BOSTES | BOARD OF STUDIES TEACHING & EDUCATIONAL STANDARDS NSW

Earth and Environmental Science Stage 6

Draft Writing Brief

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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 senior secondary Australian curriculum. BOSTES conducted consultation in August and September 2014 on proposed directions outlined in the *NSW Senior Secondary Review & Evaluation: English, Mathematics, Science and History* document.

The broad directions for each learning area, developed following consultation, were endorsed by BOSTES in December 2014 and are available in Section 2 of this Draft Writing Brief.

The development of the *Earth and Environmental Science Stage 6 Draft Writing Brief* takes account of the broad directions.

The Draft Writing Brief:

- proposes the nature and number of courses within each learning area
- proposes options for course structures
- provides information about how Australian curriculum content may be modified, reordered and supplemented for inclusion in the draft syllabus.

Following consultation on the Draft Writing Brief, a Consultation Report, detailing feedback received and the key matters arising from consultation will be published. The BOSTES endorsed final Writing Brief will inform the directions for draft syllabus development.

The draft syllabus for Earth and Environmental Science will be available for consultation during 2016. It will include the elements of a syllabus and Australian curriculum content identified with codes, learning across the curriculum content identified by icons, further information about meeting the diversity of learners, and internal and external assessment.

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.

2. Broad directions

The following broad directions for syllabus development have been informed through consultation with stakeholders. These broad directions guide development of the NSW 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 Science Life Skills Stage 6 course be reviewed to better meet the needs of the students for whom the course is intended, as well as to provide an appropriate progression from Science Life Skills Stage 5 outcomes and content and alignment with the regular Science Stage 6 courses where appropriate.

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 development of Draft Writing Briefs will determine 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

ⓘ 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:

- why the subject exists
- what the theoretical underpinnings are
- what makes the subject distinctive
- why students would study the subject
- how it contributes to the purpose of the Stage 6 curriculum.

✍ consult

Proposed rationale for Earth and Environmental Science Stage 6

Students of Earth and Environmental Science Stage 6 will develop and utilise a range of skills including the ability to communicate succinctly and concisely, to think logically, to make evidence-based judgements and to think creatively and imaginatively. This subject provides a foundation for students to critically consider information and to make informed decisions about contemporary Earth and Environmental Science issues in their everyday lives.

The course is designed for students who have substantial achievement in Science Stage 5 including those who wish to continue with the study of science and specifically Earth and environmental science at tertiary level.

Scientific knowledge and understanding and methods of working scientifically have led Earth and environmental scientists to gain a better understanding of how natural and human systems interact. By working scientifically students design and conduct qualitative and quantitative investigations both individually and collaboratively. They investigate questions and hypotheses, manipulate variables, analyse data, evaluate claims, solve problems and develop and communicate evidence-based arguments and models.

Thinking in Earth and Environmental Science involves using differing scales, including macro-scales, micro-scales and nano-scales, using models, concepts and methods to represent the changing face of the Earth over time, and being creative, as when designing new technologies and innovations in order to study the Earth. The study of Earth and Environmental Science provides a foundation for undertaking investigations in a wide range of scientific fields and often provides the unifying link across interdisciplinary studies.

The application of Earth and environmental knowledge is required to tackle major global issues and challenges now and into the future. These include the dynamic interaction with the air, water and organisms that live on its surface, the evaluation of the impact that the Earth's processes can have upon humans and the impact of human activities on the Earth, the dynamic and interdependent nature of the Earth's processes, environments and resources, and the ways in which these processes, environments and resources respond to change across a range of temporal and spatial scales.

4. Aim

ⓘ for your information

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

The aim, objectives, outcomes and content of a syllabus are clearly linked.

✍ consult

Proposed aim for Earth and Environmental Science Stage 6

The aim of the Earth and Environmental Science Stage 6 Syllabus is to develop students':

- appreciation of Earth and environmental science as an experimental science where models and theories are refined, and new models and theories are developed through independent and collaborative research that continues to have significant impacts on society
- abilities to debate and critically evaluate scientific arguments and claims, communicate to a range of audiences Earth and environmental science understanding or findings and to propose possible solutions to problems
- understanding of the theories and models used to describe, explain and make predictions about Earth and environmental 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 all living things and the environment, and understanding of how Earth and environmental science and its practices are used and are integral to developments in many fields of human endeavour.

5. Objectives

ⓘ for your information

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

✍ consult

Proposed objectives for Earth and Environmental Science Stage 6

Values and attitudes

Students:

- develop positive, informed values and attitudes towards Earth and environmental sciences
- recognise the importance and relevance of Earth and environmental 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 the Earth's systems
- develop knowledge and understanding of the Earth's processes
- develop knowledge and understanding of living on Earth
- develop knowledge and understanding of the changing Earth.

6. Outcomes

ⓘ 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.

✍ consult

Proposed outcomes for Earth and Environmental Science Stage 6

Outcomes will be developed for each year. The following table presents a sample of some of the proposed outcomes.

Values and attitudes

Objectives
Students: • develop positive, informed values and attitudes towards Earth and environmental science • recognise the importance and relevance of Earth and environmental science in their lives now and for the future

Skills

Objective	
Students: • develop skills in applying the processes of Working Scientifically	
Preliminary course outcomes A student:	**HSC course outcomes** A student:
EEP-1 proposes questions or hypotheses to be investigated scientifically and predicts outcomes	EEH-1 evaluates questions and/or hypotheses to be investigated scientifically and predicts evidence-based outcomes
EEP-2 designs investigations, considers risks and ethical issues, identifies appropriate materials and suggests related data for collection	EEH-2 justifies the design of risk-assessed, ethical investigations involving appropriate materials and selects and collects relevant primary- and secondary-sourced data

Knowledge and understanding

Preliminary course Unit 1	
Objective Students: develop knowledge and understanding of the Earth's systems	
Preliminary course outcomes A student:	
EEP-8	describes and evaluates available resources and uses of the Earth's resources locally, regionally and globally
EEP-9	describes and assesses the natural and human-induced changes affecting local, regional and global environments

HSC course Unit 3	
Objective Students: develop knowledge and understanding of living on Earth	
HSC course outcomes A student:	
EEH-8	describes and evaluates how environmental change is modelled, and how the reliability of these models influences predictions of future events and changes
EEH-9	describes and assesses the difference between renewable and non-renewable Earth resources and how their extraction, use, consumption and disposal impact Earth systems

Preliminary course Unit 2	
Objective Students: develop knowledge and understanding of the Earth's processes	
Preliminary course outcomes A student:	
EEP-10	describes and analyses the factors that influence how energy is transferred and transformed in Earth systems
EEP-11	describes and uses models to demonstrate how energy transfers and transformations influence oceanic, atmospheric and biogeochemical cycling

HSC course Unit 4	
Objective Students: develop knowledge and understanding of the changing Earth	
HSC course outcomes A student:	
EEH-10	describes and evaluates the causes of Earth hazards and the ways in which they impact, and are impacted by, Earth systems
EEH-11	outlines and explains the models that show the structure and development of the Earth over its 4.5 million year history

7. Course structure and options

ⓘ for your information

Rather than stipulate a single approach the Draft Writing Brief proposes options for possible course structure. The consultation process will inform the final structure which may be one of the options, or may involve a combination of the ideas presented.

The following provides an outline of some proposed Preliminary and HSC course structures for the Earth and Environmental Science (E&ES) Stage 6 Syllabus with indicative course hours and the arrangement of course content, along with outlining relationships between specific components and between core and options.

✍ consult

Overview of Preliminary course structures – E&ES 2 Unit course – 120 hours

<table>
<tr><th>Preliminary course</th><th>Option 1</th><th>Option 2</th><th>Option 3</th></tr>
<tr><td>Structure</td><td>Maintain the current (120 hour) Preliminary course structure</td><td>Four topics of equal length (30 hours)</td><td>Four topics of equal length (25 hours) and a depth study component (20 hours)</td></tr>
<tr><td rowspan="2">Content</td><td rowspan="2">Review and update the content to include the relevant aspects of the Australian curriculum
Eg:
• Planet Earth and Its Environment (30 hours)
• The Local Environment (30 hours)
• Water Issues (30 hours)
• Dynamic Earth (30 hours)</td><td colspan="2">Revise the course to reduce the content to provide for greater depth of study.
Integrate the relevant aspects of the Australian curriculum and consider the mathematical aspects of the course.</td></tr>
<tr><td>Eg:
• Earth’s Resources (30 hours)
• Australian Environmental Impacts (30 hours)
• Plate Tectonics and Energy (30 hours)
• Interactions of Plate Tectonics (30 hours)</td><td>Eg:
• Earth’s Resources (25 hours)
• Australian Environmental Impacts (25 hours)
• Plate Tectonics and Energy (25 hours)
• Interactions of Plate Tectonics (25 hours)
• Depth Study (20 hours)</td></tr>
<tr><td>Practical content</td><td>Update practical experiences to reflect revised content</td><td colspan="2">Focus on delivering content through practical experiences</td></tr>
<tr><td>Investigation/</td><td colspan="2">Maintain at least ONE open-ended investigation</td><td>Include practical</td></tr>
</table>

PBL	(OEI)	investigation/depth study component related to core (20 hours)

Overview of HSC course structures – E&ES 2 Unit course – 120 hours

HSC course	Option 1	Option 2	Option 3
Structure	Maintain current HSC structure	Four topics of equal length (30 hours)	Four topics of equal length (25 hours) with a depth study component (20 hours)
Content	Review and update content to include the relevant aspects of the Australian curriculum Eg: • Tectonic Impacts (30 hours) • Environments Through Time (30 hours) • Caring for the Country (30 hours) • One of four options (30 hours)	Revise the course and integrate the relevant aspects of the Australian curriculum content Eg: • Climate Change • (30 hours) • Resource Management (30 hours) • Hazards (30 hours) • Evolution of the Earth (30 hours)	Revise the course and integrate the relevant aspects of the Australian curriculum content Eg: • Climate Change (25 hours) • Resource Management (25 hours) • Hazards (25 hours) • Evolution of the Earth (25 hours) • Depth Study (20 hours)
Practical content	Update practical experiences to reflect revised content	Focus on delivering content through practical experiences	
Investigation/ PBL	Maintain at least ONE open-ended investigation (OEI)		Includes practical investigations/projects/ (depth study) component (20 hours)
Options	Update the current four options	No options	

Proposed options for course structure for Earth and Environmental Science Stage 6

Option 1 – E&ES 2 Unit (240 hours) course

This model maintains the current course structures with a view to review and update the content where required. Consideration would be given to providing for greater depth of study and allowing more time for practical learning.

The subject matter of the E&ES course would recognise the different needs and interests of students and provide a structure that builds upon the foundations laid in Stage 5, yet would acknowledge that students entering Stage 6 have a wide range of abilities, circumstances and expectations.

The proposed E&ES 2 Unit course would be examined for the HSC.

Revise current Preliminary course – 120 indicative hours

- Planet Earth and Its Environment – A Five Thousand Million Year Journey (30 indicative hours)
- The Local Environment (30 indicative hours)
- Water Issues (30 indicative hours)
- Dynamic Earth (30 indicative hours)

Revise current HSC course – 120 indicative hours

- Tectonic Impacts (30 indicative hours)
- Environments Through Time (30 indicative hours)
- Caring for the Country (30 indicative hours)
- Choice of one option (30 indicative hours):
  - Introduced Species and the Australian Environment
  - Organic Geology – A Non-renewable Resource
  - Mining and the Australian Environment
  - Oceanography

Option 2 – E&ES 2 Unit (240 hours) course

This model proposes a revision of course content to allow for practical-based learning to encourage students to learn science as it is practised.

The quantitative analytical demands of the content in this course will be considered.

The proposed E&ES 2 Unit course would be examined for the HSC.

Example Preliminary course (120 indicative hours)

<table>
<tr><th>Example unit</th><th>Example modules and areas of study</th></tr>
<tr><td rowspan="2">Unit 1
The Earth’s System
(60 hours)</td><td>Earth’s Resources (30 hours)
Structure of the Earth
Formation of soils
Water management
Salinity and erosion</td></tr>
<tr><td>Australian Environmental Impacts (30 hours)
Identification of introduced species
Effect of introduced species upon Australian biota
Consequences for the future biota of Australia
Actions to alleviate the problem</td></tr>
<tr><td rowspan="2">Unit 2
The Earth’s Process
(60 hours)</td><td>Plate Tectonics and Energy (30 hours)
Energy in Earth processes
Development of the Theory of Plate Tectonics
Energy transformations in Earth</td></tr>
<tr><td>Interactions of Plate Tectonics (30 hours)
Transformations in Earth processes
Geothermal processes
Biogeochemical processes
Hydrological processes</td></tr>
<tr><td colspan="2">Nature of the course
The Earth and Environmental Science Preliminary course is designed to focus on learning science as it is practised. It is suggested that at least 50% of the Preliminary course time is allocated to practical aspects of the course including project work.
At least ONE open-ended investigation is to be completed.</td></tr>
</table>

Example HSC course (120 indicative hours)

<table>
<tr><th>Example unit</th><th>Example modules and areas of study</th></tr>
<tr><td rowspan="2">Unit 3
Living on Earth
(60 hours)</td><td>Climate Change (30 hours)
Natural processes
Effect of human activities
Evidence for climate change
Future change</td></tr>
<tr><td>Resource Management (30 hours)
Earth’s resources
Renewable/Non-renewable resources
Biotic/Abiotic factors
Waste management</td></tr>
<tr><td rowspan="2">Unit 4
Changing Earth
(60 hours)</td><td>Hazards (30 hours)
Geological natural disasters
Metrological natural disasters
Effect of human activity
Impact of disasters on biosphere</td></tr>
<tr><td>Evolution of the Earth (30 hours)
Early Earth
Development of geosphere
Development of atmosphere and hydrosphere
Development of biosphere</td></tr>
<tr><td colspan="2">Nature of the course
The Earth and Environmental Science HSC course is designed to focus on learning science as it is practised. It is suggested that at least 40% of the HSC course time is allocated to practical aspects of the course including project work.
At least ONE open-ended investigation is to be completed.</td></tr>
</table>

Option 3 – E&ES 2 Unit (240 hours) course with depth studies

This model introduces an investigative/project/depth study opportunity in the Preliminary and HSC course years.

The investigative depth study is designed to allow time for all students to engage more deeply with chosen aspects of the course content and to study in depth aspects of earth and environmental science they may continue with at the tertiary level.

Example Preliminary course (120 indicative hours)

<table>
<tr><th>Example unit</th><th colspan="2">Example modules and areas of study</th></tr>
<tr><td rowspan="2">Unit 1
The Earth's System
(60 hours)</td><td>Earth's Resources (25 hours)
• Structure of the Earth
• Formation of soils
• Water management
• Salinity and erosion</td><td rowspan="2">Depth study related to core
(10 hours)</td></tr>
<tr><td>Australian Environmental Impacts
(25 hours)
• Identification of introduced species
• Effect of introduced species upon Australian biota
• Consequences for the future biota of Australia
• Actions to alleviate the problem</td></tr>
<tr><td rowspan="2">Unit 2
The Earth's Process
(60 hours)</td><td>Plate Tectonics and Energy (25 hours)
• Energy in Earth processes
• Development of the Theory of Plate Tectonics
• Energy transformations in Earth</td><td rowspan="2">Depth study related to core
(10 hours)</td></tr>
<tr><td>Interactions of Plate Tectonics (25 hours)
• Transformations in Earth processes
• Geothermal processes
• Biogeochemical processes
• Hydrological processes</td></tr>
<tr><td colspan="3">Nature of the course
The Earth and Environmental Science Preliminary course is designed to focus on learning science as it is practised. It is suggested that at least 50% of the Preliminary course time is allocated to practical aspects of the course including project work.</td></tr>
</table>

Example HSC course (120 indicative hours)

<table>
<tr><th>Example unit</th><th colspan="2">Example modules and areas of study</th></tr>
<tr><td rowspan="2">Unit 3
Living on Earth
(60 hours)</td><td>Climate Change (25 hours)
• Natural processes
• Effect of human activities
• Evidence for climate change
• Future change</td><td rowspan="2">Depth study related to core
(10 hours)</td></tr>
<tr><td>Resource Management (25 hours)
• Earth’s resources
• Renewable/Non-renewable resources
• Biotic/Abiotic factors
• Waste management</td></tr>
<tr><td rowspan="2">Unit 4
Changing Earth
(60 hours)</td><td>Hazards (25 hours)
• Geological natural disasters
• Metrological natural disasters
• Effect of human activity
• Impact of disasters on biosphere</td><td rowspan="2">Depth study related to core
(10 hours)</td></tr>
<tr><td>Evolution of the Earth (25 hours)
• Early Earth
• Development of geosphere
• Development of atmosphere and hydrosphere
• Development of biosphere</td></tr>
<tr><td colspan="3">Examples of depth studies/investigative projects
Food – ‘Effects of types of soil on plant growth – how to improve yield?’
Predicting Earthquakes – ‘How is it done and are there improvements to be made?’</td></tr>
<tr><td colspan="3">Nature of the course
The depth study/investigative project aspect is designed to allow for deeper engagement with specific content of interest to the students.
The HSC course includes 20 hours of depth study using investigative project(s) related to the core units. These could be implemented through a range of approaches with a minimum of 5 hours and a maximum of 10 hours for each depth study. The E&ES course is designed to focus on learning science as it is practised. It is suggested that at least 40% of the HSC course time is allocated to practical aspects of the course including project work.</td></tr>
</table>

Practical nature of the Earth and Environmental Science course

Practical experiences are a core component of the Earth and Environmental Science course.

Practical experiences should be designed to integrate the skills and knowledge and understanding outcomes in both the Preliminary and HSC courses.

Practical experiences should emphasise hands-on activities including:

- undertaking laboratory experiments including the use of appropriate ICT technologies
- fieldwork
- the use of computer simulations for modelling or manipulating data
- the use of, reorganisation and representation of acknowledged secondary data
- the extraction and reorganisation of information in the form of flow charts, tables, graphs, diagrams, prose and keys
- the use of digital media to capture, obtain, manipulate, calculate and present data, information and solutions to problems.

Depth study - Investigative project(s) (5–10 hours)

It is proposed that investigative project(s) be incorporated into each of the Preliminary and HSC courses based upon the principle of learning science as it is practised. This may be a 10 hour project or two 5 hour projects completed anytime within each unit.

Investigative project(s) opportunities are suggested for inclusion to allow schools to cater for the full range of students undertaking the course. They are incorporated to provide a vehicle for content coverage, to aid engagement and to provide students with further opportunities to demonstrate what they know and can do.

Investigative projects in both the Preliminary and HSC years may be considered for inclusion in the school-based assessment components for the HSC.

The investigative projects are to focus on:

- reviewing current knowledge/literature review
- producing an explanation or proof of a problem(s) posed or area researched
- including evidence of validity, reliability and precision in data analysis
- involving students in peer review of other students' work
- formulating logical explanations/conclusions and suggesting further research
- developing skills in designing and managing projects
- developing communication skills, including presentation skills, using relevant forms of media and reporting techniques.

The project may be a product, design, system, model, report or solution to problems posed and may be associated with fieldwork undertaken.

Extension courses

Extension courses build on the content of the 2 Unit courses. They are set at a more demanding level and have a more intensive focus. Extension courses involve complex levels of conceptualisation and provide the opportunity for students to work in increasingly independent ways. They enable high performing students to reach their potential in their senior secondary years.

BOSTES criteria ensure that Extension courses are only developed where there is a compelling educational justification. Equity across subjects is not in itself a reason for the development of Extension courses. The following criteria are applied to the establishment and maintenance of Extension courses:

- There is additional subject content necessary to achieve the purpose of the subject beyond that which can be accommodated in the 2 Unit course; which build on the content of the 2 Unit course; which is at a more demanding level; and which requires additional curriculum time for students to learn.
- It can be demonstrated that study of the Extension course will lead particular target groups to substantial, positive gains in relation to the prime purpose for each course.
- Study of the Extension course may be required or assumed necessary by tertiary institutions for study in courses beyond those in the same subject area.
- The likely candidature for the Extension course and whether there are significant resource constraints or issues in developing and offering the extended study course.

An argument for a new Extension course would have to establish that the current 2 Unit courses are not sufficiently challenging. It would need to be shown that a new Extension course could cover completely new higher level content with higher order outcomes without overlapping with the content of University courses.

Extension courses in Science could take the form of one of the following options:

A. An Extension Chemistry course and an Extension Physics course
B. A combined Extension course drawing on elements of Chemistry and Physics
C. A combined Extension course that draws from across the four science disciplines.

Some advantages and disadvantages for each option include:

A. Chemistry and Physics are high demand courses that are important to the nation’s STEM initiatives. More demanding study in these sciences will better prepare students to engage in related courses at university. Some schools will be forced to make a decision about which course they can support as an Extension course.

B. These two high candidature subjects complement each other in cross discipline aspects of science. There may be a perception that this Extension course is only accessible by students who study both Chemistry and Physics.

C. This course could appeal to a broader range of students. A breadth in working across disciplines could act against the essential requirement of greater depth.

Extension course content could include:

A. Extension Chemistry	**A. Extension Physics**	**B. Extension Chemistry & Physics**	**C. Extension Science**
• Equilibrium constants and the effect of temperature on their value • Design an industrial process that could be used for producing an economically viable chemical	• Effects of gravity on photons of light • Emerging technologies that use the quantum theory	• Equilibrium constants and the effect of temperature on their value • Effects of gravity on photons of light	• Research emerging technologies and manipulation of DNA • Equilibrium constants and the effect of temperature on their value • Renewable and non-renewable resources in terms of cost, extraction methods & environmental impacts • Effects of gravity on photons of light

8. 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 Stage 6 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, helps 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 to 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

9. Glossary

ⓘ for your information

A glossary will be developed for the draft Earth and Environmental Science Stage 6 Syllabus which explains terms that will assist teachers in the interpretation of the subject.

10. Assessment and reporting

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 Preliminary and HSC courses will be developed for the draft syllabus consultation in 2016.

The information will include:

- suggested components and weightings for school-based assessment of the Preliminary course
- mandatory components and weightings for school-based assessment of the HSC course
- HSC examination specifications which describe the format of the HSC examination program for Earth and Environmental Science.

Advice about assessment in relation to the Earth and Environmental Science syllabus is contained in Assessment and Reporting in Earth and Environmental Science Stage 6. This document provides general advice on assessment in Stage 6 as well as the specific requirements for the Preliminary and HSC courses.

Consultation on assessment and reporting during the Draft Writing Brief phase will focus on providing feedback about assessment and reporting practices in schools, school-based assessment requirements, the use of technology in assessment, and external assessment programs.