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The key features of the draft senior secondary Australian Curriculum for science

The draft senior secondary Australian Curriculum for science offers four courses for study in Years 11 and 12. These courses are Biology, Chemistry, Physics, and Earth and Environmental Science. All of the four senior science courses within the Australian Curriculum provide opportunities for students to develop an understanding of scientific concepts and principles which will enable them to become more informed citizens who are able to make evidence-based decisions about the science-related issues which arise in their personal, professional and community lives.

The draft senior secondary science curriculum is organised around three interrelated strands within each course, which are continued from the K-10 science curriculum. The three interrelated strands are:

Science understanding (incorporating knowledge and understanding of the biological, physical and earth and space sciences)

An understanding of science is evident when a person selects and integrates appropriate science knowledge in ways that explain and predict phenomena, and applies that knowledge to new situations and events. Science knowledge refers to facts, concepts, principles, laws, theories and models that have been established and continue to be challenged and refined by scientists over time. Science knowledge represents the building blocks of science understanding, but it is the dynamic nature of science understanding that will most benefit citizens in an ever-changing world.

Science inquiry skills (incorporating skills and understanding of science as a way of knowing and doing)

Scientific inquiry involves posing questions; formulating testable hypotheses; planning, conducting and critiquing investigations; collecting, analysing and interpreting evidence; and communicating findings. This strand is concerned with investigating ideas, evaluating claims, solving problems, drawing valid conclusions and developing evidence-based arguments. It also recognises that scientific explanations change as new or different evidence becomes available.

Science as a human endeavour (incorporating knowledge and understanding of the personal, social, environmental, cultural and historical significance and relevance of science)

This strand highlights the need for informed, evidence-based decision making about current and future applications of science. It acknowledges that, in making decisions about science and its practices, moral, ethical and social implications must be taken into account. This strand also acknowledges that science has been advanced through, and is open to, the contributions of many different people from different cultures at different times in history. It identifies the historical aspects of science as well as contemporary science issues and activities, and demonstrates that science offers rewarding career paths.

The draft senior secondary Australian Curriculum for science provides a foundation for specific learning pathways leading to science and engineering courses at university as well as technical and vocational education and training.

The purpose and nature of each senior secondary science course and the links to K-10 Australian Curriculum

The senior secondary science courses build on the science knowledge and skills that students have acquired up to Year 10. Whilst students may choose to specialise in one science course, synergies between the four senior science courses provide opportunities for students to pursue multi-disciplinary studies and/or careers (for example, concurrent study of Chemistry and Earth and Environmental Science may lead to practical applications of monitoring environmental change and sustainability of natural resources or study of Biology and Physics may stimulate students' interest

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in careers in astrobiology or nuclear medicine).The four courses offered within the senior secondary Australian Curriculum for science are:

Biology:

This course provides opportunities to examine the development and latest applications of biological knowledge in ways which are relevant to students' everyday lives. The course provides a foundation for further studies or employment in biology related fields or in future pathways that have a synergy with other senior science courses (for example, study of Biology and Physics may stimulate students' interest in careers in astrobiology or nuclear medicine).

Chemistry:

This course provides opportunities for students to explore chemical concepts, laws, principles and theories and their relevance to their everyday lives, and to solve problems and make evidence-based decisions related to present and future challenges.

Earth and Environmental Science:

This course provides opportunities to explore the contextual framework for understanding Earth's origins and history, the variety of its natural physical environments and hazards, and the origins of its minerals and energy resources and offers pathways for students wishing to pursue further studies or to enter the workforce. The evaluation of the impact of past and current human actions is considered in addition to relevant theories and concepts.

Physics:

This course provides opportunities to think critically about the development of the fundamental laws and concepts of physics, and its applications in a range of relevant and contemporary contexts and problems.

How are the general capabilities and cross-curriculum dimensions addressed within the draft Australian Curriculum: Science in the senior years?

Good teaching in each of the subjects will always contribute to students' development of general capabilities and understanding of the cross-curriculum dimensions. The Australian Curriculum reinforces this expectation by incorporating the general capabilities and cross-curriculum dimensions into the content descriptions in ways appropriate to each subject.

The draft senior secondary Australian Curriculum for science incorporates eight general capabilities that are inherent to the study of science. These general capabilities are explicitly included in the content descriptions and achievement standards. These are literacy, numeracy, information and communication technologies (ICT), thinking skills, creativity, teamwork, ethical behaviour and self-management.

Each of these general capabilities is embedded in the content descriptions of the *Science inquiry skills* strand and many are also incorporated into the *Science as a human endeavour* strand.

The cross-curriculum dimension of sustainability is addressed in the content descriptions of all four senior years' courses in the draft science curriculum. In the *Science understanding* strand this includes knowledge and understanding of energy conservation in individual living organisms and in ecosystems, the energy balance of Earth, conservation of natural resources such as water and forests, human-induced changes in conditions that affect habitats and ecosystems, and atmospheric chemical processes. Sustainability as a social and environmental issue is incorporated in the *Science as a human endeavour* strand through the investigation of areas such as acid rain, use of fuels, management strategies for the control of greenhouses gases, depletion of atmospheric ozone, and treatment of waste. Important skills associated with sustainability, including researching areas such as the use of fuels and evaluating claims and arguing ideas, are incorporated within the *Science inquiry skills* strand.

Curriculum content that relates to Indigenous history and culture is represented in the content descriptions of the senior secondary Earth and Environmental Science curriculum. The *Science as a human endeavour* strand explicitly includes the effects over time of practices of Indigenous peoples on biodiversity and sustainability of populations and ecosystems. The relationship between the land

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and Indigenous peoples over time is implicit in the study of human-induced changes in environmental conditions, including strategies for maintaining ecological and habitat diversity systems included in the Science understanding strand.

While not specifically addressed in course content the cross-curriculum dimension of Asia and Australia's engagement with Asia provides engaging and rich contexts for science learning. Decisions about these contexts, however, will be taken by the classroom teacher.

What national comparisons and/or international references have been identified in developing the Australian Curriculum: Science in the senior years?

The draft senior secondary science courses have been informed by Australian state and territory curriculum documents and by feedback from science academics and educators.

The draft senior secondary science courses have also been informed by key international curriculum documents of top-performing countries as identified in international science education testing (TIMSS, PISA), as well as by key international research in science education.

Key international reference points have been:

- Science curriculum from the United Kingdom, New Zealand and Singapore
- International Baccalaureate Diploma courses in the sciences
- National Science Education Standards (National Research Council, USA, 1996)
- Benchmarks for Science Literacy (American Association for the Advancement of Science, Project 2061, USA, 1993)
- 21st Century Skills Map for Science (Partnership for 21st Century Skills and National Science Teachers Association, USA, 2009).

Key Australian reference points include:

- Australian School Science Education National Action Plan 2008 – 2012 (Goodrum and Rennie, 2007)
- Re-imagining Science Education: Engaging students in science for Australia's future (Tytler, 2007).