	The student demonstrates an understanding of the functioning of individual living organisms (across 5 kingdoms) from the level of their tissues and organs, to the whole organism
	11	The student demonstrates an understanding of the inter-relationships of organisms with the living and nonliving aspects of their environment, including aspects of disease and species' life cycles
	12	The student demonstrates an understanding of the mechanisms by which characteristics are handed on from one generation to the next, and of the gradual evolution of species through natural selection
	13	The Student demonstrates a conceptual understanding of the structure and energy of the Earth system, its processes, and the Earth's geochemical cycles
	14	The student demonstrates a conceptual understanding of the Earth and solar system, including its place and origin and evolution of the universe
	15	The student demonstrates a conceptual understanding of the origin and evolution of the Earth system, its features, and the properties of Earth's materials
	16	The student demonstrates an understanding of how technology and science are interconnected
	17	The student demonstrates an understanding of the impact each individual, community, and human enterprise has on natural conditions and resources from local, national, and global perspectives
	18	The student demonstrates an understanding of science as a human endeavor

History and Nature of Science	19	The student demonstrates an understanding of the historical perspectives in science
	20	The student demonstrates an understanding of the nature of scientific knowledge

The table below shows the relationship between the former Science standards, and the current Sciences objectives.

		Current MYP Objective							
		A	B	C	D	E	F	ATL	AOI
	1				■				
	2		■			■			
	3				■	■			
	4			■					
	5			■					
	6			■					
	7			■					
	8			■					
	9			■					
	10			■					
	11			■					
	12			■					
	13			■					
	14			■					
	15			■					
	16	■							
	17	■							
	18	■					■		■
	19	■							■
	20							■	

Appendix C: MYP Unit / AOI / Significant Concept / Unit Question Outlines

The following pages are a summary of the major topics, Areas of Interaction, Significant Concepts and Unit Questions that will be used to achieve the official MYP Sciences Aims and Objectives. It is expected that the document will change regularly; changes will be purposeful. Where the department considers an adjustment in one area, it considers the related adjustments needed in other areas to maintain a balanced delivery of the full Sciences program. The Academic Coordinator for Sciences is responsible for final decisions about needed adjustments, and for maintaining an up-to-date document. The outline below is current as of June 13, 2012. For a current document at any time, contact the Academic Coordinator for Sciences.

Grade	Unit Title	AOI	Significant Concept	Unit Question
	What is science and chemical concepts	HI	Scientists collect information that affects the world we live in	How do scientists change the world they live in?
	It's alive	HSE	There are specific characteristics that make living things different than non-living things	What does it mean to be alive?
	Interactive life	Env	How human interactions with living non-living components of an environment affect society	How can human activities affect the environment?
	Heating, cooling and energy	Env	Heat energy can be transferred and transformed	How do living things survive and live in the hottest and coldest places in the world?
	Feel the force	HI	Humans' activities are governed by forces	How do forces affect your daily life?

Grade	Unit Title	AOI	Significant Concept	Unit Question
	How do we do Science	C&S	**What helps mold our communities** Scientists change the world	Why should we love science?
	Material world	HI	**Creativity can result in the development of new ideas** Matter is interchangeable	What happens when we mix chemicals?
	Micro world	HSE	**The contributions of small groups and individuals can affect others** Microbes are everywhere and may be useful or harmful	What do microbes get up to?
	The active earth	Env	**The contributions of small groups can affect others** The earth is dynamic	What on earth is happening?
	Sensing the world	HSE	**Understand that as people interact with their environment, both change** Senses can affect our actions	Do you know what goes on around you?
	New Life	HI	**Open-mindedness leads to innovation** Responsible choices	How does new life begin?

Grade	Unit Title	AOI	Significant Concept	Unit Question
	Man and metals	HI	The properties of metals determine their uses. Patterns of reactivity can be determined by observing a range of chemical reactions of metals	Can you imagine the world without metal?
	Power to the people	HI	Understanding how voltage, current and resistance work in simple circuits allows humans to use electricity in a variety of ways	How does electricity work?
	Plants and the environment	Env	Human damage to the environment affects all living things, especially the plants on which we all depend	Why should we care about the environment?
	Feel the force	HI	Understanding, describing and calculating forces allows us to analyse and use simple machines	How can a simple machine help me?
	Your body energy	HSE	The human machine is made up of many small systems that work together in order for the body to function. Personal choices can affect how well the body machine functions	How do you maintain the human machine?

Grade	Unit Title	AOI	Significant concept	Unit Question
	The sum of the parts	HI	Atoms and molecules make up all the substances found on this and other planets. They bond in a predictable way to produce millions of different substances, each with its own properties, structure and application in human society.	How does a particle with no mass organize the structure of the universe?
	Making and breaking	Env	Polymers, big molecules, made from monomers, can be both made and broken naturally by living things, and in the laboratory by scientists. Both polymers and monomers have their uses and applications in everyday life.	Why do scientists and our stomachs make and break molecules?
	Rates of reaction	Env	Particles interact with one another at specific rates depending on the conditions. These interactions can be deliberately speeded up or slowed down as required.	What do energy and matter get up to in the environment of an ordinary glass beaker?
	Waves	HI	Energy can be moved around the universe by waves without moving matter. Whether these waves are beneficial or harmful depends not just on the kind of wave, but how we harness them.	How can we use it if we can't see it?

	Homeostasis	HSE	You body can respond to situations without your conscious knowledge, but will send cues when conscious actions are needed.	How do we bring the body back into balance?

Grade	Unit Title	AOI	Significant Concept	Unit Question
	Safety and control	HI	Electricity can be made to work for us	How does electricity make things easier for us?
	Human inheritance	HSE	Human reproduction is a complex process and there can be complications at any point	How can reproduction go awry?
	Humans and the environment	Env	As population increases, pressure is placed on our natural resources	How do we as humans affect our environment?
	Physics at work	HSE	Your safety can depend on your understanding of physics	How can knowledge of physics keep you safe?
	Chemistry at work	HI	Humans use models to make understanding the world easier	How do patterns allow us to make predictions?
	Radioactivity	HI	Radiation is both natural and potentially useful	What is radiation and how can we use it?

Appendix D: IB Diploma Courses in Group 4 – *Experimental Sciences*

The Diploma Programme curriculum is determined by the syllabi of each course, respectively. As such, the Aims and Objectives of the respective Group 4 courses offered at Qatar Academy are also determined by the IB.

Please see below for an overview of the IB Group 4 courses currently offered at Qatar Academy, as of June 2012. For updated information, or for more specific information regarding the Aims and Objectives of each of these courses, please refer to the relevant IB documentation found either with the Science Academic Coordinator, or the Diploma Programme Coordinator.

Biology

Students will acquire a body of facts and, at the same time, develop a broad, general understanding of the principles of the subject as well as develop scientific skills which will prepare them for University.

There are four basic biological concepts that run through this course:

Structure and Function: students learn to appreciate that structures permit some functions while, at the same time, limit others.

Universality versus Diversity: students learn that universal features exist in a biological world of enormous diversity; that species exist in a range of habitats and show adaptations that relate to structure and function; and that in a living world universality means that a diverse range of organisms are connected and interdependent.

Equilibrium with systems: checks and balances exist both within living organisms and within ecosystems. The state of dynamic equilibrium is essential for the continuity of life.

Evolution: the concept of evolution draws together the other themes. It can be regarded as change leading to diversity within constraints, and this leads to adaptations of structure and function.

Chemistry

This course details a comprehensive and thorough understanding of the basic concepts of chemistry and the role which it plays in everyday life. Chemistry combines academic study with the acquisition of practical and investigational skills. It is called the central science as chemical principles underpin both the physical environment in which we live and all biological systems.

Topics taught include atomic and electronic structure, ionic and covalent compounds, reactions in aqueous solutions, stoichiometry, thermochemistry, chemical kinetics, acids and bases, complex ions, electrochemistry, environmental and organic chemistry.

Physics

Physics is the most fundamental of the experimental sciences as it seeks to explain the universe itself, from the smallest particle to the vast distances between galaxies.

Both theory and experiments are undertaken by all students to allow them to develop traditional practical skills and techniques and also increase facility in the use of mathematics, which is the language of physics. The course also allows students to develop interpersonal skills, and information and communication technology skills which are essential in modern scientific endeavor.

Environmental Systems and Societies

The prime intent of this course is to provide students with a coherent perspective of the interrelationships between environmental systems and societies; one that enables them to adopt an informed personal response to the wide range of pressing environmental issue that they will inevitably come to face.

As a transdisciplinary subject, environmental systems and societies is designed to combine the techniques and knowledge associated with the Group 4 Experimental Sciences with those associated with Group 3 Individuals and Societies.

Computer Science

Computer science deals with the solving of problems using computers. Therefore a full understanding of logical problem-solving is required as well as a detailed knowledge of how computers operate. Successful computerized systems result from a clear understanding of the problem to be solved; appropriate use of hardware based on a detailed knowledge of its capabilities and limitations; efficient use of algorithms and data structures; thorough and logical design; careful testing and integration of all these components.

Design Technology

Design Technology aims to develop critical-thinking and design skills, which students can apply in a practical context. Design Technology studies a range of design concepts as well as developing knowledge of materials. Design Technology also studies how products are developed and manufactured.

Sport, Exercise and Health Science

The International Baccalaureate recently conducted a pilot of this new course. The pilot concluded in May 2012 and the course is available to schools as a subject in Group 4: Experimental Sciences starting in August 2012. Qatar Academy is considering whether to offer this course, and if so, how to counsel students about its potential place in their pre-university program. If this course is implemented at Qatar Academy, it would begin no earlier than August 2013.