

WHAT HAS CHANGED AND WHY?

Proposed revisions to the Foundation – Year 10 (F–10) Australian Curriculum: Science

Overview

This document summarises the proposed revisions to the F–10 Australian Curriculum: Science presented in the consultation version and provides an explanation for the changes.

The proposed revisions make clear the essential Science knowledge, understanding and skills students need to be confident and creative individuals, successful lifelong learners and active, informed members of the community. These revisions also ensure our curriculum remains world class.

The current F–10 Australian Curriculum: Science was first published in 2010, and since then, there have been shifts in science knowledge and science education research. Over that time, we have also seen an increase in the availability of quality, evidence-based teaching and learning resources and teacher professional learning support. Internationally, there has been an increased focus on the core concepts of science, often referred to as the ‘big ideas’ of science. Drawing on this body of knowledge, the review of the F–10 Australian Curriculum: Science looked to identify core content, improve the conceptual sequence of content and give teachers greater clarity and guidance about what they are expected to teach.

A key proposed change is a revision of the content descriptions in the *science understanding* and *science as a human endeavour* strands to remove ambiguity and give better guidance to teachers about what to teach. Original content descriptions were framed as propositions, such as: ‘Living things depend on each other and the environment to survive’. These have been reframed to provide greater detail and to limit the required breadth and depth of the content description, such as: ‘Investigate the roles and interactions of consumers, producers and decomposers within a habitat and how food chains represent feeding relationships’.

A common verb has been used for all content descriptions in the *science understanding* and *science as a human endeavour* strands: across F–2, ‘explore’ has been used; and across Years 3–10, ‘investigate’ has been used. The use of these verbs strengthens alignment with the *science inquiry* strand, and the content descriptions within *science inquiry* clearly articulate the expectations associated with ‘exploring’ or ‘investigating’ at each year level.

The *science understanding* strand has been the primary focus for reducing content in the Australian Curriculum: Science. This strand is where teachers identify the key science content and topics they teach their students. Clarifying the depth and breadth of content in the *science understanding* strand and strengthening alignment across all three strands will enable teachers to focus on the essential knowledge, understandings and skills.

Content that does not align with the Australian Curriculum: Science core concepts has been removed. Content has also been removed when it has been identified as being more effectively or

deeply developed in other learning areas. Some content descriptions across F–6 have been consolidated to refine and streamline the conceptual sequence across each sub-strand, and aspects of some F–6 content descriptions have been reallocated to 7–10.

The *science inquiry skills* strand has been renamed as *science inquiry* in line with international trends to emphasise that science practices include both a skill and cognitive dimension. In the *science inquiry* strand, content has been refined to more clearly articulate progression and differentiate cognitive and skill demand across each band. Intercultural inquiry skills, essential for conducting science inquiry in the Australian context, have been added, and the core inquiry skills of modelling and argumentation have been strengthened within the content descriptions.

In the *science as a human endeavour* strand, content at F–6 has been reframed to ensure that students learn about the nature of science through a focus on how scientists engage in inquiry. This complements the *science inquiry* strand, in which students develop their own inquiry practices. Across 7–10, the conceptual sequence of the strand has been refined, with revisions focusing on strengthening students' understanding of the relationship between science and society, and the key role played by science communication in mediating that relationship.

The year level descriptions and achievement standards have been revised to focus on the core concepts and key ideas and to clearly indicate expected rigour. Inquiry questions have been added to the year level descriptions to support the curriculum's focus on inquiry. The content elaborations have also been reviewed and refined to ensure they provide helpful, authentic examples to teachers and demonstrate connections both within Science and across the Australian Curriculum.

The consultation version of the F–10 Australian Curriculum: Science does not include:

- the glossary, student work samples and other support resources – these materials will be revised once the consultation process has been completed
- 'tagging' to show where general capabilities and cross-curriculum priorities are incorporated in the content descriptions and elaborations – these connections will be made explicit when the updated curriculum is published on the website.

The terms of reference for the Australian Curriculum Review also directed ACARA to improve the digital presentation of the Australian Curriculum in line with agreed revisions and teachers' user experience. In parallel with the content review process, ACARA is undertaking a redesign to improve the functionality of the current [Australian Curriculum website](#). The aim is for the updated version of the F–10 Australian Curriculum to be available on a new Australian Curriculum website for the start of 2022. The current Australian Curriculum website will also remain live to support jurisdictions and teachers to plan for transition to the updated curriculum.

Proposed revisions to the introductory sections of the F–10 Australian Curriculum: Science

	Nature of the revision	Rationale for the revision
Rationale	Minor revisions	The sentence order has been revised to provide a more engaging introduction, and minor revisions have been made to reduce the word length.
Aims	Minor revisions	Language has been aligned to the core concepts and repetition has been removed. The phrase ‘understanding the diversity of science careers’ has been removed from the aims; while the elaborations seek to illustrate some of this diversity, this focus has been removed from the content descriptions (see below).
Organisation of the learning area	This section still describes how the curriculum is structured. It now also includes an overview of the learning area core concepts – those big ideas, understandings, skills or processes central to the Science curriculum.	<p>The terms of reference for the Review required ACARA to look to refine and reduce content by identifying core concepts. In the review process, core concepts were used to identify the essential content students should learn to develop a deep and increasingly sophisticated understanding of science.</p> <p>The notion of core concepts is not new to Science. The current curriculum outlines the core concepts that frame each sub-strand of the <i>science understanding</i> strand. These concepts have been retained with minor modifications, and core concepts have been developed for all strands.</p> <p>The current curriculum also describes key ideas that support the coherence and development of science knowledge within and across year levels. These key ideas have been retained to support the core concepts.</p>
	The <i>science inquiry skills</i> strand has been renamed as <i>science inquiry</i> . The sub-strand <i>processing and analysing data and information</i> has been renamed as <i>processing, modelling and analysing</i> .	<p>The <i>science inquiry</i> strand has been refined to reflect contemporary emphases on science practices, particularly those of modelling and argumentation. The strand has been renamed to acknowledge that science practices involve both skill and cognitive dimensions.</p> <p>The sub-strand <i>processing and analysing data and information</i> has been renamed as <i>processing, modelling and analysing</i> to align it with other sub-strand naming conventions, and</p>

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	Nature of the revision	Rationale for the revision
		to emphasise the importance of modelling as core science inquiry practice. Content from the <i>processing, modelling and analysing sub-strand</i> related to evaluation of data to develop explanations has been reallocated to the <i>evaluating</i> sub-strand where it is a better fit.
Key connections	<p>This is a new section in the introduction. It replaces the learning area-specific information sheets on general capabilities and the learning area-specific advice for the cross-curriculum priorities, currently published separately from the Science curriculum.</p> <p>This section also outlines key connections to other learning areas.</p>	<p>This new section makes transparent the connections across the three dimensions of the Australian Curriculum. It provides teachers with clear information about the key relationships of Science to the general capabilities and cross-curriculum priorities, specifically highlighting those that have the most authentic fit and provide meaningful learning using the learning area context. It also highlights the important opportunities to connect Science with other learning areas' content, which is particularly useful for primary teachers.</p>
Key considerations	<p>This is a new section that contains information about safety, ethics and protocols for engaging with First Nations Australians.</p>	<p>This section is about the key matters teachers should consider when planning for and teaching the curriculum. In the case of Science, these key considerations focus on issues of safety and ethics as they relate to science investigations, and to appropriate cultural protocols for engaging with First Nations Australians.</p>

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Proposed revisions to the curriculum content of the F–10 Australian Curriculum: Science

	Nature of the revision	Rationale for the revision
Year level descriptions	The year level descriptions have been revised to reduce repetition and to strengthen the focus on the relationship between the core concepts and the key ideas as they develop at each year level. Sample inquiry questions have also been added.	The year level descriptions have been shortened to improve readability and to focus on the core concepts and key ideas that underpin each year level. Sample inquiry questions have been added to support the curriculum focus on inquiry. The inquiry questions have been designed to support teachers to frame student-friendly discussions to develop an understanding of the core concepts.
Achievement standards	The achievement standards have been revised to improve their quality and alignment to the content descriptions.	The revised achievement standards have clearer alignment with the essential content described in the content descriptions, strengthened cognitive alignment and improved consistency and clarity of language. The achievement standards clearly describe the expected quality of learning students should typically be able to demonstrate by the end of each year. Presenting the achievement standards in the same order in each year level supports teachers to see the progression of expected achievement across the year levels. This consistent approach to presenting the information in the achievement standards particularly supports primary school teachers.
Content descriptions	Many of the content descriptions have been revised, refined and realigned to ensure they specify essential science content that students learn and to give clarity to teachers about what to teach. The content descriptions in the <i>science understanding</i> and <i>science as a human endeavour</i> strands have been rewritten to begin with a verb to provide greater clarity. Some content has been removed and content has been realigned in order to strengthen conceptual progression across year levels. In some instances, content descriptions have been split into two, in others, content	The revised content descriptions clearly specify the essential knowledge, understanding and skills in each year. They have been improved to: <ul style="list-style-type: none"> remove ambiguity and ensure the meaning and expectations are clear to teachers remove unnecessary duplication and repetition within the Science curriculum and with other learning area curricula ensure consistency and clarity of language reflect new evidence and research developments in science. All content descriptions in the <i>science understanding</i> and <i>science as a human endeavour</i> strands have been revised to begin with the same verb: 'explore' is used in F–2 and 'investigate' is used in Years 3–10. The use of these verbs strengthens alignment with the

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	Nature of the revision	Rationale for the revision
	descriptions have been combined.	<p><i>science inquiry</i> strand and the content descriptions within <i>science inquiry</i> clearly articulate the expectations associated with ‘exploring’ or ‘investigating’ at each year level.</p> <p><i>Details of the specific content changes are presented separately in Table 1 below.</i></p>
Content elaborations	Content elaborations have been revised or deleted, and new elaborations that align with revised content descriptions and improve their usefulness to teachers have been developed.	<p>The revised content elaborations provide teachers with improved suggestions and illustrations of ways to teach the content descriptions. They illustrate and exemplify the content descriptions with a diverse range of relevant examples, clearly unpacking the content description. They now target the general capabilities and cross-curriculum priorities that provide the most appropriate and authentic opportunities to enrich the content of Science.</p> <p>The revised content descriptions also aim to illustrate opportunities to integrate the three strands and to represent the diversity of scientists and science careers.</p>

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Table1: Details of proposed content revisions to the F–10 Australian Curriculum: Science

Nature of the content revision	Rationale for the revision
Content removed or reduced	
<p>Year 2</p> <p>Use of Earth’s resources has been removed from the <i>science understanding</i> strand.</p>	<p>This content has been removed as it did not align with the core concepts for <i>Earth and space sciences</i>. Elaborations have been added across <i>science understanding</i> F–10 to develop and explore resources and their uses.</p>
<p>Year 2</p> <p>The content description about combining materials for a purpose has been removed from the <i>science understanding</i> strand.</p>	<p>This content has been absorbed into the Foundation content description, focused on objects as combinations of materials. The concept of combining materials for a purpose can be further explored within the Year 4 content description that investigates properties and uses of materials. These changes have been made to improve the sequence of learning.</p>
<p>Year 6</p> <p>Content about effects of sudden geological changes and extreme weather has been removed from the <i>science understanding</i> strand.</p>	<p>This content has been removed from Year 6 Science because it did not enable an age-appropriate explanatory model for geological changes and extreme weather: these models are developed in Years 7–10. Students continue to have opportunities to learn about these phenomena: phenomena associated with geological changes are now explored in Science at Year 8 with a focus on plate tectonics, and HASS explores the weather-related phenomena of flood and fire at Year 6. This change to Year 6 Science removes duplication with HASS.</p>
<p>Years 7 and 8</p> <p>Science in occupations content has been removed from the <i>science as a human endeavour</i> strand.</p>	<p>This content has been removed as it does not align with the core concepts. Career education is not limited to science and should begin in primary school, emphasising the diversity of opportunities and pathways. Diverse science careers are illustrated through elaborations across the entire F–10 curriculum.</p>
<p>Year 9</p> <p>Content about ecosystems has been removed from the <i>science understanding</i> strand.</p>	<p>This content has been removed as students explore ecosystems with a focus on matter and energy flow at Year 7, and this content description was effectively a repeat of that content. At Year 9, further examination of matter and energy flow occurs through the lens of the <i>Earth and space sciences</i> sub-strand with a focus on the carbon cycle and interactions between Earth’s spheres.</p>
<p>Years 9 and 10</p> <p>Content about evaluating claims has been removed from the <i>science as a human endeavour</i> strand.</p>	<p>Evaluating claims content has been removed as it duplicated content under the <i>science inquiry</i> strand.</p>

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Nature of the content revision	Rationale for the revision
<p>Years 9 and 10</p> <p>Career opportunities content has been removed from the <i>science as a human endeavour</i> strand.</p>	<p>Career opportunities content has been removed as it does not align with the core concepts. Career education is not limited to science and should begin in primary school, emphasising the diversity of opportunities and pathways. Diverse science careers are now illustrated in elaborations across F–10.</p>
Content resequenced and realigned	
<p>From Foundation to Year 1</p> <p><i>Science understanding</i> strand: needs of living things content has been merged.</p>	<p>This content is closely related to the Year 1 focus on habitats as places where living things meet their needs, so the two content descriptions have been combined at Year 1.</p>
<p>From Foundation to Year 1</p> <p><i>Science understanding</i> strand: daily and seasonal changes content has been merged.</p>	<p>This content is closely related to the focus on observable changes in the sky and landscape at Year 1, so the two content descriptions have been combined at Year 1.</p>
<p>From Year 1 to Foundation</p> <p><i>Science understanding</i> strand: external features of living things have been moved.</p>	<p>This content is more appropriate at Foundation, where the focus is on describing features and properties.</p>
<p>From Year 1 to Year 2</p> <p><i>Science understanding</i> strand: physical changes to materials have been moved.</p>	<p>This content has been moved to balance the amount of content to be taught across F–3. Balancing content distribution includes consideration of conceptual progression, alignment of content within each year level and total teaching time required as a product of the expected breadth and depth of each content description.</p>
<p>From Year 1 to Year 2 and from Year 2 to Year 1</p> <p><i>Science understanding</i> strand: content about sound and push and pull forces has been moved between years.</p>	<p>This content has been moved to introduce the concept of push and pull forces before exploring the concept that vibrations, which cause sound, are the result of a push or pull force.</p>
<p>From Year 3 to Year 2</p> <p><i>Science understanding</i> strand: grouping living things, and classification of living and non-living content has been moved.</p>	<p>Classification of living and non-living things has been moved to Year 2 and consolidated with life cycles of living things to enable the introduction of the concept of interdependencies at Year 4 and to balance content across F–3.</p>
<p>From Year 3 to Year 5</p> <p><i>Science understanding</i> strand: day and night content has been moved.</p>	<p>The relationship between Earth and the sun that causes day and night requires students to understand movement of these bodies in 3-dimensional space and can be complex for early learners to grasp.</p>

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	Teachers often need to re-teach this content, so it has been consolidated with the solar system content at Year 5.
From Year 4 to Year 2 <i>Science understanding</i> strand: Life cycles content has been moved.	Life cycles content has been moved to Year 2 and consolidated with the classification of living and non-living things to enable the introduction of the concept of interdependencies at Year 4 and to balance content across F–3.
From Year 8 to Year 6 <i>Science understanding</i> strand: Rock cycle content has been resequenced.	This content has been moved to build on the understanding of the dynamic nature of the geosphere introduced via a focus on weathering, erosion and deposition at Year 4, and to provide an introduction to plate tectonics at Year 8. Introduction of geological timescales and appreciation of the scales over which phenomena occur builds on the focus on astronomical scales and the particulate nature of matter (sub-microscopic scales) at Year 5.
From Year 8 to Year 7 <i>Science understanding</i> strand: Particle theory content has been resequenced.	This content has been moved in line with international trends and current research. It provides an explanatory model for distinguishing between types of substances and separation of mixtures, which is also taught at Year 7.
From Year 9 to Year 8 <i>Science understanding</i> strand: Energy transfer in chemical reactions content has been moved and combined in Year 8.	This content has been moved and combined with chemical change. It now aligns with the classification of different types of energy also taught at this level.
From Year 9 to Year 8 <i>Science understanding</i> strand: Plate tectonics content has been moved.	This content has been moved to align with types of energy at Year 8 and to build on the effect of forces in Year 7.
From Year 10 to Year 9 <i>Science understanding</i> strand: Carbon cycle content has been moved.	This content has been moved to introduce interactions between Earth's spheres through matter cycling before models of climate change are examined.
From Year 10 to Year 9 <i>Science understanding</i> strand: Energy conservation content has been realigned.	This content has been moved to align with the carbon cycle, energy transformations and conservation of mass at the same level.
Content separated and emphasised	
Foundation	This content has been split from the current F–2 content description to align with a common Foundation year across all learning areas and as

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<p><i>Science as a human endeavour</i> strand: Scientists use observation and questioning content has been separated.</p>	<p>a core understanding of how students' inquiry practices align with those of scientists.</p>
<p>Year 6 and Year 7 to Year 8 <i>Science understanding</i> strand: Electricity generation has been separated from Year 6 content and renewable/non-renewable resources from Year 7; both have been moved to Year 8.</p>	<p>This content has been combined in a new content description at Year 8, which addresses renewable and non-renewable energy sources used for electrical energy generation, and the energy transfers and transformations that take place in these processes. This aligns with the focus on types of energy at Year 8. It enables a focus on electricity in Years 7–10 and an exploration of Australia's energy future.</p>
<p>Year 9 <i>Science understanding</i> strand: Content related to chemical reactions in living and non-living systems, and chemical reactions involve energy changes has been separated.</p>	<p>This content has been separated into two content descriptions. Key chemical reactions have been included in the carbon cycle at Year 9, and energy changes have been included in Year 8 chemical sciences.</p>
<p>Year 9 <i>Science understanding</i> strand: Sexual and asexual reproduction content has been given greater emphasis.</p>	<p>This content was previously included in Year 8 body systems and revisited within the Year 10 heredity content. Teaching it explicitly at Year 9 provides a strong basis for Year 10.</p>
<p>Year 10 <i>Science understanding</i> strand: Models of climate change have been given greater emphasis.</p>	<p>This content was taught in many schools within an exploration of the global carbon cycle. The carbon cycle has been moved to Year 9 (see above). By focusing on models of energy flow between Earth's spheres, this content now enables a deeper exploration of the science underpinning climate models.</p>
Content revised and reframed	
<p>Foundation – Year 10 All content in the <i>science understanding</i> strand has been revised.</p>	<p>All content descriptions in the <i>science understanding</i> strand have been revised to provide a clearer focus on core content and to remove ambiguity about what is to be taught.</p>
<p>F–6 Nature of science in the <i>science as a human endeavour</i> strand has been reframed.</p>	<p>This content has been reframed to focus on how scientists do science, rather than repeating the science skills at the same level. Students can now connect their science inquiry with the actual work of scientists, which is the recommended approach in education research.</p>

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<p>Years 7 and 8</p> <p>Content about global contributions in the <i>science as a human endeavour</i> strand has been revised.</p>	<p>This content currently focuses on scientists' 'culture'. Scientists' values, beliefs and actions are shaped by their world views and by the socio-cultural environment in which they are working; this content description has been reframed to align with this focus.</p>
<p>Years 7–10</p> <p>Influence of science on society in the <i>science as a human endeavour</i> strand has been reframed.</p>	<p>Content has been reframed to align with core concepts for <i>science as a human endeavour</i> and to enable students to appreciate the importance of science communication.</p>
<p>Years 7–10</p> <p>Making evidence-based conclusions has been repositioned in the <i>science inquiry</i> strand.</p>	<p>Making evidence-based conclusions has been repositioned from the <i>processing, modelling and analysing</i> sub-strand to the <i>evaluating</i> sub-strand in order to emphasise the need to evaluate supporting evidence before forming a conclusion.</p>
Content added	
<p>Foundation</p> <p>Content for the <i>evaluating</i> sub-strand has been added to the <i>science inquiry</i> strand.</p>	<p>This content has been added to reflect the importance of critical and creative thinking in the early years.</p>
<p>Year 3</p> <p>The water cycle has been added to the <i>science understanding</i> strand.</p>	<p>This content has been introduced to link chemical and physical processes with observable changes and to provide a basis for understanding weathering, erosion and deposition in Year 4.</p>
<p>Year 5</p> <p>Particulate nature of matter has been added to the <i>science understanding</i> strand.</p>	<p>This content has been introduced in line with international trends in curriculum: recent education research indicates that students can benefit from exploring phenomena at macroscopic and sub-microscopic levels in parallel.</p>
<p>Year 5–10</p> <p>Content about intercultural inquiry practices has been added to the <i>science inquiry</i> strand.</p>	<p>Intercultural inquiry practices associated with field work and use of secondary data have been introduced. These reflect actions within the Australian scientific community to adhere to protocols for accessing Country or Place and to recognise the contributions of, learn from, work collaboratively with, and protect the intellectual property of First Nations Australians.</p>

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