BOSTES | BOARD OF STUDIES TEACHING & EDUCATIONAL STANDARDS NSW

Science and Technology

K–6

Draft Directions for Syllabus Development

Draft for consultation
18 July–31 August 2016

Phone: (02) 9367 8289
Fax: (02) 9279 1482
Email: mila.buraga@bostes.nsw.edu.au

Published by
Board of Studies, Teaching and Educational Standards NSW
GPO Box 5300
Sydney NSW 2001
Australia

www.bostes.nsw.edu.au

D2016/23821

Contents

BOSTES K–10 syllabus development project

The BOSTES process for the development of K–10 syllabuses with consideration of Australian curriculum content involves expert writers and opportunities for broad consultation with teachers and other stakeholder groups in order to receive the highest quality advice from across the education community.

This project will follow the BOSTES syllabus development process, recognising the substantial review and development work that the Australian Curriculum, Assessment and Reporting Authority (ACARA), together with all states and territories has undertaken.

The *Draft Directions for Syllabus Development* is the detailed blueprint for the development of a draft syllabus and is structured according to the elements of a K–10 syllabus. Each subsection of the *Draft Directions for Syllabus Development* addresses a syllabus component and includes an explanation of the component's purpose. Content subsections include proposed instructions to the writers in the writing of the draft syllabus.

In developing the draft Directions for Syllabus Development in Science and Technology K–6, the Australian curriculum rationales, aims, content and achievement standards have been considered for a NSW context.

Consultation

The following icons are used throughout the document to assist respondents:

for your information	This icon indicates general information that assists in reading or understanding the information contained in the document. Text introduced by this icon will not appear in the final syllabus.
consult	This icon indicates material on which responses and views are sought through consultation.

The *Science and Technology K–6 Draft Directions for Syllabus Development* is accompanied by an online consultation survey on the Board of Studies, Teaching and Educational Standards NSW (BOSTES) website. The purpose of the survey is to obtain detailed comments from individuals and systems/organisations on the syllabus. Please comment on both the strengths and the weaknesses of the *Science and Technology K–6 Draft Directions for Syllabus Development*. Feedback will be considered when the draft syllabus is developed.

The consultation period is from 18 July to 31 August 2016.

Written responses may be forwarded to:
Senior Curriculum Officer, Technology Education
Curriculum and Assessment Standards
BOSTES NSW
GPO Box 5300
Sydney NSW 2001

Or emailed to: alesha.bleakley@bostes.nsw.edu.au

Or faxed to: (02) 9367 8476

Science and Technology K–6 Draft Directions for Syllabus Development

1 Introduction

The K–10 Curriculum

ⓘ for your information

The Board of Studies, Teaching and Educational Standards NSW (BOSTES) syllabuses are developed with respect to some overarching views about education. These include the Board's *K–10 Curriculum Framework* and *Statement of Equity Principles,* and the *Melbourne Declaration on Educational Goals for Young Australians (December 2008)*.

BOSTES syllabuses include the agreed Australian curriculum content and content that clarifies the breadth and depth of learning and scope for Science and Technology K–6. The Australian curriculum achievement standards underpin the syllabus outcomes and the Stage statements for Early Stage 1 to Stage 5.

In accordance with the *K–10 Curriculum Framework* and the *Statement of Equity Principles*, the *Science and Technology K–6 Syllabus* takes into account the diverse needs of all students. It identifies essential knowledge, understanding, skills, values and attitudes. It outlines clear standards of what students are expected to know and be able to do in K–6. It provides structures and processes by which teachers can provide continuity of study for all students.

The framework also provides a set of broad learning outcomes that summarise the knowledge, understanding, skills, values and attitudes essential for all students in all learning areas to succeed in and beyond their schooling.

The continued relevance of the *K–10 Curriculum Framework* is consistent with the intent of the *Melbourne Declaration on Educational Goals for Young Australians (December 2008)*, which sets the direction for Australian schooling for the next ten years. There are two broad goals:

> Goal 1: Australian schooling promotes equity and excellence
>
> Goal 2: All young Australians become successful learners, confident and creative individuals, and active and informed citizens.

The way in which learning in the *Science and Technology K–6 Syllabus* will contribute to the curriculum and to students' achievement of the broad learning outcomes is outlined in the syllabus rationale.

Diversity of learners

ⓘ for your information

The *Science and Technology K–6 Syllabus* is inclusive of the learning needs of all students. The rationale, aim, objectives, outcomes and content have been designed to accommodate teaching approaches that support student diversity as detailed under the sections: Students with special education needs; Gifted and talented students; Students learning English as an additional language or dialect (EAL/D).

Students with special education needs

All students are entitled to participate in and progress through the curriculum. Schools are required to provide additional support or adjustments to teaching, learning and assessment activities for some students. Adjustments are measures or actions taken in relation to teaching, learning and assessment that enable a student to access syllabus outcomes and content and demonstrate achievement of outcomes.

Students with special education needs can access the K–10 outcomes and content in a range of ways. Students may engage with:

- syllabus outcomes and content with adjustments to teaching, learning and/or assessment activities
- selected outcomes and content appropriate to their learning needs
- outcomes from an earlier Stage, using age-appropriate content
- selected Years 7–10 Life Skills outcomes and content appropriate to their learning needs.

Decisions regarding adjustments should be made in the context of collaborative curriculum planning with the student, parent/carer and other significant individuals to ensure that syllabus outcomes and content reflect the learning needs and priorities of individual students.

Further information can be found in support materials for:

- Science and Technology
- Special education needs
- Life Skills Years 7–10.

Gifted and talented students

Gifted students have specific learning needs that may require adjustments to the pace, level and content of the curriculum. Differentiated educational opportunities assist in meeting the needs of gifted students.

Generally, gifted students demonstrate the following characteristics:

- the capacity to learn at faster rates
- the capacity to find and solve problems
- the capacity to make connections and manipulate abstract ideas.

There are different kinds and levels of giftedness. Gifted and talented students may also possess learning difficulties and/or disabilities that should be addressed when planning appropriate teaching, learning and assessment activities.

Curriculum strategies for gifted and talented students may include:

- differentiation: modifying the pace, level and content of teaching, learning and assessment activities
- acceleration: promoting a student to a level of study beyond their age group
- curriculum compacting: assessing a student's current level of learning and addressing aspects of the curriculum that have not yet been mastered.

School decisions about appropriate strategies are generally collaborative and involve teachers, parents and students with reference to documents and advice available from BOSTES and the education sectors.

Gifted and talented students may also benefit from individual planning to determine the curriculum options, as well as teaching, learning and assessment strategies, most suited to their needs and abilities.

Students learning English as an additional language or dialect (EAL/D)

Many students in Australian schools are learning English as an additional language or dialect (EAL/D). EAL/D students are those whose first language is a language or dialect other than Standard Australian English and who require additional support to assist them to develop English language proficiency.

EAL/D students come from diverse backgrounds and may include:

- overseas and Australian-born students whose first language is a language other than English, including creoles and related varieties.
- Aboriginal and Torres Strait Islander students whose first language is Aboriginal English, including Kriol and related varieties.

EAL/D students enter Australian schools at different ages and stages of schooling and at different stages of English language learning. They have diverse talents and capabilities and a range of prior learning experiences and levels of literacy in their first language and in English. EAL/D students represent a significant and growing percentage of learners in NSW schools. For some, school is the only place they use English.

EAL/D students are simultaneously learning a new language and the knowledge, understanding and skills of the Science and Technology syllabus through that new language. They require additional time and support, along with informed teaching that explicitly addresses their language needs, and assessments that take into account their developing language proficiency.

2 Science and Technology key

ⓘ for your information

The following codes will be used in the *Science and Technology K–6 Syllabus.*

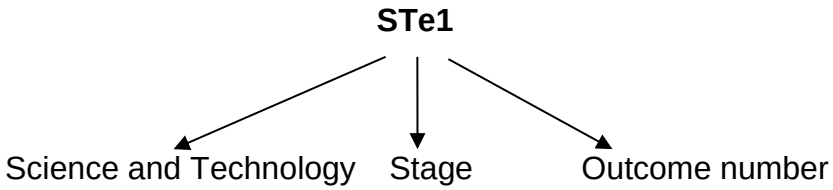
Outcome coding

Syllabus outcomes will be coded in a consistent way. The code identifies the subject, stage, outcome number and the way content is organised.

The stages will be represented by the following codes:

Stage	**Code**
Early Stage 1	e
Stage 1	1
Stage 2	2
Stage 3	3

In the Science and Technology syllabus, outcome codes indicate the subject, stage and outcome number. For example:



Coding of Australian curriculum content

The syllabus will contain Australian curriculum content descriptions for Science and Technology with Australian curriculum codes in brackets at the end of each content description, for example:

> Identify how people design and produce familiar products, services and environments and consider sustainability to meet personal and local community needs (ACTDEK001)

Learning across the curriculum icons

ⓘ for your information

Learning across the curriculum content, including cross-curriculum priorities, general capabilities and other areas identified as important learning for all students, is incorporated and identified by icons in the *Science and Technology K–6 Syllabus.*

Aboriginal and Torres Strait Islander histories and cultures
Asia and Australia's engagement with Asia
Sustainability
Critical and creative thinking
Ethical understanding
Information and communication technology capability
Intercultural understanding
Literacy
Numeracy
Personal and social capability
Civics and citizenship
Difference and diversity
Work and enterprise

3 Rationale

ⓘ for your information

The rationale describes the distinctive nature of the subject and outlines its relationship to the contemporary world and current practice. It explains the place and purpose of the subject in the curriculum, including:

- why the subject exists
- the theoretical underpinnings
- what makes the subject distinctive
- why students study the subject
- how it contributes to the purpose of the *K–10 Curriculum Framework*
- how it prepares students for further schooling.

 consult

Proposed rationale for Science and Technology K–6

Science and Technology K–6 is an integrated study in which students learn about the world around them and how it works. It aims to foster students' sense of wonder and encourages them to embrace new ideas, the unexpected, value risk taking, and learning through trial and error. The course provides students with the skills to investigate and develop informed solutions suitable for a changing world. It provides students with an understanding of the relationship between science and technology and broader learning outcomes of the K–6 curriculum such as in English, Mathematics, HSIE, the Arts and PDHPE.

The study of science and technology develops the building blocks of inquiry, the ability to solve problems and provides opportunities for students to develop an informed understanding based on evidence and reason. These skills enable students to participate responsibly in developing innovative ideas and solutions in response to opportunities and questions relevant to personal, social and environmental issues in their lives. These learning experiences prepare students to contribute to the world as active global citizens both now and into the future.

Science and technology are pedagogically linked as are the processes of inquiry and design. Both use problem solving to promote genuine learning opportunities for students. Through making their solutions students develop a sense of accomplishment and enhance their skills in manipulating tools and materials. Inquiry and design equip students with skills to succeed in a rapidly developing technological world.

Knowledge and understanding in science and technology is developed through practical application which develops students' interest in the world and how it works. Studying science and technology, students learn to question and seek solutions to problems through collaboration, investigation, critical thinking, creative problem solving and making solutions. These are essential skills to support them in managing current and future challenges.

Science and technology fosters curiosity in understanding phenomena and the ability to solve complex problems. It provides students with a sense of achievement through

developing solutions based on reason, defined processes and the practical application of knowledge. These attributes are fundamental to the development of decision making skills.

Actions for writers

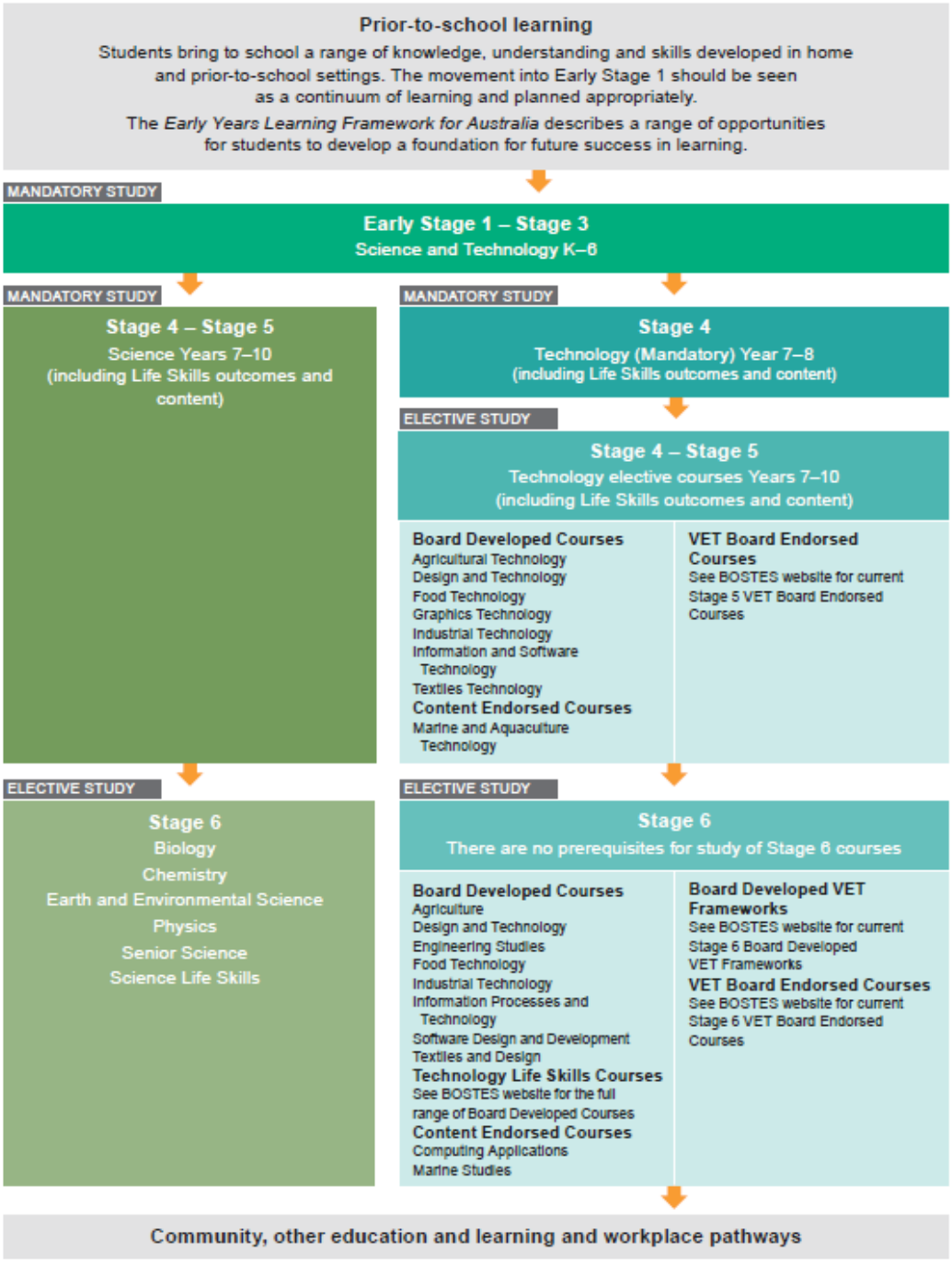
- Review the alignment of the rationale to the aim, objectives and outcomes.
- Review and ensure the rationale states why the subject exists, the theoretical underpinnings and what makes Science and Technology distinctive.
- Review the rationale and consider why students study the subject, how it contributes to the purpose of the *K–10 Curriculum Framework* and how it prepares students for further schooling.
- Review the rationale and ensure it highlights the core skills of a 21st century learner: collaboration, critical thinking, creative thinking and communication.

4 The Place of the *Science and Technology K–6 Syllabus* in the K–12 Curriculum

ⓘ for your information

NSW syllabuses include a diagram that illustrates how the syllabus relates to the learning pathways K–12. This section places the K–6 syllabus in the K–12 curriculum as a whole.

consult



5 Aim

ⓘ for your information

In NSW syllabuses the aim provides a succinct statement of the overall purpose of the syllabus. It indicates the general educational benefits for students from programs based on the syllabus.

The aim, objectives, outcomes and content of a syllabus are clearly linked and sequentially amplify details of the intention of the syllabus.

 consult

Proposed aim for Science and Technology K–6

The aim of Science and Technology K–6 is to foster interest in and enthusiasm for science and technology and stimulate students' curiosity about the world in which they live. Through inquiry and design processes, including making, students explore concepts and gain knowledge and understanding enabling them to plan and develop solutions to meaningful problems.

Actions for writers

- Review the alignment of the aim to the rationale, objectives and outcomes.
- Ensure the aim highlights the core skills and broad educational benefits of studying Science and Technology K–6.
- Ensure the proposed aim reflects the course in its entirety.
- Refine the aim to reflect the purpose and place of Science and Technology K–6 in the curriculum.

6 Objectives

ⓘ for your information

In NSW syllabuses objectives provide specific statements of the intention of a syllabus. They amplify the aim and provide direction to teachers on the teaching and learning process emerging from the syllabus. They define, in broad terms, the knowledge, understanding, skills, values and attitudes to be developed through study in the subject. They act as organisers for the intended outcomes.

 consult

Proposed objectives for Science and Technology K–6

Knowledge and understanding

Students:

- develop knowledge and understanding of the basic needs of living things and their interactions with the physical world around them
- develop knowledge and understanding of how forms of energy, forces and materials are used by people for a purpose
- develop knowledge and understanding of information systems and their application in a connected world

Skills

Students:

- develop and apply skills in the inquiry and design processes in the development of solutions and products
- develop and apply skills including manipulation of data to communicate ideas and concepts using a range of technologies
- develop and apply skills in decision making, drawing conclusions and making products

Values and attitudes

Students value and appreciate the:

- importance and relevance of science and technology in their lives now and into the future
- contribution of science and technology, recognising opportunities and developing solutions for personal, social and global issues
- importance of using evidence and reason to engage with and respond to scientific and technological ideas as informed, reflective citizens
- opportunity to develop solutions to problems and challenges through the application of the inquiry and design processes.

Actions for writers

- Ensure the objectives demonstrate a close alignment with the rationale to define what is distinctive about the course.
- Ensure objectives highlight the knowledge and understanding, and skills that students will gain through the study of Science and Technology K–6.

7 Outcomes

ⓘ for your information

The Australian curriculum does not include outcomes.

In NSW syllabuses, outcomes provide detail about what students are expected to achieve at the end of each Stage in relation to the objectives. They indicate the knowledge, understanding and skills expected to be gained by most students as a result of effective teaching and learning. They are derived from the objectives of the syllabus.

 consult

Proposed objectives and outcomes for Science and Technology K–6

The following draft outcomes are a guide only and may be amended as the syllabus is developed.

<table>
<tr><td colspan="4">Objectives</td></tr>
<tr><td colspan="4">Students:
develop knowledge and understanding of the basic needs of living things and their interactions with the physical world around them
develop knowledge and understanding of how forms of energy, forces and materials are used by people for a purpose
develop knowledge and understanding of information systems and their application in our world</td></tr>
<tr><td colspan="4">A student:</td></tr>
<tr><td>Early Stage 1</td><td>Stage 1</td><td>Stage 2</td><td>Stage 3</td></tr>
<tr><td rowspan="2">STe-1
identifies the basic needs of living things</td><td>ST1-1
examines external features, changes in and growth of living things</td><td>ST2-1
describes the life cycles of living things and how they impact upon the production of food and fibre</td><td>ST3-1
explains how adaptations and behaviours help living things survive and how managed environments support food and fibre production</td></tr>
<tr><td>ST1-2
examines changes in the sky and landscape</td><td>ST2-2
describes changes to the earth as a result of the earth’s rotation, natural processes and human activity over time</td><td>ST3-2
explains changes to the natural and built environment as a result of the earth’s position in the solar system, geological changes and extreme weather conditions</td></tr>
<tr><td>STe-2
identifies that the way objects move depends on a variety of factors</td><td>ST1-3
examines how forces can be used to create movement and build environments</td><td>ST2-3
describes how forces and energy are used by people for a specific purpose</td><td>ST3-3
explains how forces are used and energy is harnessed, transferred and changed from one form to another to benefit our lives</td></tr>
</table>

	ST1-4 identifies characteristics and properties of materials and how they may be combined for a particular purpose	ST2-4 describes the suitability of materials, systems, components for a range of purposes	ST3-4 explains how the properties of materials, systems and components can be changed to alter their suitability for a range of purposes
		ST2-5 describes the role of people in scientific and technological occupations	ST3-5 explains how people in scientific and technological occupations contribute to sustainable design of products and services

Objectives

Students:

- develop and apply skills in the inquiry and design processes in the development of solutions and products
- develop and apply skills including manipulation of data to communicate ideas and concepts using a range of technologies
- develop and apply skills in decision making, drawing conclusions and safely making products

A student:

Early Stage 1	**Stage 1**	**Stage 2**	**Stage 3**
STe-3 observes, collects data and recognises patterns when investigating and making	ST1-5 poses questions, observes, collects data and communicates ideas	ST2-6 conducts investigations, develops and communicates ideas	ST3-6 plans and conducts investigations, develops and communicates ideas
	ST1-6 follows, describes and represents a sequence of steps and decisions needed to solve simple problems	ST2-7 defines simple problems, describes and follows a sequence of steps and decisions needed to solve them	ST3-7 defines problems and uses computational thinking to develop solutions
	ST1-7 uses materials, tools and equipment to test ideas and make designed solutions	ST2-8 selects and uses materials, tools and equipment to test ideas and make designed solutions	ST3-8 collaborates to select, justify and use appropriate technologies to test ideas and make designed solutions

Actions for writers

- Ensure outcomes demonstrate a clear progression from Early Stage 1 to Stage 5.
- Ensure outcomes align with, and amplify the objectives.
- Ensure objectives and outcomes reflect and complement the rationale and aim.
- Ensure outcomes are accessible to assist in developing a more manageable primary curriculum whilst maintaining the integrity of scientific and technological concepts.
- Develop up to seven outcomes in Stage 3.

8 Stage statements

ⓘ for your information

In NSW syllabuses Stage statements summarise the knowledge, understanding, skills, values and attitudes developed by students as a result of achieving the outcomes for each stage of learning.

 consult

Proposed Stage statements for Science and Technology K–6

The following draft Stage statements are a guide only and may be amended as the syllabus is developed.

STAGE 2
By the end of Stage 2, students show interest in and enthusiasm for science and technology. Students investigate real-world problems using processes of inquiry and design, develop communication skills and an understanding of how to collect data through observations, questions and the exploration of ideas. They pose questions, experiment, test, design and make their solutions.

Students investigate the interaction of living things with the environment. They identify natural and manufactured changes in our world and explore and describe observable changes that result from these processes.

Students investigate how the earth rotates on an axis and how the changes on the earth's surface affect human activity. Students investigate that matter takes the form of solids, liquids and gases. They investigate how forces, properties of materials and digital systems affect the behaviour of a product or system.

Actions for writers

- Develop stage statements that describe the achievement of the typical student by the end of the Stage.
- Ensure the stem of the stage statements commences with: By the end of <insert stage> student.
- Ensure Stage statements relate closely to the syllabus outcomes and content.

9 Content

ⓘ for your information

In NSW syllabuses for Kindergarten to Year 10, courses of study and educational programs are based on the outcomes of syllabuses. The content describes in more detail how the outcomes are to be interpreted and used, and the intended learning appropriate for the stage. In considering the intended learning, teachers will make decisions about the sequence, the emphasis to be given to particular areas of content, and any adjustments required based on the needs, interests and abilities of their students.

The knowledge, understanding and skills described in the outcomes and content will provide a sound basis for students to successfully move to the next stage of learning.

 consult

Proposed content structure for Science and Technology K–6

The Science and Technology K–6 syllabus content will be organised into Stages for Early Stage 1 to Stage 3. The outcomes will be categorised in two related strands:

- Knowledge and Understanding
- Skills

The Science and Technology K–6 knowledge and understanding content is to be delivered through the processes of inquiry and design. The proposed four modules are:

- Living World
- Natural World
- Physical World
- Connected World

Living World

The *Living World* module focuses on living things and their interactions with each other and their environment. The module explores the basic needs of living things, and how plants are grown and animals are raised to provide food, clothing and shelter.

Concepts to be addressed

- Living things: living things can be grouped on the basis of observable features and can be distinguished from non-living things.
- Life cycles: living things have life cycles and their growth and survival is dependent on each other and the environment.
- Basic needs of living things: all living things have basic needs that affect their interactions. For example, bio diverse relationships including the use of plant and animal products for food, clothing and shelter.
- Food and fibre: food and fibre production and food technologies used in modern and traditional societies. For example, to enable people to grow and be healthy.

Example inquiry questions

- What are the characteristics of living things?
- How are they different from non-living things?
- What can be used to classify the differences in living things?
- How do living things interact with each other in the environment?
- What are the traits living things need to survive?

Natural World

The *Natural World* module focuses on the world around them and how it works. Students explore the use and application of the earth's resources and how they are used to support living things.

Concepts to be addressed

- Night and day: earth's rotation on its axis causes regular changes, including night and day.
- Daily and seasonal changes: daily and seasonal changes in our environment affect everyday life. Observable changes occur in the sky and landscape.
- Solar systems: the earth is part of a system of planets orbiting around a star (the sun).
- Earth's resources: earth's resources are finite and need to be managed sustainably.
- Characteristics and properties of materials: objects are made of materials that have observable properties that can be altered, combined or joined for a purpose. The suitability of a range of materials, systems, components, tools and equipment and the properties of materials that affect their characteristics or the behaviour of a product or system.
- States of matter: there are three simple states of matter that may change state between a solid, liquid and gas. Solids, liquids and gases have different observable properties and behave in different ways. Changes to materials may be reversible whilst many are irreversible.

Example inquiry questions

- What environments are best for living things to thrive and survive?
- In what ways do living things respond to their environment?
- What are the unique characteristics of our planet? How are they different from other known planets?
- How do the needs of living things vary according to their environments?
- What are some key considerations when designing, constructing products and environments?

Physical World

The *Physical World* module focuses on how and why things are made, produced, move, and use energy. Students explore forces and the way in which forces alter or shape materials, and create movement in products, systems and environments.

Concepts to be addressed

- Light and sound: light and sound are produced by a range of sources and can be sensed. Light from a source forms shadows and can be absorbed, reflected and refracted.
- Motion: the way objects move depends on a variety of factors, including their size and shape. A push or a pull affects how an object moves or changes shape.
- Forces: forces can be exerted by one object on another through direct contact or from a distance. Technologies use forces to create movement, and alter or shape materials for a purpose.
- Energy: energy can be harnessed in many ways and can be transferred or transformed.
- Electricity: electrical energy can be transferred and transformed and can be generated from a range of sources. Energy can control movement, sound or light in products or systems.

Example inquiry questions

- In what ways are energy and movement related? How are they different?
- How does energy affect life on earth?
- What forces are in action when an object is moving?
- How is energy produced, transferred and transformed
- What is the difference between renewable and sustainable energy? How is this different from fossil fuel?

Connected World

The *Connected World* module focuses on communication systems. Students explore different types of data, learn how to interpret patterns and develop skills in algorithmic and computational thinking.

Concepts to be addressed

- Communications: examine how living things communicate and transmit information.
- Digital systems: recognise and explore how hardware and software components interact.
- Data patterns: recognise different patterns in data including coding. Test predications by gathering data and evidence to develop explanations of events and phenomena.
- Data types: recognise that whole numbers are used to represent data in digital systems.
- Networks: explore components of common natural and digital systems and how they connect to form networks to transmit data.

Example inquiry questions

- What are some changes that have occurred in our world due to the introduction of digital technologies?
- What is the purpose of collecting data?
- What methods of information transmission and communication are used to transfer information?
- What are some of the key components of a digital system?
- Identify and examine how information is transmitted in the natural world.

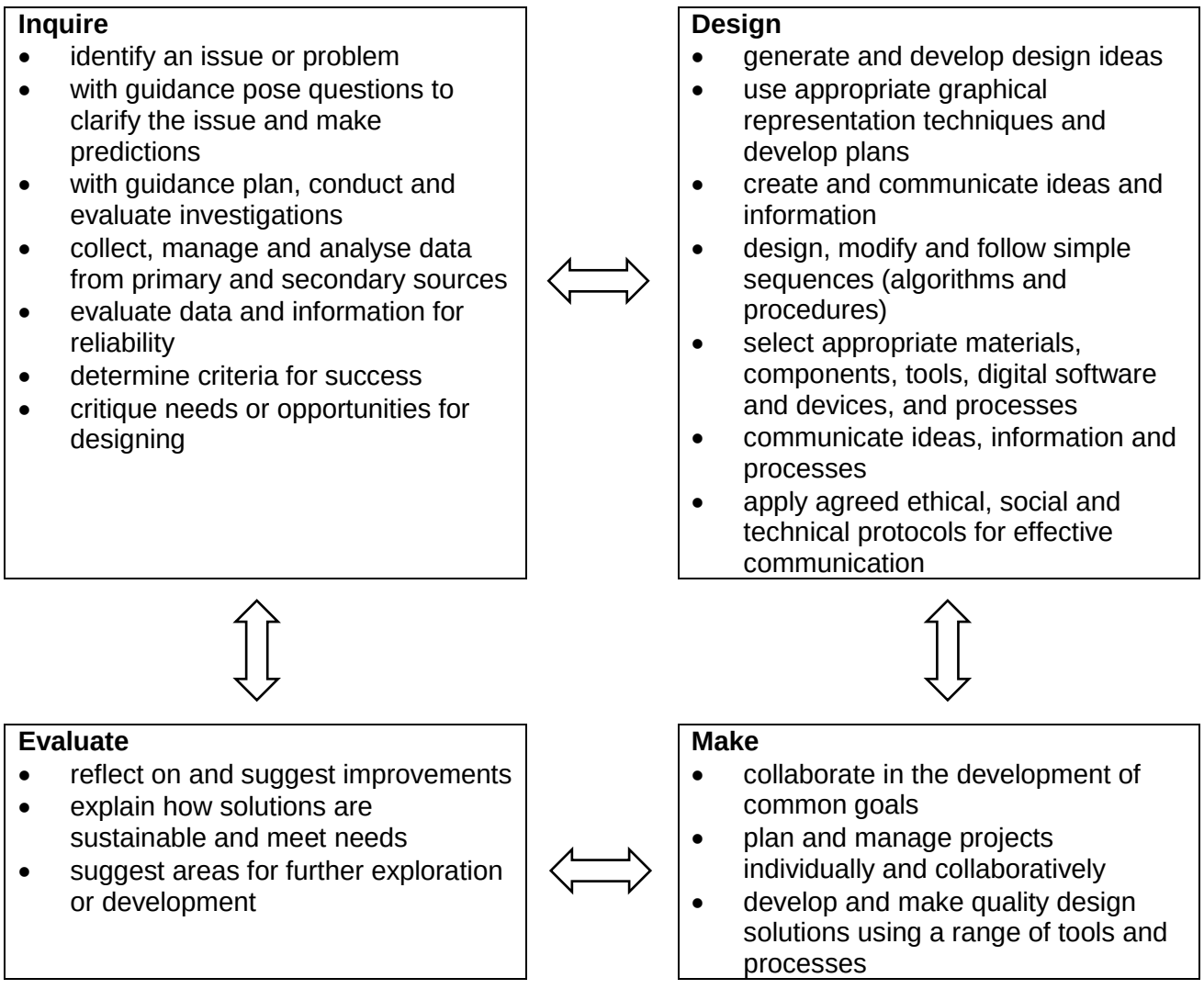
Inquiry and Design Processes

Inquiry and Design Processes are the skills students use to expand their knowledge and understanding of science and technology. Students will apply skills and select appropriate tools and materials when inquiring and designing a 'fit for purpose' solution involving the collection of data and the communication of ideas to solve problems, formulate innovative ideas, then develop and make them.

It is not intended that students will always undertake a complete inquiry and design process. Throughout the years of schooling, inquiry will progressively move from teacher-centred to more student-centred as students develop skills and gain experience with these inquiry and design processes.

The Inquiry and Design Processes are dynamic and non-linear. They are interactive and aspects of the processes are used according to the demands of the task. The processes may be repeated to generate a final, conclusion, result, solution or product. Unexpected results are to be welcomed and used to inspire further inquiry and design.

The components of the Inquiry and Design Processes are:



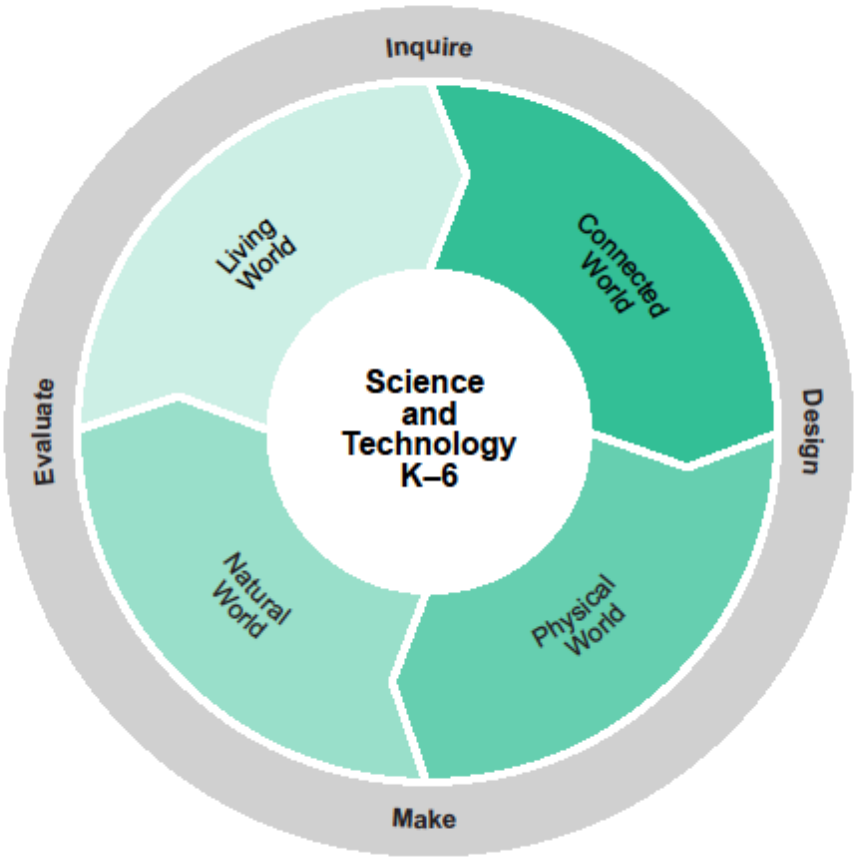
Actions for writers

- Consider Australian Curriculum Technologies content descriptions and modify, supplement or reordered for inclusion in NSW K–10 syllabuses where appropriate.
- Integrate content from the NSW Science and Technology K–6 syllabus.
- Consider Australian Curriculum content elaborations and drawn upon where appropriate. Ensure a clear continuum across all stages of learning.

Proposed NSW *K–6 Science and Technology Syllabus* content organisation

This diagram is a draft and may be amended as the syllabus is developed.

consult



The **Living World** module focuses on living things and their interactions with each other and their environment. The module explores the basic needs of living things, and how plants are grown and animals are raised to provide food, clothing and shelter.

The **Natural World** module focuses on the world around them and how it works. Students explore the use and application of the earth's resources and how they are used to support living things.

The **Physical World** module focuses on how and why things are made, produced, move, and use energy. Students explore forces and the way in which forces alter or shape materials, and create movement in products, systems and environments.

The **Connected World** module focuses on communication systems. Students explore different types of data, learn how to interpret patterns and develop skills in algorithmic and computational thinking.

Learning across the curriculum

ⓘ for your information

BOSTES has described learning across the curriculum areas that are to be included in syllabuses. In K–10 syllabuses, the identified areas will be embedded in the descriptions of content and identified by icons. Learning across the curriculum content assists students to achieve the broad learning outcomes defined in the BOSTES *K–10 Curriculum Framework* and *Statement of Equity Principles,* and in the *Melbourne Declaration on Educational Goals for Young Australians* (December 2008).

Knowledge, understanding, skills, values and attitudes derived from the learning across the curriculum areas will be included in BOSTES syllabuses, while ensuring that subject integrity is maintained.

The learning across the curriculum areas include the cross-curriculum priorities and general capabilities from the Australian curriculum as well as other areas identified by BOSTES as important learning for all students.

Cross-curriculum priorities enable students to develop understanding about and address the contemporary issues they face.

The cross-curriculum priorities are:

- Aboriginal and Torres Strait Islander histories and cultures
- Asia and Australia's engagement with Asia
- Sustainability

General capabilities encompass the knowledge, skills, attitudes and behaviours to assist students to live and work successfully in the 21st century.

The general capabilities are:

- Critical and creative thinking
- Ethical understanding
- Information and communication technology capability
- Intercultural understanding
- Literacy
- Numeracy
- Personal and social capability

BOSTES syllabuses include other areas identified as important learning for all students:

- Civics and citizenship
- Difference and diversity
- Work and enterprise

Writers will draw on the explanations already provided in the Australian curriculum cross-curriculum priorities and general capabilities, the NSW cross-curriculum content statements and further research, to develop statements that analyse and describe the representation of the learning across the curriculum areas in the *Science and Technology K–6 Syllabus.*

 consult

Proposed learning across the curriculum statements

These statements are a draft and may be amended as the syllabus is developed.

Aboriginal and Torres Strait Islander histories and cultures

Aboriginal and Torres Strait Islander communities have diverse cultures, social structures and a history of unique, complex knowledge systems. The *Science and Technology K–6 Syllabus* provides students with opportunities to learn about how Aboriginal and Torres Strait Islander peoples have developed and refined knowledge about the world through observation, making predictions, testing (trial and error) and responding to environmental factors within specific contexts. Students will investigate examples of Aboriginal and Torres Strait Islander peoples' understanding of the environment and the ways that traditional knowledge and western scientific knowledge can be complementary.

When planning and programming content relating to Aboriginal and Torres Strait Islander histories and cultures teachers are encouraged to consider involving local Aboriginal communities and/or appropriate knowledge holders in determining suitable resources, or to use Aboriginal or Torres Strait Islander authored or endorsed publications.

Information and communication technology capability

Information and communication technology (ICT) can be used effectively and appropriately to access, create and communicate information and ideas, solve problems and work collaboratively. The *Science and Technology K–6 Syllabus* provides students with opportunities to develop ICT capability when they develop design ideas and solutions, research science concepts and applications, investigate science phenomena, and communicate their scientific and technological understandings. In particular they learn to access information, collect, analyse and represent data, model and interpret concepts and relationships, and communicate scientific and technological ideas, processes and information. Digital technologies and aids, such as animations and simulations, provide opportunities to view phenomena and test predictions that cannot be investigated through practical experiences in the classroom, and may enhance students' understanding and engagement with science and technology.

Actions for writers

- Analyse the proposed Science and Technology K–6 Learning Across the Curriculum descriptions and identify opportunities where they can be strengthened.
- Align statements with syllabus objectives, outcomes and content.
- Ensure the approach taken in the learning area maintains a consistent expectation with the approaches used for Learning Across the Curriculum in other K–10 syllabuses.
- Identify opportunities for integrated approaches to Science and Technology and other learning areas in the K–6 curriculum.

Draft content sample page

The following sample content page indicates the way in which Australian curriculum content may be built upon and integrated in the NSW syllabus.

Living World — Early Stage 1

OUTCOMES

A student:

identifies the basic needs of living things STe-1

identifies that the way objects move depends on a variety of factors STe-2

observes, collects data and recognises patterns when investigating and making STe-3

CONTENT FOCUS

The *Living World* module focuses on living things and their interactions with each other and their environment. The module explores the basic needs of living things, and how plants and animals are grown to provide food, clothing and shelter.

INQUIRY QUESTION: **What are living things?**

Students

- examine a living thing to explain what the essential requirements for it to live (air (oxygen), food, water and shelter)
- explore how plants are grown to produce air (oxygen)
  - explore how changes in the environment can affect the growth of plants
- investigate some plants and animals that are grown to provide food for example corn, wheat, cane. For example;
  - investigate how plants are grown
  - explore how food is selected for healthy eating
- identify how plant and animal products are used to develop clothing
- identify how plants are made into materials and used to develop shelters. For example;
  - explore the characteristics and properties of materials (ACTDEK004)
  - investigate how the characteristics of materials, including their shape can affect the way they move
  - investigate why materials have been used in the development of familiar shelters

10 Assessment

ⓘ for your information

Specific assessment advice relating to Science and Technology K–6 will be provided in support materials.

Standards

The Board of Studies, Teaching and Educational Standards NSW (BOSTES) *K–10 Curriculum Framework* is a standards-referenced framework that describes, through syllabuses and other documents, the expected learning outcomes for students.

Standards in the framework consist of three interrelated elements:

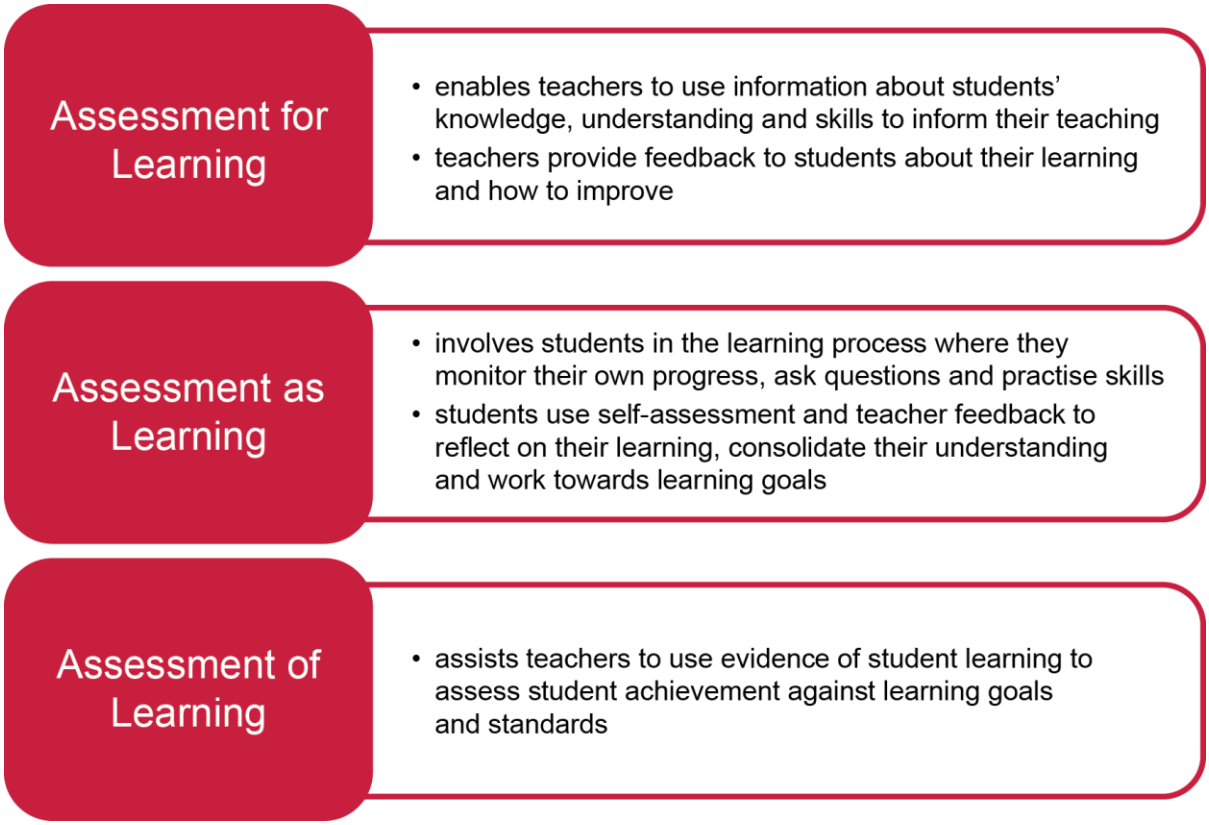
- outcomes and content in syllabuses showing what is to be learned
- Stage statements that summarise student achievement
- samples of work on the BOSTES Assessment Resource Centre (ARC) website which provide examples of levels of achievement within a Stage.

Syllabus outcomes in Science and Technology K–6 contribute to a developmental sequence in which students are challenged to acquire new knowledge, understanding and skills.

Assessment

Assessment is an integral part of teaching and learning. Well-designed assessment is central to engaging students and should be closely aligned to the outcomes within a Stage. Effective assessment increases student engagement in their learning and leads to enhanced student outcomes.

Assessment for Learning, Assessment as Learning and *Assessment of Learning* are three approaches to assessment that play an important role in teaching and learning. The BOSTES Years K–10 syllabuses particularly promote *Assessment for Learning* as an essential component of good teaching.



Further advice on programming and appropriate assessment practice in relation to the Science and Technology K–6 syllabus is contained on the BOSTES website. This support material provides general advice on assessment as well as strategies to assist teachers in planning education programs.

Assessment for students with special education needs

Some students with special education needs will require adjustments to assessment practices in order to demonstrate what they know and can do in relation to syllabus outcomes and content. The type of adjustments and support will vary according to the particular needs of the student and the requirements of the activity. These may be:

- alternative formats for responses, for example written point form instead of essays, scaffolded structured responses, short objective questions or multimedia presentations
- adjustments to assessment activities, for example rephrasing questions, using simplified language, fewer questions or alternative formats for questions
- adjustments to the assessment process, for example additional time, rest breaks, quieter conditions, or the use of a reader and/or scribe or specific technology.

It is a requirement under the *Disability Standards for Education 2005* for schools to ensure that assessment tasks are accessible to students with a disability. Schools are responsible for any decisions made at school level to offer adjustments to course work, assessment tasks and in-schools tests.

Further examples of adjustments to assessment for students with special education needs and information on assessment of students undertaking Life Skills outcomes and content can be found in support materials for:

- Science and Technology K–6
- Special education needs
- Life Skills Years 7–10.

Reporting

Reporting is the process of providing feedback to students, parents and other teachers about student progress.

Teachers use assessment evidence to extend the process of *Assessment for Learning* into their *Assessment of Learning*. In a standards-referenced framework, teachers make professional judgements about student achievement at key points in the learning cycle. These points may be at the end of a Year or Stage, when schools may wish to report differentially on the levels of knowledge, understanding and skills demonstrated by students.

Descriptions of student achievement in Science and Technology K–6 provide schools with a useful tool to report consistent information about student achievement to students and parents, and to the next teacher to help plan the next steps in the learning process.

The A–E grade scale or equivalent provides a common language for reporting by describing observable and measurable features of student achievement at the end of a Stage, within the indicative hours of study. Teachers use the descriptions of the standards to make a professional, on-balance judgement, based on available assessment information, to match each student's achievement to a description. The Common Grade Scale (A–E) or equivalent is used by teachers to report student levels of achievement from Stages 1 to 5.

For students with special education needs, teachers may need to consider, in consultation with their school and sector, the most appropriate method of reporting student achievement. It may be deemed more appropriate for students with special education needs to be reported against outcomes or goals identified through the collaborative curriculum planning process. There is no requirement for schools to use the Common Grade Scale (A–E) or equivalent to report achievement of students undertaking Life Skills outcomes and content.

11 Glossary

ⓘ for your information

This section will draw on *the Australian Curriculum Technologies* glossary developed by ACARA and the NSW *Science and Technology K–6* glossary. Writers will review and refine the glossary to identify additional terminology and definitions to be included.

Actions for writers

- Review the current NSW Science and Technology K–6 glossary and identify terminology that will be relevant in the revised NSW syllabus.
- Review the Australian Curriculum Technologies glossary and identify terminology that will be relevant in the revised NSW syllabus.
- Include only subject specific terminology.