



**Senior Science  
Senior Years**

**Writing Brief**

**February 2016**

© 2016 Copyright Board of Studies, Teaching and Educational Standards NSW for and on behalf of the Crown in right of the State of New South Wales.

This document contains Material prepared by the Board of Studies, Teaching and Educational Standards for and on behalf of the Crown in right of the State of New South Wales. The Material is protected by Crown copyright.

All rights reserved. No part of the Material may be reproduced in Australia or in any other country by any process, electronic or otherwise, in any material form, or transmitted to any other person or stored electronically in any form without the prior written permission of the Board of Studies, Teaching and Educational Standards NSW, except as permitted by the *Copyright Act 1968*.

When you access the Material you agree:

- to use the Material for information purposes only
- to reproduce a single copy for personal bona fide study use only and not to reproduce any major extract or the entire Material without the prior permission of the Board of Studies, Teaching and Educational Standards NSW
- to acknowledge that the Material is provided by the Board of Studies, Teaching and Educational Standards NSW
- to include this copyright notice in any copy made
- not to modify the Material or any part of the Material without the express prior written permission of the Board of Studies, Teaching and Educational Standards NSW.

The Material may contain third-party copyright materials such as photos, diagrams, quotations, cartoons and artworks. These materials are protected by Australian and international copyright laws and may not be reproduced or transmitted in any format without the copyright owner's specific permission. Unauthorised reproduction, transmission or commercial use of such copyright materials may result in prosecution.

The Board of Studies, Teaching and Educational Standards NSW has made all reasonable attempts to locate owners of third-party copyright material and invites anyone from whom permission has not been sought to contact the Copyright Officer.

Phone: (02) 9367 8289

Fax: (02) 9279 1482

Email: [mila.buraga@bostes.nsw.edu.au](mailto: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](http://www.bostes.nsw.edu.au)

DSSP-27012  
D2015/100634

## Contents

1. Introduction .....	4
2. Senior Science key .....	6
3. Rationale .....	7
4. The place of the Senior Science Senior Years syllabus in the K–12 curriculum ..	8
5. Aim.....	9
6. Objectives .....	10
7. Outcomes.....	11
8. Course structure .....	13
9. Content .....	15
10. Learning across the curriculum .....	18
11. Senior Years Life Skills advice.....	20
12. Senior Science Senior Years Life Skills outcomes.....	21
13. Senior Science Senior Years Life Skills content .....	23
14. Glossary.....	24
15. Assessment and reporting .....	25
16. Appendix I.....	26
17. Appendix II .....	27

## 1. Introduction

In 2014, the Board of Studies, Teaching and Educational Standards NSW (BOSTES) commenced a review of NSW senior secondary syllabuses for English, Mathematics, Science and History learning areas to determine directions for the incorporation of the senior secondary Australian curriculum. BOSTES conducted consultation in August and September 2014 on proposed directions outlined in [NSW Senior Secondary Review & Evaluation: English, Mathematics, Science and History](#).

The broad directions for each learning area, developed following consultation, were endorsed by BOSTES in December 2014 and are available in Appendix I of this writing brief.

The development of the *Senior Science Senior Years Writing Brief* takes account of the broad directions and feedback gathered through consultation conducted in October and November 2015.

The purpose of the writing brief is to inform the directions for draft syllabus development.

The writing brief is structured according to the elements of a Senior Years syllabus. Each element includes proposed actions and key considerations for writers in the writing of the draft syllabus. These elements are:

- Rationale
- The place of the Senior Science Senior Years syllabus in the K–12 curriculum
- Aim
- Objectives
- Outcomes
- Course structure
- Content, including how Australian curriculum content may be incorporated
- Glossary.

The draft syllabus package will include the elements of a syllabus and Australian curriculum content (where appropriate) identified with codes, learning across the curriculum content identified by icons, further information about meeting the diversity of learners, and internal and external assessment.

The draft syllabus for Senior Science will be developed and available for consultation during 2016.

A summary of the BOSTES syllabus development process is available at <http://www.boardofstudies.nsw.edu.au/syllabuses/syllabus-development/>.

### Diversity of learners

NSW senior secondary syllabuses will be inclusive of the learning needs of all students. The draft syllabuses will be designed to accommodate teaching approaches that support student diversity under the sections 'Students with special education needs', 'Gifted and talented students' and 'Students learning English as an additional language or dialect (EAL/D)'.

For example:

## **Special education needs**

All students with special education needs are entitled to participate in and progress through the curriculum. Some students may require additional support or adjustments to teaching, learning and assessment activities. 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.

Most students with special education needs will undertake regular Board Developed courses and/or Board Endorsed courses. Students with special education needs can access Years 11 and 12 outcomes and content in a range of ways. They should choose the most appropriate courses for the HSC in keeping with their goals, interests and learning needs.

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
- selected Years 11–12 Life Skills outcomes and content appropriate to their learning needs provided in the Senior Science Senior Years draft syllabus.

Life Skills outcomes and content will be provided for Senior Science only.

## **Australian curriculum**

BOSTES began its syllabus development process for Stage 6 English, Mathematics, Science and History in 2014. This follows state and territory Education Ministers' endorsement of senior secondary Australian curriculum in these learning areas as the agreed and common base for development of state and territory senior secondary courses. It was also agreed that states and territories would have the flexibility to integrate the approved senior secondary Australian curriculum as appropriate. The writing brief determines how Australian curriculum content can be modified, reordered and supplemented in each learning area, while remaining compatible with the NSW Senior Years assessment and examinations structures.



### 3. Rationale

**i** 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 would study the subject
- how it contributes to the purpose of the Senior Years curriculum
- how it prepares students for post-school pathways.

#### **Proposed rationale for Senior Science Senior Years**

The Senior Science Senior Years course is designed to cater for all students to assist them in becoming scientifically literate citizens with the means to investigate personally relevant local and global scientific issues. The course is designed to engage all those with a need to investigate the world around them.

The course promotes active enquiry and explores key concepts, models and phenomena around big ideas of science. It draws upon and builds on the values and attitudes, skills and knowledge and understanding developed in Stage 5 Science.

The processes of science and the specific skills of working scientifically and working technologically have led humans to accumulate an evidence-based body of knowledge about how we have, are and intend to interact with our world and our galactic neighbourhood. The course is firmly focused on developing these skills as they provide a lifelong means for students to value investigating, solve problems, develop and communicate evidence-based arguments, develop models and/or create valuable ideas and products.


Senior Science Senior Years draws upon an integration of the understandings found in the natural and physical sciences and emphasises authentic practical individualised learning for every student.

The course encourages the development of a range of capabilities that will enhance students' ability to participate in all aspects of community life and within a technologically fast-changing landscape.

#### **Actions for writers and key considerations**

- The rationale requires some revision to provide clarity and consistency of purpose in regard to the principles of science, and to complement the and better reflect the nature and characteristics of the course.
- The rationale should be reviewed to reflect the specific nature and characteristics of the course.
- Where appropriate the rationale should complement the aims and objectives of the syllabus.

#### **4. The place of the Senior Science Senior Years syllabus in the K–12 curriculum**

 for your information

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

This diagram will be included in the draft syllabus.



## 5. Aim

**i** for your information

In NSW syllabuses, the aim provides a statement(s) 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.

### **Proposed aim for Senior Science Senior Years**

The aim of the Senior Science Senior Years syllabus is to develop students’:

- appreciation that science has developed through independent and collaborative research and has significant impacts on society
- abilities to debate and critically evaluate scientific arguments and claims, communicate to a range of audiences evidence-based understanding or findings and to propose possible solutions to problems
- understanding of the theories and models used to describe, explain and make predictions about systems, structures and properties by considering the factors that affect these and how they can be controlled to produce desired products or outcomes
- respect for living things and the environment and to develop an understanding of how the story of science, science understanding and scientific practices are integral to our understanding about ourselves and to developments in many fields of human endeavour

### **Actions for writers and key considerations**

- The aim requires some revision to provide more consistency and clarity of purpose with regards to the principles, specific nature and characteristics of the course, and to complement and better reflect the amended rationale, objectives and outcomes.
- The aim will be reviewed to ensure consistency of length, detail and complexity with other senior syllabuses.

## 6. Objectives

**i** 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.

### Proposed objectives for Senior Science Senior Years

#### Values and attitudes

Students:

- develop positive, informed values and attitudes towards science
- recognise the importance and relevance of science in their lives now and for the future.

#### Skills

Students:

- develop skills in applying the processes of Working Scientifically

#### Knowledge and understanding

Students:

- develop knowledge and understanding of cause and effect
- develop knowledge and understanding of models and theories
- develop knowledge and understanding of modern technologies and science
- develop knowledge and understanding of contemporary issues involving science

#### Actions for writers and key considerations

- Review the objectives to ensure consistency with the amended rationale, aim and outcomes of the course, and to reflect the principles of the course.
- Enhance the concept of Science as a Human Endeavour in the values and attitudes objectives.
- Review the objectives to ensure that they provide opportunities for the development of Life Skills outcomes and content.

## 7. Outcomes

**i** for your information

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.

### Proposed outcomes for Senior Science Senior Years

The following table presents a sample of some of the proposed outcomes.

#### Values and attitudes

<p><b>Objectives</b> Students</p> <ul style="list-style-type: none"> <li>develop positive, informed values and attitudes towards science</li> <li>recognise the importance and relevance of science in their lives now and for the future</li> </ul>
----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

#### Skills

The skills outlined below apply across all the Senior Years science syllabuses

<p><b>Objective</b> Students:</p> <ul style="list-style-type: none"> <li>develop knowledge and understanding and skills in applying Working Scientifically</li> </ul>	
<p><b>Year 11 outcomes</b> A student:</p>	<p><b>Year 12 outcomes</b> A student:</p>
<p>SSP-1 proposes questions or hypotheses to be investigated scientifically and predicts outcomes</p>	<p>SSH-1 evaluates questions and/or hypotheses to be investigated scientifically and predicts evidence based outcomes</p>
<p>SSP-2 designs investigations, consider risks, ethical issues and identifies appropriate materials and suggests related data for collection</p>	<p>SSH-2 justifies the design of risk assessed, ethical investigations, involving appropriate materials and selects and collects relevant primary and secondary sourced data</p>

## Knowledge and understanding

<p><b>Year 11 Course Unit 1</b></p>	<p><b>Year 12 Course Unit 3</b></p>
<p><b>Objective</b> Students:</p> <ul style="list-style-type: none"> <li>develop knowledge and understanding of cause and effect</li> </ul>	<p><b>Objective</b> Students:</p> <ul style="list-style-type: none"> <li>develop knowledge and understanding of modern technologies and science</li> </ul>
<p><b>Year 11 outcomes</b> A student:</p>	<p><b>Year 12 outcomes</b> A student:</p>
<p>SSP-8 describes and explains that science assumes for every phenomena there is one or more causes</p>	<p>SSH-8 assesses and explains that the knowledge produced by science is used in many technologies to create products and techniques that serve human ends</p>
<p><b>Year 11 Course Unit 2</b></p>	<p><b>Year 12 Course Unit 4</b></p>
<p><b>Objective</b> Students:</p> <ul style="list-style-type: none"> <li>develop knowledge and understanding of models and theories</li> </ul>	<p><b>Objective</b> Students:</p> <ul style="list-style-type: none"> <li>develop knowledge and understanding contemporary issues involving science</li> </ul>
<p><b>Year 11 outcomes</b> A student:</p>	<p><b>Year 12 outcomes</b> A student:</p>
<p>SSP-9 explains that scientific explanations, models and theories are those that best fit the facts known at a particular time</p>	<p>SSH-9 compares and contrasts the applications of science through ethical, social, economic and political frameworks</p>

## Actions for writers and key considerations

- Develop up to 10–12 skills and knowledge and understanding outcomes to complement the existing outcomes and to ensure that core content areas and skills development are addressed.
- Ensure there is a coherent and logical development from Year 11 to Year 12, and that the outcomes provide detail with regards to the knowledge, understanding and skills expected to be gained. The outcomes should be derived from the objectives.
- The outcomes should build on and extend the Science K–10 continuum of learning.

## 8. Course structure

**i** for your information

The following provides an outline of the Year 11 and Year 12 course structure for the Senior Science Senior Years syllabus with indicative course hours and the arrangement of course content, along with outlining relationships between specific components and between core and options.

### Proposed course structure for Senior Science Senior Years

	Senior Science	Indicative hours	Depth Studies
Year 11 course (120 hours)	Unit 1 Cause and Effect	20	20 hours for depth studies
		20	
	Unit 2 Models and Theories	20	20 hours for depth studies
		20	
Year 12 course (120 hours)	Unit 3 Modern Technologies and Science	20	20 hours for depth studies
		20	
	Unit 4 Contemporary Issues involving science	20	20 hours for depth studies
		20	

#### Actions for writers and key considerations

The course structure requires some revision to enhance coherence with the other courses and ensure a logical development of interrelated ideas.

Further information is to be included in the syllabus about the nature and structure of depth studies. They are intended to be flexible, non-prescriptive areas for further study, selected to meet the needs of individual students.

They should:

- consider contemporary issues
- provide opportunities for the diversity of learners
- extend students in areas of particular interest
- provide access to specific areas of science not included in the core content
- promote student engagement
- provide students with opportunities to apply their knowledge and further develop the skills, understandings gained in the course.

Area(s) of study are to be selected and investigated at depth either individually, in a group or as a whole class activity. Information should include that a substantial component of first or second-hand investigative work and research is to be undertaken to assist students in applying the core content knowledge and skills.

Examples of activities that may be suitable for depth studies should be included. These include individual or group projects that may be chosen by students according to their interests and abilities. Examples of small and large-scale studies are to be provided, along with recommended time allocations.

The examples should include a range of activities that result in a variety of outcomes. Some examples are:

- Individual or group projects chosen by students according to their interests (eg new treatments for disease, fireworks, coal seam gas, investigating traffic black spots).
- A class-based in-depth study of an area not included in the core syllabus (eg a fieldwork excursion, a survey to determine the genetic composition of the school or an audit of school energy efficiency).

## 9. Content

**i** for your information

In NSW syllabuses for Senior Years, 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 each year. In considering the intended learning, teachers will make decisions about the emphasis to be given to particular areas of content, and any adjustments required based on the needs, interests and abilities of their students.

### Organisation of the content

The Senior Science Senior Years syllabus will be organised in the following way:

<b>Year 11 course (120 hours)</b>	<b>Senior Science</b>	
	<b>Unit 1 Cause and Effect</b>  <i>Observing, explaining and making generalisations about phenomena</i>	<b>Natural Sciences</b> - Geological formations and transformations - Climate and biodiversity
		<b>Physical Sciences</b> - Gravity - Chemicals and their reactions
	<b>Unit 2 Models and Theories</b>  <i>Describing, explaining, testing, predicting and validating</i>	<b>Natural Sciences</b> - Earth - plates, volcanoes & quakes - Darwin, evolution and DNA
<b>Physical Sciences</b> - Atomic Theory - Conservation Laws		
<b>Year 12 course (120 hours)</b>	<b>Unit 3 Modern Technologies and Science</b>  <i>Developing technologies, processes and materials to investigate and solve human problems</i>	<b>Natural Sciences</b> - Biotechnology - genetic modification - Earth Science technologies
		<b>Physical Sciences</b> - Pharmaceuticals - Control technology – Robotics
	<b>Unit 4 Contemporary Issues Involving Science</b>  <i>Ethical, social, economic and political implications of developments in science</i>	<b>Natural Sciences</b> - Biomedical technologies - Energy and its alternatives
		<b>Physical Sciences</b> - Colonisation of space - Emerging materials and their uses

## **Sample content**

### **Cause and Effect: Geological Formations and Transformations**

#### **Outcomes**




##### **A student:**

- proposes questions or hypotheses to be investigated scientifically and predicts outcomes SSP-1
- designs investigations, considers risks and ethical issues, identifies appropriate materials and suggests related data for collection SSP-2
- describes and explains that science assumes that for every phenomena there is one or more causes SSP-8

#### **Content**

The processes of weathering and erosion contribute to an understanding of geological formations and the ever-changing nature of our landscapes and the environments that forms them.

##### **Students:**

- review the processes involved in the Rock Cycle including:
  - weathering
  - erosion
- compare the composition of rock types and their characteristics in relation to weathering and erosion including:
  - sedimentary rocks
  - igneous rocks
  - metamorphic rocks
- observe a local or international geological formation and suggest a hypothesis that explains the processes by which the formation may have developed
- use a range of first-hand and secondary investigative methods to collect data that provides evidence in support of a hypothesis 
- make predictions about the future of the formation in regard to its characteristics and the forces of weathering and erosion
- use digital technologies to present findings in relation to the hypothesis, predictions and the supporting data and evidence collected to an audience
- peer review evidence, findings and conclusions made by investigators and comment on the validity and reliability of the data and conclusions drawn 
- refine hypotheses and make suggestions for further scientific research
- design solutions to maintain or manage the geological formation in relation to weathering and erosion. 




### **Suggestions for depth studies:**

- Carry out fieldwork to observe a geological feature/area for study and gather various evidences including historical and climatic data to inform hypotheses, models and theories about the history and possible future of the feature/area.
- Analyse geological and topological maps and diagrams to predict the causes and effects of erosion in a selected local area.
- In a team, develop laboratory tests and/or design models to simulate changes to landscapes that may eventuate from a proposed construction project in your local area.
- Explain in scientific terms the damage weathering has on a selected archaeological treasure and make suggestion for its protection.

### **Actions for writers and key considerations**

- The content and depth studies should provide opportunities for STEM learning and emphasise the development of scientific literacy and numeracy through practical experiences and the application of knowledge and skills.
- The four course Units are informed by four fundamental ideas about science. Opportunities should be provided to address the four fundamental ideas and the development of knowledge and skills, including problem-solving and investigations.
- There should be a focus on providing opportunities that do not rely on predictable outcomes, but enable students to work scientifically and engage in creative activities such as hypothesising, drawing conclusions, and experimenting to learn that some experiments fail, that mistakes and miscalculations occur, including in the interpretation of data and that conclusions can be challenged.
- The content included should complement and supplement that found in the disciplines but not restate it.
- The content, knowledge, understanding and skills should build on and extend the continuum of learning from Stage 5 Science.
- Identify, by underlining, specific terms for inclusion in and links to a glossary.
- Appropriate and authentic opportunities to develop knowledge, understanding, skills, values and attitudes specific to learning across the curriculum areas should be identified by icons.

## 10. Learning across the curriculum

 for your information

NSW syllabuses provide a context within which to develop core skills, knowledge and understanding considered essential for the acquisition of effective, higher-order thinking skills that underpin successful participation in further education, work and everyday life including problem-solving, collaboration, self-management, communication and information technology skills.

BOSTES has described learning across the curriculum areas that are to be included in syllabuses. In Senior Years syllabuses, the identified areas will be embedded in the descriptions of content and identified by icons. Learning across the curriculum content, including the cross-curriculum priorities and general capabilities, assists students to achieve the broad learning outcomes defined in the BOSTES *Statement of Equity Principles*, the *Melbourne Declaration on Educational Goals for Young Australians (December 2008)* and in the Australian Government's *Core Skills for Work Developmental Framework (2013)*.

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.

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 ⭐

## **Sample learning across the curriculum area for Senior Science Senior Years**

### ***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 Senior Science Senior Years 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 and key considerations**

- For each learning across the curriculum area develop a succinct statement that describes how the subject provides opportunities to develop knowledge, understanding, skills, values and attitudes related to the area and its relevance.

## 11. Senior Years Life Skills advice

 for your information

Senior Years Life Skills outcomes and content are developed from the Senior Years objectives of the Senior Science Senior Years syllabus.

Before deciding that a student should undertake a course based on Life Skills outcomes and content, consideration should be given to other ways of assisting the student to engage with the regular course outcomes. This assistance may include a range of adjustments to the teaching, learning and assessment activities of the Senior Science Senior Years curriculum.

If the adjustments do not provide a student with sufficient access to some or all of the Senior Years outcomes, a decision can be explored for the student to undertake Life Skills outcomes and content. This decision should be made through the collaborative curriculum planning process involving the student and parent/carer and other significant individuals. School principals are responsible for the management of the collaborative curriculum planning process.

The following points need to be taken into consideration:

- students are not required to complete all Life Skills outcomes
- specific Life Skills outcomes should be selected on the basis that they meet the learning needs, strengths, goals and interests of each student
- outcomes may be demonstrated independently or with support.

The Senior Science Senior Years draft syllabus will provide information, consistent with the information provided in K–10 syllabuses, which relate to:

- who is eligible to undertake Senior Years Life Skills outcomes and content
- how Life Skills outcomes and content should be implemented
- assessment and reporting of Life Skills outcomes and content.

## 12. Senior Science Senior Years Life Skills outcomes

**i** for your information

Life Skills outcomes are presented alongside Senior Years outcomes below, and may be used to explore content related to each outcome.

The Life Skills outcomes can also be viewed as two outcomes tables:

- a table of Life Skills outcomes, which shows the syllabus objectives and all Life Skills outcomes
- a table of Life Skills and related syllabus outcomes, which shows the relationship between Life Skills and Senior Years outcomes.

### Proposed Life Skills outcomes for Senior Science Senior Years

<p><b>Skills objective</b></p> <p>Students:</p> <ul style="list-style-type: none"> <li>• develop knowledge and understanding and skills in applying Working Scientifically</li> </ul>		
<p><b>Life Skills outcomes</b></p> <p>A student:</p>	<p><b>Year 11 outcomes</b></p> <p>A student:</p>	<p><b>Year 12 outcomes</b></p> <p>A student:</p>
<p>SSLS-1 responds to questions to be investigated scientifically and suggests answers</p>	<p>SSP-1 proposes questions or hypotheses to be investigated scientifically and predicts outcomes</p>	<p>SSH-1 evaluates questions and/or hypotheses to be investigated scientifically and predicts evidence based outcomes</p>
<p>SSLS-2 follows instructions to carry out investigations, identifies risks, ethical issues and identifies materials used.</p>	<p>SSP-2 designs investigations, considers risks and ethical issues, identifies appropriate materials and suggests related data for collection</p>	<p>SSH-2 justifies the design of risk-assessed, ethical investigations, involving appropriate materials and selects and collects relevant primary and secondary sourced data</p>

<p><b>Knowledge and understanding objectives</b></p> <p>Students:</p> <ul style="list-style-type: none"> <li>• develop knowledge and understanding of cause and effect</li> <li>• develop knowledge and understanding of models and theories</li> </ul>	
<p><b>Year 11 Life Skills outcomes</b></p> <p>A student:</p>	<p><b>Year 11 outcomes</b></p> <p>A student:</p>
<p>SSPLS-8 identifies that science recognises that for every phenomena there is one or more causes</p>	<p>SSP-8 describes and explains that science assumes that for every phenomena there is one or more causes</p>
<p>SSPLS-9 recognises that scientific explanations, models and theories are those that best fit the facts known at a particular time</p>	<p>SSP-9 explains that scientific explanations, models and theories are those that best fit the facts known at a particular time</p>

<p><b>Knowledge and understanding objectives</b></p> <p>Students:</p> <ul style="list-style-type: none"> <li>• develop knowledge and understanding of modern technologies</li> <li>• develop knowledge and understanding of contemporary issues in science</li> </ul>	
<p><b>Year 12 Life Skills outcomes</b></p> <p>A student:</p>	<p><b>Year 12 outcomes</b></p> <p>A student:</p>
<p>SSHLS-8 describes how the knowledge produced by science is used in some technologies to create products and techniques that serve human ends</p>	<p>SSH-8 assesses and explains that the knowledge produced by science is used in many technologies to create products and techniques that serve human ends</p>
<p>SSHLS-9 discusses the effects of the applications of science through ethical, social, economic and political frameworks</p>	<p>SSH-9 compares and contrasts the applications of science through ethical, social, economic and political frameworks</p>

**Actions for writers and key considerations**

- Develop up to 10 Life Skills outcomes from the objectives of Senior Science course.
- Develop Life Skills content that aligns with Senior Science topics and content.

### 13. Senior Science Senior Years Life Skills content

 for your information

The Senior Years Life Skills outcomes and content provide the basis for developing a rigorous, relevant, accessible and meaningful age-appropriate program. Outcomes and content should be selected based on the learning needs, strengths, goals and interests of each student. Students are not required to complete all of the content to demonstrate achievement of an outcome.

#### **Proposed Life Skills content for Senior Science Senior Years Cause and Effect: Geological Formations and Transformations**

##### **Outcomes**



##### **A student:**

- responds to questions to be investigated scientifically and suggests answers  
SSLS-1
- identifies that science recognises that for every phenomena there is one or more causes SSPLS-8

##### **Content**

Understanding of geological processes contributes to an understanding of the ever-changing nature of our landscape and the environment that forms it.

##### **Students:**

- Recall the processes involved in the Rock Cycle, and the characteristics of weathering and erosion
- Observe a geological formation and suggest ways in which that formation may have developed.
- Use a range of first-hand and secondary sources to provide information concerning rock formations 
- Present data and relate it to the structure of the geological formation
- Present findings for peer review 


##### **Suggestions for depth studies:**

- Fieldwork to observe a geological feature/area for study and gather evidence
- Examine geological and topological maps and diagrams
- Perform laboratory tests to simulate forms of weathering and erosion.

##### **Actions for writers and key considerations**

- The Life Skills content will align with the Senior Science course content to promote inclusive learning.

## 14. Glossary

 for your information

One glossary will be developed for each Senior Years learning area. The glossary to be developed for the Senior Science Senior Years draft syllabus will explain terms that will assist teachers in the interpretation of the subject. The glossary will be based on the NSW K–10 Science glossary and Australian curriculum Senior Years Science glossary.

### **Actions for writers and key considerations**

- Identify and underline words and/or terms additional to those in the K–10 Science glossary in the content for inclusion in the Senior Years glossary.



## 15. Assessment and reporting

 for your information

BOSTES continues to promote a standards-referenced approach to assessing and reporting student achievement in NSW, and the importance of assessment for, of and as learning as essential components of quality teaching and learning.

Information on assessment and reporting for the Year 11 and Year 12 courses will be reviewed and developed for draft syllabus consultation in 2016.

The information will include:

- mandatory components and weightings for school-based assessment of the Year 12 course
- HSC examination specifications which describe the format of the HSC examination program for Senior Science.

## 16. Appendix I

### Broad directions from consultation

The following broad directions for syllabus development have been informed through consultation with stakeholders. These broad directions will guide the development of the NSW Senior Science Stage 6 syllabuses.

1. In the revision and development of the courses, consideration be given to how the courses provide flexibility to meet the needs of all students.
2. In the revision of the current content-heavy courses provision be made for the reduction and integration of content. This may be organised using the concept of Big Ideas of Science.
3. The nature and practice of Science is reflected in the inclusion of working scientifically using first-hand investigations, secondary sources, models and modelling.
4. The Science courses be reviewed to allow flexibility of pedagogy and delivery. This may include cross-disciplinary study, project based/research and STEM learning.
5. Opportunities be considered to extend students' learning in Science by revising each course's content and requirements.
6. The Senior Science course rationale, structure and assessment requirements be reviewed to focus on developing scientifically literate students.
7. The Senior Science course rationale, structure and assessment requirements be reviewed with a focus to support a range of post-school contexts.
8. Assessment and HSC examination specifications be reviewed to ensure appropriate opportunities for assessment of a wide range of student performance including assessing analytical and critical thinking, first-hand investigations, the use of secondary sources and research projects.
9. The Science syllabuses should provide for the continual inclusion of contemporary and relevant material.
10. The rationale, outcomes and content of the Stage 6 Science Life Skills course be reviewed to better meet the needs of the students for whom the course is intended, as well as provide an appropriate progression from Stage 5 Science Life Skills outcomes and content and alignment with the regular Stage 6 Science courses where appropriate.

## 17. Appendix II

### Key matters raised during draft writing brief consultation and actions

Key matters	Actions
<p>Option 2 is preferred; however, there is strong support for Option 3 with its depth study component to cater for the diversity of learners.</p>	<p>Aspects of Options 2 and 3, including depth studies, will be incorporated.</p>
<p>The scope and requirements of assessment of depth studies needs clarification.</p>	<p>The nature, scope and structure of depth studies, including investigative projects, will be clarified.</p>
<p>The name of the Senior Science course should be changed to better represent its purpose and relationship to the other disciplines.</p>	<p>A change of course name will be considered.</p>
<p>The rationale, aim and objectives require revision to provide clarity and consistency.</p>	<p>The rationale, aim and objectives will be reviewed and amended to provide clarity and consistency.</p>
<p>Content should be less prescriptive and include contemporary, practical-based learning opportunities.</p>	<p>Content will be reduced to provide opportunities for deeper learning through a focus on practical investigations.</p>
<p>Science Life Skills outcomes and content should be developed and align with the Senior Science course.</p>	<p>Life Skills outcomes and content will be developed from and align with the objectives of the Senior Science course.</p>