

1. Key Messages

- The Australian Science Teachers Association (ASTA) supports attempts by ACARA to improve the curriculum by rationalising content progression from Foundation to Year 10.
- The revised curriculum makes it more clear to teachers the breadth and depth of what should be taught at each year level, whilst making the investigative nature of science more explicit.
- The changes to the Science Inquiry strand will enable students to apply a greater range of skills when carrying out investigations and presenting their findings.
- Importantly, ASTA recognises that there will be significant implementation challenges in terms of resourcing and teacher professional development for primary teachers of science to ensure their confidence in, and ownership of the curriculum and to facilitate improved understanding and continued engagement of their students.

2. Introductory elements

2.1 Rationale / Aims / Structure

ASTA supports the retention of the Rationale, Aims and overall structure of the Australian Curriculum: Science and encourages teachers to use these to help frame their school-based curricula. The double layer of Core Concepts within each strand and the overarching Key Ideas makes sense as a curriculum framework, but could potentially be seen as another level of complexity for teachers. To alleviate this risk, it would make sense to use the language of the Key Ideas, for example *Matter and energy*, and *Form and function* more in the content descriptions as well as the year level statements. This would bring teachers and students back to the consideration of this Key Ideas if that is the chosen aim. A suggestion is that if these Key Ideas are titled 'Key Ideas of Science', or 'Key Scientific ideas' or 'Big Ideas of Science' it would differentiate them more from the strand specific Core Concepts.

2.2 Key Connections

There are specific references to the Cross Curriculum Priorities later in this paper, but overall this section is useful. The connections to other learning area content, once finalized, should be made more specific (Year level and strands) either in this section, or in the Year Level Descriptions, or linked/tagged to content descriptions. This will reduce the risk of these connections not being identified by teachers or curriculum planners in schools.

2.3 Key considerations

ASTA notes that safety within science education in our schools of vital importance and supports ACARA in highlighting this issue here. We also note that some national organisations providing advice on Immunology, Allergies and Animal Ethics are quoted in this section. However the one national service, Science ASSIST with previous federal government funding, providing advice on laboratory safety in Australian Schools is not yet included. (<https://assist.asta.edu.au/>)

3. Curriculum Elements

3.1 Science Understanding

In its earlier feedback to ACARA, ASTA's position was that the Science Curriculum did not require a significant reduction in Science Understanding content and that perceived overcrowding more as a result of lack of clarity around the role of the **Elaborations** and some areas where the structure of the curriculum made it challenging to integrate aspects of the curriculum into a fluent school based curriculum. Hence ASTA supports the retention of most of the existing Science understanding content. There is evidence of improvement in the clarity of progression of conceptual demand through the curriculum and how some content has been reduced by avoiding duplication of across learning areas. However, there are some concerns that the amount of Science Understanding content

will risk not allowing enough time for in-depth Science Inquiry and considerations of Science as a Human Endeavour through the secondary years.

ASTA continues to have strong concerns that the changes have done little to reduce the teaching content in the primary years. We believe the changes are not necessarily going to improve student understanding or engagement and have the potential to lead to misconceptions and reduction of inquiry-based teaching and learning. We also believe many of the changes require extensive professional learning for primary teachers of science, especially for those with a limited scientific background.

The revised **Elaborations** continue to provide clarity, but with the proposed new content descriptions themselves now being more explicit, the function of the elaborations has changed and serious thought should be given as to how they are presented in the curriculum to avoid any implication that they are mandated. It is our opinion that in terms of hierarchy, they should be below the year **level statements** and the **inquiry questions**, which could frame the curriculum for teachers well.

ASTA Strongly supports the foregrounding of the explorative and investigative nature of Science in the proposed Science Understanding **content descriptions**. By making explicit the fact that students should be able to investigate or explore a concept, it requires them to develop a thorough understanding of the concepts that are taught at each level in order for true scientific inquiry, and the authentic recognition of Science as a Human Endeavour to occur in our classrooms. ASTA rejects any argument that considers the proposed curriculum as a deterrent to any particular type of pedagogy, including explicit teaching of science ideas, especially given that the revised nature of the **Achievement Standards** will provide clear guidance as to the expectations in the Science Understanding strand.

In addition to the above issues around the moving of content into the primary years, there remains concern about some specific Scientific Understanding content. This includes the inclusion of the observable properties of gases and the water cycle in Year 3, the inclusion of particle theory in Year 5, the teaching of the rock cycle in Year 6, and the lack of clarity about what is expected around ecosystems within the biosphere in Year 9 with limited in-depth consideration of matter and energy in ecosystems. There is also the lack of explicit types of chemical reactions in Year 9 (such as combustion, neutralisation to complement the photosynthesis and respiration included in the Earth and Space Sciences) and inappropriate choice of labelling of chemical reactions in Year 10, i.e. synthesis and decomposition, which might be better framed as reactions of acids and oxidation. However, the removal of light from Year 1 (previously light and sound) and the reduction of some content in Year 10 are positive changes.

ASTA believes that many teachers of Science, particularly F-6 educators, will require a great deal of support through professional learning and targeted resources, in order to be equipped to engage with, and implement the revised Australian Curriculum: Science. However complementary benefits to student learning or engagement that will result from many of these curriculum changes are unclear, particularly as teacher and student workload have not been 'reorganised' rather than reduced.

3.2 Science Inquiry

ASTA recognises that in Science Inquiry there is an improved discrimination between the skills required at different bands in the curriculum. We agree that in Science Inquiry, the early years revisions increase student curiosity, exploration and discovery and inclusion of student voice but that in the secondary years some of the content descriptions are over long, potentially leading to potential misinterpretation by teachers. We ask that consideration be given to reviewing these with a focus on readability and clarity, and ensuring that the glossary being developed is unambiguous and can be used with confidence across the country.

3.2 Science as a Human Endeavour

ASTA believes that Science as a Human Endeavour is integral to the success of the Science Curriculum, in terms of engagement of teachers and students, supporting critical and creative thinking and as a means to develop understandings of the Key Ideas of Science.

ASTA retains concerns that the re-write of Science as a Human Endeavour in Years F-6 changes the nature of this strand, focussing more on the idea that science is done by other people ('scientists') and reducing the focus on the idea of the students as the people 'doing' the science. Specifically – in the *Nature and Development of Science* sub strand is almost entirely linked to scientists doing the science, whereas we would argue that the Nature of

Science has links to anyone, including our students, not just doing science, but knowing that they are doing science. Hence knowledge of the Nature of Science, that is, what is it that makes science special, is vital at a personal level. This is particularly the case at Foundation level, where the proposed changes position the nature of science only in reference to scientists doing science.

3.4 Cross Curricular Priorities

ASTA strongly supports the role of the Cross Curriculum Priorities in foregrounding important aspects of student learning in contemporary Australia. We note that possibilities for the integration of Sustainability into the Science curriculum may have been diminished with the removal of content around resources and ecosystems, but that the Earth and Space Sciences sub strand in Year 9 and Year 10 creates other opportunities around environmental carbon and climate change.

ASTA is also fully supportive of the inclusion of the Aboriginal and Torres Strait Islanders Histories and Cultures Cross Curriculum Priority, and recognises that existing and revised elaborations in this area continue to support teachers. The way that this priority has been included in the Science Inquiry content descriptions could be reviewed to improve clarity.

For example, in Year 6, Planning and Conducting, the content descriptor states *'plan and conduct repeatable investigations to answer questions, including, as appropriate, deciding the variables to be changed and measured in fair tests, describing potential risks, planning for the safe use of equipment and materials and identifying required permissions to conduct investigations on Country or Place'* and the Planning and Conducting statements in Year 7/8 and 9/10 are of a similar structure. We would argue that the 'as appropriate' could be linked more explicitly to the final statement, as this important consideration will only be appropriate in a relatively small number of situations. So in this example if it could be rewritten as: *'plan and conduct repeatable investigations to answer questions, including deciding the variables to be changed and measured in fair tests, describing potential risks, planning for the safe use of equipment and materials and as appropriate, identifying required permissions to conduct investigations on Country or Place'*

3.5 Inquiry Questions

ASTA supports the inclusion of the sample inquiry questions within the curriculum. They give teachers ideas from which to develop school based curriculum activities. If, as we hope, they are to be retained, ASTA suggests the following:

- Careful thought should be given to how and where they are presented, so as to exemplify good practice, but not to give the impression of added content.
- They should include more questions related to Science as a Human Endeavour, or specific Science Inquiry practices, as currently they are predominantly linked to Science Understanding.
- Teachers with year level expertise should be asked to review these in terms of age appropriate content, context and language.
- They should support students to ask questions and 'inquire'.

4. Overall

ASTA welcomes opportunities to work with ACARA on behalf of the members of the State and Territory Science Teacher Professional Associations around Australia. Many of these teachers have been involved in other local and national feedback processes.

The concerns from teachers raised above result from the desire of the science teaching profession to support our students and to provide them with the maximum possible opportunity to engage with the curriculum, develop an interest in science and to gain scientific knowledge and skills which will enable them to make informed, evidence-based decisions about applications of science. Suggestions that are included will, we believe, enable our teachers to better meet those needs.

We recognise that the Curriculum Review has addressed a number of our key aims, including greater clarity of content, the broadening of the Science Inquiry strand, and some more effective alignment of concept development, based on the Core Concepts, across the three strands.

We also recognise that high quality, fit for purpose professional learning will be required to ensure the successful implementation of the improved Australian Curriculum: Science. ASTA is well placed to support, guide and inform Australian Curriculum: Science professional learning programs moving forward.

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