International Baccalaureate®
Baccalauréat International
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Primary Years Programme

Science scope and sequence

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Published July 2008

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The International Baccalaureate (IB) offers three high quality and challenging educational programmes for a worldwide community of schools, aiming to create a better, more peaceful world.

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Printed in the United Kingdom by Antony Rowe Ltd, Chippenham, Wiltshire PYP95

IB mission statement

The International Baccalaureate aims to develop inquiring, knowledgeable and caring young people who help to create a better and more peaceful world through intercultural understanding and respect.

To this end the organization works with schools, governments and international organizations to develop challenging programmes of international education and rigorous assessment.

These programmes encourage students across the world to become active, compassionate and lifelong learners who understand that other people, with their differences, can also be right.

IB learner profile

The aim of all IB programmes is to develop internationally minded people who, recognizing their common humanity and shared guardianship of the planet, help to create a better and more peaceful world.

IB learners strive to be:

Inquirers They develop their natural curiosity. They acquire the skills necessary to conduct inquiry and research and show independence in learning. They actively enjoy learning and this love of learning will be sustained throughout their lives.

Knowledgeable They explore concepts, ideas and issues that have local and global significance. In so doing, they acquire in-depth knowledge and develop understanding across a broad and balanced range of disciplines.

Thinkers They exercise initiative in applying thinking skills critically and creatively to recognize and approach complex problems, and make reasoned, ethical decisions.

Communicators They understand and express ideas and information confidently and creatively in more than one language and in a variety of modes of communication. They work effectively and willingly in collaboration with others.

Principled They act with integrity and honesty, with a strong sense of fairness, justice and respect for the dignity of the individual, groups and communities. They take responsibility for their own actions and the consequences that accompany them.

Open-minded They understand and appreciate their own cultures and personal histories, and are open to the perspectives, values and traditions of other individuals and communities. They are accustomed to seeking and evaluating a range of points of view, and are willing to grow from the experience.

Caring They show empathy, compassion and respect towards the needs and feelings of others. They have a personal commitment to service, and act to make a positive difference to the lives of others and to the environment.

Risk-takers They approach unfamiliar situations and uncertainty with courage and forethought, and have the independence of spirit to explore new roles, ideas and strategies. They are brave and articulate in defending their beliefs.

Balanced They understand the importance of intellectual, physical and emotional balance to achieve personal well-being for themselves and others.

Reflective They give thoughtful consideration to their own learning and experience. They are able to assess and understand their strengths and limitations in order to support their learning and personal development.

Contents

Introduction to PYP science scope and sequence

Science within a transdisciplinary programme

In the Primary Years Programme (PYP), science is viewed as the exploration of the biological, chemical and physical aspects of the natural world, and the relationships between them. Our understanding of science is constantly changing and evolving. The inclusion of science within the PYP leads learners to an appreciation and awareness of the world as it is viewed from a scientific perspective. It encourages curiosity and ingenuity and enables the student to develop an understanding of the world. Reflection on scientific knowledge also helps students to develop a sense of responsibility regarding the impact of their actions on themselves, others and their world.

It is recognized that teaching and learning science as a subject, while necessary, is not sufficient. Of equal importance is the need to learn science in context, exploring content relevant to students, and transcending the boundaries of the traditional subject area. The transdisciplinary themes provide the framework for a highly defined, focused, in-depth programme of inquiry, and as science is relevant to all the transdisciplinary themes, all planned science learning should take place within this framework. In return, the science knowledge and the application of that knowledge will enhance inquiries into the central ideas defined by the transdisciplinary themes.

It is worthwhile to note that spontaneous, student-initiated science inquiries will occur that are not directly related to any planned units of inquiry. These are valuable teaching and learning experiences in themselves and they provide teachers and students with the opportunity to apply the pedagogy of the PYP to authentic, of-the-moment situations.

The science component of the PYP should be characterized by concepts and skills rather than by content. However, schools should ensure that a breadth and balance of science content is covered through the units of inquiry. The knowledge component of science in the PYP is arranged into four strands: living things, Earth and space, materials and matter, and forces and energy.

Science strands	
Living things	The study of the characteristics, systems and behaviours of humans and other animals, and of plants; the interactions and relationships between and among them, and with their environment.
Earth and space	The study of planet Earth and its position in the universe, particularly its relationship with the sun; the natural phenomena and systems that shape the planet and the distinctive features that identify it; the infinite and finite resources of the planet.
Materials and matter	The study of the properties, behaviours and uses of materials, both natural and human-made; the origins of human-made materials and how they are manipulated to suit a purpose.
Forces and energy	The study of energy, its origins, storage and transfer, and the work it can do; the study of forces; the application of scientific understanding through inventions and machines.

Developing a school's science scope and sequence

Unless a school has adopted the PYP sample programme of inquiry, the science content in its own scope and sequence will be different from the sample provided here. Some schools may need to reflect national, regional or local requirements within the units of inquiry that are developed and included in their programme of inquiry. These requirements will also need to be incorporated into their scope and sequence.

The science scope and sequence should ensure that schools are building developmentally appropriate units of inquiry. Moreover, as the programme of inquiry, PYP planners and scope and sequences form the basis of a school's written curriculum, the development of all these documents becomes an iterative process. For example, it may be that the process of planning and reflecting on the units of inquiry will highlight the need for more concept-driven learning outcomes in the scope and sequence. Similarly, it may become apparent when developing or revising the science scope and sequence document that science content has not been incorporated to the fullest extent possible in a school's programme of inquiry.

All teaching and learning provides the opportunity to utilize and develop the transdisciplinary skills identified in *Making the PYP happen: A curriculum framework for international primary education* (2007). In addition to these, the science component of the curriculum also provides opportunities for students to develop a range of science-specific skills and processes. In the list that follows, each of the science-specific skills (taken from the subject annex in *Making the PYP happen: A curriculum framework for international primary education*, 2007) is accompanied by examples of how these skills might manifest themselves in the classroom. These examples vary in their degree of complexity and are intended to show progression in the development of each skill. When developing their own science scope and sequence, schools may add their own relevant level of detail to illustrate each skill.

a. **Observe carefully in order to gather data** (for example, students will examine objects and living things to find out more about them; observe and manipulate objects by using all their senses as appropriate; observe changes in living things, objects and events over a period of time; distinguish between significant and less significant observations; record observations in a systematic way).

b. **Use a variety of instruments and tools to measure data accurately** (for example, students will use a range of tools and techniques with increasing competency; use standard and non-standard units for measurement; measure, compare and record data including mass, weight, time and temperature; select appropriate tools and measurement units).

c. **Use scientific vocabulary to explain their observations and experiences** (for example, students will talk about what is observed; describe simple features of objects and events; describe what is happening using an increasing scientific vocabulary; record and present findings and conclusions using a variety of strategies and appropriate scientific vocabulary).

d. **Identify or generate a question or problem to be explored** (for example, students will ask questions or show curiosity about the natural and physical environment; ask questions or identify problems that may lead to investigations; pose questions and define problems that will facilitate effective investigations or inquiries).

e. **Plan and carry out systematic investigations, manipulating variables as necessary** (for example, students will identify variables; collect information and data from a range of sources; suggest approaches and methods for solving problems; identify one or two variables relevant to an investigation; recognize the way in which an experiment is unfair if the relevant variables are not controlled; reflect on methods used in investigations and their effectiveness).

f. **Make and test predictions** (for example, students will observe similarities and differences; guess and suggest what will happen next in structured situations; based on prior learning and/or observations, suggest outcomes of an investigation; make justified predictions; propose ideas or simple theories that may be explored or tested).

g. **Interpret and evaluate data gathered in order to draw conclusions** (for example, students will sort and classify according to observable features or selected criteria; look for and recognize patterns in observations; compare results of different investigations; interpret information and offer explanations).

h. **Consider scientific models and applications of these models (including their limitations)** (for example, students will share findings with peers informally; represent findings using pictures and models; reflect on and build upon their own current scientific theories and applications; apply scientific knowledge to reconstruct or refine their understandings of the physical, chemical and biological worlds; assess their understanding in light of new data or reconsideration of existing data).

How to use the PYP science scope and sequence

This scope and sequence aims to provide information for the whole school community about the learning that is going on in the subject area of science through the transdisciplinary programme of inquiry. In addition, it is a tool that will support teaching, learning and assessment of science within the context of units of inquiry.

The sample programme of inquiry published in *Developing a transdisciplinary programme of inquiry* (2008) provides the context and the content for the PYP science scope and sequence. The subject-specific knowledge and skills identified in the subject area annex of *Making the PYP happen: A curriculum framework for international primary education* (2007) are also reflected in this document.

The scope and sequence document contains the following.

For each age range:

- overall expectations by age range.

For each unit selected from the PYP sample programme of inquiry:

- transdisciplinary theme
- central idea
- key concepts and related concepts
- lines of inquiry.

Specific reference to subject area knowledge and skills:

- knowledge strands for science
- subject-specific skills for science
- possible learning outcomes for each unit of inquiry
- cross-reference to social studies scope and sequence document (where appropriate).

At the start of each age range, the **overall expectations** provide broad, summative descriptions of what a PYP student could have achieved in science by the end of each age range. The **possible learning outcomes** in the tables that follow are an extension of these overall expectations and relate directly to the units of inquiry from the PYP sample programme of inquiry. Verbs such as “analyse”, “describe” or “identify” are used at the start of each possible learning outcome in order to focus the planning, teaching and assessment on what is demonstrable and observable, and to place the focus on the conceptual understanding of a particular central idea.

The annotated diagram (figure 1) explains the content of the science scope and sequence.

The first column comes directly from the sample programme of inquiry and includes the **transdisciplinary theme** title and descriptor and the **central idea**. The **key** and **related concepts** and **lines of inquiry** are also listed here. This encourages schools to keep in mind the transdisciplinary nature of learning, and reminds them that they should utilize the subject-specific concepts, knowledge and skills to support learning that transcends the confines of the subject area.

The second column lists the **science strands** applicable to this unit of inquiry. Full science strand descriptions are found in the introduction to this scope and sequence document.

The **possible learning outcomes** in column three have been developed to reflect the knowledge, concepts and skills from columns one and two as well as being developmentally appropriate for the intended age group. They also take into account the attitudes and the attributes of the IB learner profile and transdisciplinary skills.

Learning will include the development of the following knowledge, concepts and skills		Possible learning outcomes in science
Transdisciplinary theme **Sharing the planet** An inquiry into 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** People interact with, use and value the natural environment in different ways. **Key concepts** • Causation • Reflection • Responsibility **Related concepts** • Conservation • Interdependence • Order **Lines of inquiry** • Local natural environment • Human use of the local natural environment • Actions that benefit or harm the local environment	**Science strand(s)** Living things Earth and space **Science skills** a. **Observe carefully in order to gather data** b. Use a variety of instruments and tools to measure data accurately c. **Use scientific vocabulary to explain their observations and experiences** d. **Identify or generate a question or problem to be explored** e. **Plan and carry out systematic investigations, manipulating variables as necessary** f. **Make and test predictions** g. **Interpret and evaluate data gathered in order to draw conclusions** h. Consider scientific models and applications of these models (including their limitations)	**The student will be able to:** • describe the natural features of local and other environments (for example, underlying geology) • analyse ways in which humans use the natural environment • identify or generate a question or problem to be explored in relation to human impact on the local environment.

Reflecting a "less is more" principle, the number of learning outcomes has been carefully considered and limited in terms of what is achievable and assessable in each unit of inquiry.

The second column lists the **science skills** that have been identified in the subject annex of *Making the PYP happen: A curriculum framework for international primary education* (2007). Those science skills that might be easier to teach and observe for each unit are marked in bold text.

This box notifies users when possible learning outcomes for social studies have been developed for this unit. These outcomes can be found in the *PYP social studies scope and sequence* (2008).

Please note: this unit is also included in the social studies scope and sequence.

Figure 1
An explanation of the science scope and sequence content

Overall expectations in science: 3–5 years

Students will develop their observational skills by using their senses to gather and record information, and they will use their observations to identify simple patterns, make predictions and discuss their ideas. They will explore the way objects and phenomena function, and will recognize basic cause and effect relationships. Students will examine change over varying time periods and know that different variables and conditions may affect change. They will be aware of different perspectives, and they will show care and respect for themselves, other living things and the environment. Students will communicate their ideas or provide explanations using their own scientific experience and vocabulary

Science scope and sequence: 3–5 years

Learning will include the development of the following knowledge, concepts and skills		Possible learning outcomes in science
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 on the environment. **Central idea** Our activity is usually connected to the Earth's natural cycles. **Key concepts** • Change • Connection **Related concepts** • Cycles • Interaction **Lines of inquiry** • Night and day cycles (dark and light) • Seasonal changes • Health and safety as related to climate and seasonal changes	**Science strand(s)** Living things Earth and space **Science skills** a. **Observe carefully in order to gather data** b. **Use a variety of instruments and tools to measure data accurately** c. Use scientific vocabulary to explain their observations and experiences d. Identify or generate a question or problem to be explored e. Plan and carry out systematic investigations, manipulating variables as necessary f. **Make and test predictions** g. Interpret and evaluate data gathered in order to draw conclusions h. Consider scientific models and applications of these models (including their limitations)	**The student will be able to:** • talk about activities that occur during the day and night • compare activities that occur during the seasons • make connections between the weather and how to protect himself or herself • identify simple patterns in daily and seasonal cycles • observe the features of the local environment that are affected by daily and seasonal cycles.

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

Sharing the planet

An inquiry into 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 requirements in order to grow and stay healthy.

Key concepts

• Function
• Responsibility

Related concepts

• Classification
• Living and non-living

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

a. Observe carefully in order to gather data

b. Use a variety of instruments and tools to measure data accurately

c. Use scientific vocabulary to explain their observations and experiences

d. Identify or generate a question or problem to be explored

e. Plan and carry out systematic investigations, manipulating variables as necessary

f. Make and test predictions

g. Interpret and evaluate data gathered in order to draw conclusions

h. 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="2">Learning will include the development of the following knowledge, concepts and skills</th><th>Possible learning outcomes in science</th></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 on the environment.

Central idea

Understanding the way materials behave and interact determines how people use them.

Key concepts
• Function
• Change
Related concepts
• Prediction
• Behaviour
Lines of inquiry
• Behaviour and uses of materials
• Changing properties of materials
• Manipulation of materials for specific purposes</td>
<td>Science strand(s)

Materials and matter

Science skills
a. Observe carefully in order to gather data
b. Use a variety of instruments and tools to measure data accurately
c. Use scientific vocabulary to explain their observations and experiences
d. Identify or generate a question or problem to be explored
e. Plan and carry out systematic investigations, manipulating variables as necessary
f. Make and test predictions
g. Interpret and evaluate data gathered in order to draw conclusions
h. Consider scientific models and applications of these models (including their limitations)</td>
<td>The student will be able to:
• use senses to describe observable properties of familiar materials (including solids, liquids, gases)
• describe observable changes (including changes of state) that occur in materials
• recognize that materials can be solid, liquid or gas
• be aware of how to change water into a solid, liquid and gas
• 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="2">Learning will include the development of the following knowledge, concepts and skills</th><th>Possible learning outcomes in science</th></tr>
<tr>
<td>Transdisciplinary theme

Sharing the planet

An inquiry into 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 are a life-sustaining resource for us and for other living things

Key concepts
• Form
• Change
• Connection
Related concepts
• Interdependence
• Systems
Lines of inquiry
• What plants provide for us and other living things
• The structure of a plant
• Caring for plant life</td>
<td>Science strand(s)

Living things

Science skills
a. Observe carefully in order to gather data
b. Use a variety of instruments and tools to measure data accurately
c. Use scientific vocabulary to explain their observations and experiences
d. Identify or generate a question or problem to be explored
e. Plan and carry out systematic investigations, manipulating variables as necessary
f. Make and test predictions
g. Interpret and evaluate data gathered in order to draw conclusions
h. Consider scientific models and applications of these models (including their limitations)</td>
<td>The student will be able to:
• identify the parts of plants that are used by other living things (for example, for food, shelter, tools)
• be aware of the role of plants in sustaining life (for example, providing oxygen, food)
• show responsibility when caring for plants.</td>
</tr>
</table>

Overall expectations in science 5–7 years

Students will develop their observational skills by using their senses to gather and record information, and they will use their observations to identify patterns, make predictions and refine their ideas. They will explore the way objects and phenomena function, identify parts of a system, and gain an understanding of cause and effect relationships. Students will examine change over varying time periods, and will recognize that more than one variable may affect change. They will be aware of different perspectives and ways of organizing the world, and they will show care and respect for themselves, other living things and the environment. Students will communicate their ideas or provide explanations using their own scientific experience.

Science scope and sequence: 5–7 years

Learning will include the development of the following knowledge, concepts and skills		Possible learning outcomes in science
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** Making balanced choices about daily routines enables us to have a healthy lifestyle. **Key concepts** • Function • Causation • Reflection **Related concepts** • Balance • Well-being **Lines of inquiry** • Daily habits and routines (hygiene, sleep, play, eating) • Balanced choices • Consequences of choices	**Science strand(s)** Living things **Science skills** a. **Observe carefully in order to gather data** b. Use a variety of instruments and tools to measure data accurately c. **Use scientific vocabulary to explain their observations and experiences** d. Identify or generate a question or problem to be explored e. Plan and carry out systematic investigations, manipulating variables as necessary f. Make and test predictions g. **Interpret and evaluate data gathered in order to draw conclusions** h. Consider scientific models and applications of these models (including their limitations)	**The student will be able to:** • recognize that living things, including humans, need certain resources for energy and growth • identify the major food groups and be aware of the role they play in human development.

Learning will include the development of the following knowledge, concepts and skills		Possible learning outcomes in science
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 on the environment. **Central idea** All living things go through a process of change. **Key concepts** • Change • Connection **Related concepts** • Cycles • Transformation **Lines of inquiry** • Life cycles • How living things change over their life time • Developmental stages of various living things	**Science strand(s)** Living things **Science skills** a. **Observe carefully in order to gather data** b. Use a variety of instruments and tools to measure data accurately c. **Use scientific vocabulary to explain their observations and experiences** d. **Identify or generate a question or problem to be explored** e. Plan and carry out systematic investigations, manipulating variables as necessary f. **Make and test predictions** g. **Interpret and evaluate data gathered in order to draw conclusions** h. Consider scientific models and applications of these models (including their limitations)	**The student will be able to:** • describe the life cycles of a variety of living things (for example, a range of animals and plants) • compare the life cycles of different living things • identify the common components of life cycles (for example, birth, growth, maturity, reproduction, death) • investigate the responses of plants or animals to changes in their habitats.

Learning will include the development of the following knowledge, concepts and skills		Possible learning outcomes in science
Transdisciplinary theme **Sharing the planet** An inquiry into 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** People interact with, use and value the natural environment in different ways. **Key concepts** • Causation • Reflection • Responsibility **Related concepts** • Conservation • Interdependence • Order **Lines of inquiry** • Local natural environment • Human use of the local natural environment • Actions that benefit or harm the local environment	**Science strand(s)** Living things Earth and space **Science skills** a. **Observe carefully in order to gather data** b. Use a variety of instruments and tools to measure data accurately c. **Use scientific vocabulary to explain their observations and experiences** d. **Identify or generate a question or problem to be explored** e. **Plan and carry out systematic investigations, manipulating variables as necessary** f. **Make and test predictions** g. **Interpret and evaluate data gathered in order to draw conclusions** h. Consider scientific models and applications of these models (including their limitations)	**The student will be able to:** • describe the natural features of local and other environments (for example, underlying geology) • analyse ways in which humans use the natural environment • identify or generate a question or problem to be explored in relation to human impact on the local environment.

Please note: this unit is also included in the social studies scope and sequence.

Learning will include the development of the following knowledge, concepts and skills		Possible learning outcomes in science
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** Imagination is a powerful tool for extending our ability to think, create and express ourselves. **Key concepts** • Causation • Perspective • Reflection **Related concepts** • Empathy • Invention • Transformation **Lines of inquiry** • How we demonstrate and enjoy our imagination • How our imagination helps us to consider other perspectives • How imagination helps us to solve problems • The value of imagination	**Science strand(s)** Living things Earth and space Materials and matter Forces and energy **Science skills** a. **Observe carefully in order to gather data** b. Use a variety of instruments and tools to measure data accurately c. Use scientific vocabulary to explain their observations and experiences d. **Identify or generate a question or problem to be explored** e. Plan and carry out systematic investigations, manipulating variables as necessary f. **Make and test predictions** g. Interpret and evaluate data gathered in order to draw conclusions h. Consider scientific models and applications of these models (including their limitations)	**The student will be able to:** • recognize that imagination contributes to scientific developments • explore the use of imagination as a tool to solve problems (for example, particular inventions, scientific discoveries).

<table>
<tr><th colspan="2">Learning will include the development of the following knowledge, concepts and skills</th><th>Possible learning outcomes in science</th></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 on the environment.

Central idea

Understanding the properties of air allows people to make practical applications.

Key concepts
• Function
• Causation
Related concepts
• Force
• Energy
Lines of inquiry
• The evidence of the existence of air
• What air can do and how we use it
• The relationship between air, light and sound</td>
<td>Science strand(s)

Living things

Earth and space

Materials and matter

Forces and energy

Science skills

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

• investigate and identify the properties of air
• examine how people use air in their everyday lives (for example, transportation, recreation)
• reflect on the impact of air on living things
• apply his or her understanding about the properties of air (for example, building a windmill)
• explore links between air, light and sound (for example, thunder and lightning).</td>
</tr>
</table>

Learning will include the development of the following knowledge, concepts and skills		Possible learning outcomes in science
Transdisciplinary theme **Sharing the planet** An inquiry into 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** People can establish practices in order to sustain and maintain the Earth's resources. **Key concepts** • Change • Responsibility • Reflection **Related concepts** • Lifestyle • Resources **Lines of inquiry** • Limited nature of the Earth's resources • Personal choices that can help sustain the environment • Reusing and recycling different materials • Reducing waste	**Science strand(s)** Living things Earth and space Materials and matter **Science skills** a. Observe carefully in order to gather data b. **Use a variety of instruments and tools to measure data accurately** c. **Use scientific vocabulary to explain their observations and experiences** d. **Identify or generate a question or problem to be explored** e. Plan and carry out systematic investigations, manipulating variables as necessary f. Make and test predictions g. **Interpret and evaluate data gathered in order to draw conclusions** h. Consider scientific models and applications of these models (including their limitations)	**The student will be able to:** • reflect on and self-assess his or her personal use of natural resources • investigate ways that familiar materials can be reused • group materials on the basis of properties for the purpose of recycling • describe how a particular material is recycled • explore the role of living things in recycling energy and matter.

Please note: this unit is also included in the social studies scope and sequence.

Overall expectations in science 7–9 years

Students will develop their observational skills by using their senses and selected observational tools. They will gather and record observed information in a number of ways, and they will reflect on these findings to identify patterns or connections, make predictions, and test and refine their ideas with increasing accuracy. Students will explore the way objects and phenomena function, identify parts of a system, and gain an understanding of increasingly complex cause and effect relationships. They will examine change over time, and will recognize that change may be affected by one or more variables. They will examine how products and tools have been developed through the application of science concepts. They will be aware of different perspectives and ways of organizing the world, and they will be able to consider how these views and customs may have been formulated. Students will 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. Students will communicate their ideas or provide explanations using their own scientific experience and that of others.

Science scope and sequence: 7–9 years

Learning will include the development of the following knowledge, concepts and skills		Possible learning outcomes in science
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 on the environment. **Central idea** The design of buildings and structures is dependent on the environment and available materials. **Key concepts** • Connection • Responsibility **Related concepts** • Structure • Sustainability • Transformation **Lines of inquiry** • Considerations to take into account when building a structure • How building impacts on the environment • Indigenous architecture	**Science strand(s)** Living things Materials and matter Forces and energy **Science skills** a. **Observe carefully in order to gather data** b. **Use a variety of instruments and tools to measure data accurately** c. **Use scientific vocabulary to explain their observations and experiences** d. **Identify or generate a question or problem to be explored** e. **Plan and carry out systematic investigations, manipulating variables as necessary** f. **Make and test predictions** g. **Interpret and evaluate data gathered in order to draw conclusions** h. Consider scientific models and applications of these models (including their limitations)	**The student will be able to:** • investigate how buildings and other structures stand up (for example, piles, buttresses, I-beam girders) • investigate the construction of a building or structure and identify the materials used • critique the impact of a structure on the natural environment • explain people's responsibility regarding the use of materials from the environment.

Please note: this unit is also included in the social studies scope and sequence.

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

Sharing the planet

An inquiry into 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

Over time, living things need to adapt in order to survive.

Key concepts

• Change
• Connection

Related concepts

• Adaptation
• Evolution

Lines of inquiry

• Concept of adaptation
• Circumstances that lead to adaptation
• How plants and animals adapt or respond to environmental conditions</td>
<td>Science strand(s)

Living things

Science skills

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

• recognize the ways in which plants and animals have adapted over time
• make links between different features of the environment and the specific needs of living things
• assess the impact that changes in environmental conditions can have on living things
• recognize the importance of the fossil record to inform the concept of evolution.</td>
</tr>
</table>

Learning will include the development of the following knowledge, concepts and skills		Possible learning outcomes in science
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 on the environment. **Central idea** Human survival is connected to understanding the continual changing nature of the Earth. **Key concepts** • Causation • Change • Connection **Related concepts** • Erosion • Geology • Tectonic plates • Movement **Lines of inquiry** • How the different components of the Earth are interrelated • How the Earth has changed and is continuing to change • Why the Earth changes • Human response to the Earth's changes	**Science strand(s)** Earth and space **Science skills** a. **Observe carefully in order to gather data** b. Use a variety of instruments and tools to measure data accurately c. **Use scientific vocabulary to explain their observations and experiences** d. Identify or generate a question or problem to be explored e. Plan and carry out systematic investigations, manipulating variables as necessary f. **Make and test predictions** g. **Interpret and evaluate data gathered in order to draw conclusions** h. **Consider scientific models and applications of these models (including their limitations)**	**The student will be able to:** • identify the long-term and short-term changes on Earth (for example, plate tectonics, erosion, floods, deforestation) • describe how natural phenomena shape the planet • identify the evidence that the Earth has changed (for example, land formations in local environment) • explore scientific and technological developments that help people understand and respond to the changing Earth • reflect on the explanations from a range of sources as to why the Earth changes.

Please note: this unit is also included in the social studies scope and sequence.

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

Sharing the planet

An inquiry into 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

Water is essential to life, and is a limited resource for many people.

Key concepts
• Function
• Responsibility
Related concepts
• Conservation
• Equity
• Processes
Lines of inquiry
• Sources of water and how water is used
• What happens to water after we have used it
• Distribution and availability of usable water
• Responsibilities regarding water</td>
<td>Science strand(s)

Living things

Earth and space

Science skills

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

• recognize that water exists in the air in different forms
• explore the impact of the sun on the availability of water
• describe how water sustains life
• analyse systems of water storage and usage, both natural and human-made
• explain why fresh water is a limited resource
• identify water issues and propose solutions for responsible, equitable water use (for example, desalination).</td>
</tr>
</table>

Please note: this unit is also included in the social studies scope and sequence.

Overall expectations in science 9–12 years

Students will develop their observational skills by using their senses and selected observational tools. They will gather and record observed information in a number of ways, and they will reflect on these findings to identify patterns or connections, make predictions, and test and refine their ideas with increasing accuracy. Students will explore the way objects and phenomena function, identify parts of a system, and gain an understanding of increasingly complex cause and effect relationships. They will examine change over time, and they will recognize that change may be affected by one or more variables. Students will reflect on the impact that the application of science, including advances in technology, has had on themselves, society and the environment. They will be aware of different perspectives and ways of organizing the world, and they will be able to consider how these views and customs may have been formulated. Students will examine ethical and social issues in science-related contexts and express their responses appropriately. They will 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. Students will communicate their ideas or provide explanations using their own scientific experience and that of others.

Science scope and sequence: 9–12 years

Learning will include the development of the following knowledge, concepts and skills		Possible learning outcomes in science
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 on the environment. **Central idea** Energy may be converted from one form to another and stored in various ways. **Key concepts** • Form • Function • Connection **Related concepts** • Conservation • Transformation **Lines of inquiry** • Forms of energy • The storage and transformation of energy • Conservation of energy • Renewable and sustainable energy	**Science strand(s)** Living things Earth and space Forces and energy **Science skills** a. **Observe carefully in order to gather data** b. Use a variety of instruments and tools to measure data accurately c. **Use scientific vocabulary to explain their observations and experiences** d. **Identify or generate a question or problem to be explored** e. Plan and carry out systematic investigations, manipulating variables as necessary f. Make and test predictions g. **Interpret and evaluate data gathered in order to draw conclusions** h. **Consider scientific models and applications of these models (including their limitations)**	**The student will be able to:** • identify and describe different forms of energy • demonstrate how energy can be stored and transformed from one form to another (for example, storage of fat, batteries as a store of energy) • explain the impact of diet in providing the body with sources of potential energy • assess renewable and sustainable energy sources (for example, wind, solar, water) • examine ways in which the local community could be improved in relation to the conservation of energy.

Learning will include the development of the following knowledge, concepts and skills		Possible learning outcomes in science
Transdisciplinary theme **Sharing the planet** An inquiry into 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** Children worldwide face a variety of challenges and risks. **Key concepts** • Function • Reflection **Related concepts** • Equality • Rights **Lines of inquiry** • Challenges and risks that children face • How children respond to challenges and risks • Ways in which individuals, organizations and nations work to protect children from risk	**Science strand(s)** Living things **Science skills** a. **Observe carefully in order to gather data** b. Use a variety of instruments and tools to measure data accurately c. **Use scientific vocabulary to explain their observations and experiences** d. Identify or generate a question or problem to be explored e. Plan and carry out systematic investigations, manipulating variables as necessary f. Make and test predictions g. **Interpret and evaluate data gathered in order to draw conclusions** h. **Consider scientific models and applications of these models (including their limitations)**	**The student will be able to:** • explore health and safety issues facing children (for example, spread of disease, accidents, access to health care) • understand the role of vaccinations • explain the need to act responsibly with regards to his or her health and the health of others (for example, colds, head lice).

Please note: this unit is also included in the social studies scope and sequence.

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

Past civilizations shape present day systems and technologies.

Key concepts
• Causation
• Change
• Perspective
Related concepts
• Continuity
• Progress
• Technology
Lines of inquiry
• Aspects of past civilizations that have survived
• Reasons these systems and technologies developed
• Why modern societies continue to use adaptations of these systems and technologies
• Implications for the future</td>
<td>Science strand(s)

Forces and energy

Science skills
a. Observe carefully in order to gather data
b. Use a variety of instruments and tools to measure data accurately
c. Use scientific vocabulary to explain their observations and experiences
d. Identify or generate a question or problem to be explored
e. Plan and carry out systematic investigations, manipulating variables as necessary
f. Make and test predictions
g. Interpret and evaluate data gathered in order to draw conclusions
h. Consider scientific models and applications of these models (including their limitations)</td>
<td>The student will be able to:
• investigate which simple machines were developed by past civilizations (for example, lever, ramp, pulley, screw, wheel)
• explore the principle of using gears to provide more work for less energy
• analyse why and how we still use simple machines.</td>
</tr>
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<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 on the environment.

Central idea

The fact that materials can undergo permanent or temporary changes poses challenges and provides benefits for society and the environment.

Key concepts

• Form
• Function
• Responsibility

Related concepts

• Measurement
• Transformation

Lines of inquiry

• Nature of chemical and physical energy
• Practical applications and implications of change in materials
• Ethical dilemmas associated with manufacturing processes and by-products</td>
<td>Science strand(s)

Living things

Materials and matter

Science skills

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

• identify the difference between physical and chemical changes
• investigate the ways materials can be changed (for example, metal, sand)
• assess the benefits and challenges of changing materials to suit people's needs and wants (for example, plastic)
• recognize and report on the environmental impact of some manufacturing processes.</td>
</tr>
</table>

Learning will include the development of the following knowledge, concepts and skills		Possible learning outcomes in science
Transdisciplinary theme **Sharing the planet** An inquiry into 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** Biodiversity relies on maintaining the interdependent balance of organisms within systems. **Key concepts** • Connection • Responsibility **Related concepts** • Balance • Biodiversity • Interdependence **Lines of inquiry** • Interdependence within ecosystems, biomes and environments • Ways in which organisms are interconnected in nature • How human interaction with the environment can affect the balance of systems	**Science strand(s)** Living things **Science skills** a. **Observe carefully in order to gather data** b. Use a variety of instruments and tools to measure data accurately c. **Use scientific vocabulary to explain their observations and experiences** d. Identify or generate a question or problem to be explored e. Plan and carry out systematic investigations, manipulating variables as necessary f. **Make and test predictions** g. **Interpret and evaluate data gathered in order to draw conclusions** h. **Consider scientific models and applications of these models (including their limitations)**	**The student will be able to:** • describe the interactions of living things within and between ecosystems • examine interactions between living things and non-living parts of the environment • recognize that solar energy sustains ecosystems through a transformation of energy • investigate the conservation of energy in ecosystems • analyse the effects of changing a link in a food web • explain how human activities can have positive or adverse effects on local and other environments (for example, waste disposal, agriculture, industry).

Please note: this unit is also included in the social studies scope and sequence.

Learning will include the development of the following knowledge, concepts and skills		Possible learning outcomes in science
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** Exploration leads to discovery and develops new understandings. **Key concepts** • Form • Perspective • Reflection **Related concepts** • Consequences • Discovery • Geography **Lines of inquiry** • Reasons for exploration (historical and personal) • Feelings and attitudes associated with exploration • What we learn through exploration • Methods of navigation	**Science strand(s)** Earth and space **Science skills** a. Observe carefully in order to gather data b. **Use a variety of instruments and tools to measure data accurately** c. **Use scientific vocabulary to explain their observations and experiences** d. Identify or generate a question or problem to be explored e. Plan and carry out systematic investigations, manipulating variables as necessary f. Make and test predictions g. **Interpret and evaluate data gathered in order to draw conclusions** h. **Consider scientific models and applications of these models (including their limitations)**	**The student will be able to:** • identify regular and irregular events in time and space that occur in the solar system • examine the impact of events that occur in the solar system on the Earth • investigate and explain how stars are used for navigation • demonstrate an understanding of other methods of navigation (for example, compasses, satellites).

Please note: this unit is also included in the social studies scope and sequence.

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<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 on the environment.

Central idea

Reproduction of living things contributes to the continuation of the species.

Key concepts
• Change
• Connection
Related concepts
• Cycles
• Growth
Lines of inquiry
• Reproduction as part of a life cycle
• Reproductive processes
• Genetics and hereditary factors</td>
<td>Science strand(s)

Living things

Science skills
a. Observe carefully in order to gather data
b. Use a variety of instruments and tools to measure data accurately
c. Use scientific vocabulary to explain their observations and experiences
d. Identify or generate a question or problem to be explored
e. Plan and carry out systematic investigations, manipulating variables as necessary
f. Make and test predictions
g. Interpret and evaluate data gathered in order to draw conclusions
h. Consider scientific models and applications of these models (including their limitations)</td>
<td>The student will be able to:
• recognize that plants and animals go through predictable life cycles
• identify the structures of plants and animals that are responsible for reproduction
• analyse similarities and differences in the ways that different living things reproduce
• be aware of the role of genetics in determining physical characteristics.</td>
</tr>
</table>

Learning will include the development of the following knowledge, concepts and skills		Possible learning outcomes in science
Transdisciplinary theme **How we organize ourselves** An inquiry into the interconnectedness of human-made systems and communities; the structure and function of organizations; societal decision-making; economic activities and their impact on humankind and the environment. **Central idea** Technology impacts on the world of work and leisure. **Key concepts** • Change • Connection • Responsibility **Related concepts** • Communication • Systems • Ethics **Lines of inquiry** • Technology and inventions of the home, workplace and leisure activities • Circumstances that lead to the development of important inventions and their impact • How technology supports/ impacts sustainability	**Science strand(s)** Living things Earth and space Forces and energy **Science skills** a. Observe carefully in order to gather data b. Use a variety of instruments and tools to measure data accurately c. **Use scientific vocabulary to explain their observations and experiences** d. **Identify or generate a question or problem to be explored** e. Plan and carry out systematic investigations, manipulating variables as necessary f. **Make and test predictions** g. **Interpret and evaluate data gathered in order to draw conclusions** h. Consider scientific models and applications of these models (including their limitations)	**The student will be able to:** • analyse the way in which technology supports the functioning of workplaces (for example, schools) • investigate technology developments • examine the impact of particular technologies on sustainability • suggest areas for future technological advances.

Please note: this unit is also included in the social studies scope and sequence.