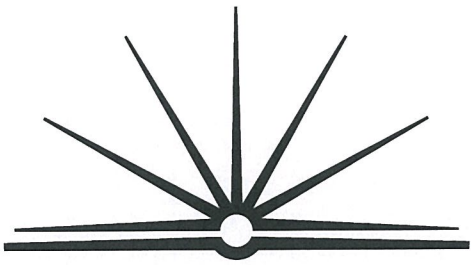


BOARD OF STUDIES
NEW SOUTH WALES

Senior Science

Stage 6
Syllabus

Amended October 2002

2 Rationale for Senior Science in the Stage 6 Curriculum

The study of Senior Science Stage 6 provides students with a contemporary and coherent understanding of some of the basic laws, theories and principles of Biology, Chemistry, Physics and Earth and Environmental Science and their application. It includes an examination of the technology that uses these laws, theories and principles and the impact of this science and technology on society. It reflects the interdisciplinary nature of science with a focus on the interdependence of science, technology and society.

Senior Science Stage 6 caters to a wide range of students who wish to become scientifically literate citizens. The course encourages students to develop a range of practical skills including the use of current instrumentation, information technology and an increased ability to communicate understanding. Senior Science Stage 6 focuses on all of these areas framed within the principles of Biology, Chemistry, Physics and Earth and Environmental Science.

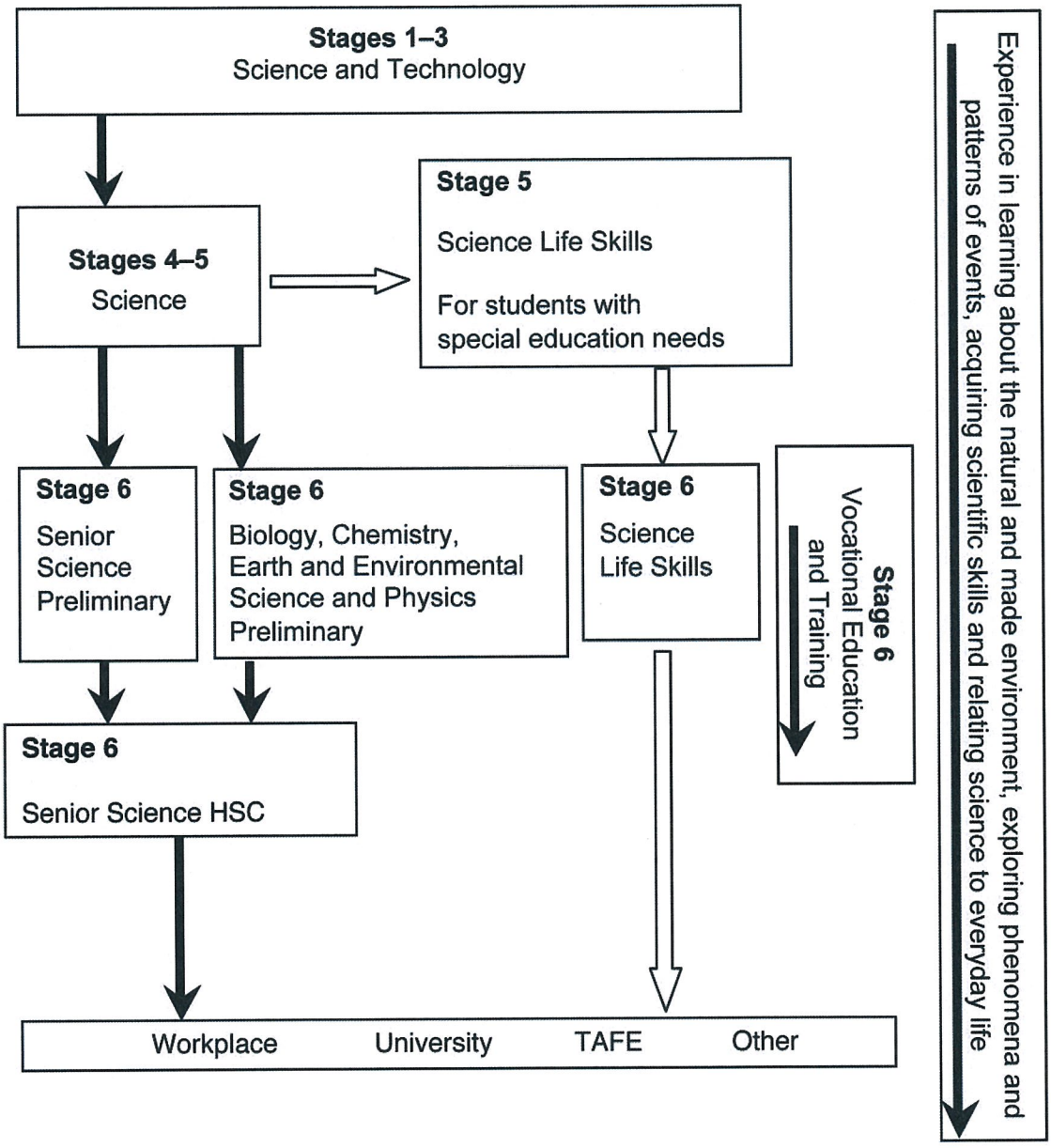
Senior Science Stage 6 draws upon and builds on the knowledge and understanding, skills and values and attitudes developed in Science Stages 4–5. It further develops students' understanding of science as a continually developing body of knowledge, of the role of experimentation in deciding between competing theories and of the provisional nature of scientific explanations. In addition, this course develops further understanding of the interdisciplinary nature of science, the complex relationship between evidence and ideas and the impact of science on society.

The study of Senior Science Stage 6 involves the students working individually and with others in the laboratory, in the field and with interactive multimedia, gaining experiences that are related to the theoretical concepts considered in the course. It is expected that students studying Senior Science Stage 6 will apply investigative and problem-solving skills, effectively communicate scientific information and understanding and appreciate the contribution that a study of science makes to our understanding of the world.

Senior Science Stage 6 caters for a wide range of students, providing stimulation for students who have achieved elementary to substantial achievement level in the Science Stages 4–5 course.

Students who have completed the Biology, Chemistry, Earth and Environmental Science or Physics Preliminary course but do not wish to continue on to the HSC in that course can elect to undertake the Senior Science HSC course.

3 Continuum of Learning for Senior Science Stage 6 Students



In the Preliminary course students can elect to undertake either Preliminary Senior Science or one or more of the Preliminary Biology, Chemistry, Earth and Environmental Science or Physics courses. For the HSC course, students who have completed the Biology, Chemistry, Earth and Environmental Science or Physics Preliminary course but do not wish to continue on to the HSC from a particular chosen Preliminary course can elect to undertake the Senior Science HSC course.

4 Aim

To provide learning experiences through which students will:

- acquire knowledge and understanding about fundamental concepts related to the nature and functioning of physical, chemical, geological and biological systems, the historical development of these concepts and their application in personal, social, economic, technological and environmental situations
- progress from the consideration of specific data and knowledge to the understanding of models and concepts and the explanation of generalised scientific terms; from the collection and organisation of information to problem-solving and from the use of simple communication skills to those that are more sophisticated
- develop positive attitudes towards the study of physical, chemical, geological and biological systems, the environment and opinions held by others, recognising the importance of evidence and the use of critical evaluation of differing scientific opinions related to various aspects of science.

5 Objectives

Students will develop knowledge and understanding of:

1. the history of science
2. the nature and practice of science
3. applications and uses of science
4. the implications of science for society and the environment
5. current issues, research and developments in science
6. the resources of the Earth
7. internal and external environments
8. chemical changes
9. organs and systems of the body
10. energy.

Students will develop further skills in:

11. planning investigations
12. conducting investigations
13. communicating information and understanding
14. developing scientific thinking and problem-solving techniques
15. working individually and in teams.

Students will develop positive values about and attitudes towards:

16. themselves, others, learning as a lifelong process, science and the environment.

6 Course Structure

This *Senior Science Stage 6 Syllabus* has a Preliminary course and a HSC course. The Preliminary and HSC courses are organised into a number of modules.

The Preliminary modules consist of core content that would be covered in 120 indicative hours.

The HSC course consists of core and options organised into a number of modules. The core content covers 90 indicative hours, with options covering 30 indicative hours. Students are required to cover one of the options.

Practical experiences are an essential component of both the Preliminary and HSC courses. Students will complete 80 indicative hours of practical/field work during the Preliminary and HSC courses, with no less than 35 indicative hours of practical experiences in the HSC course. Practical experiences must include at least one open-ended investigation, integrating skill and knowledge outcomes, in both the Preliminary and HSC courses.

Practical experiences should emphasise hands-on activities and include:

- undertaking laboratory experiments, including the use of appropriate computer and digital-based technologies
- fieldwork
- research by using the library, Internet and digital technologies
- using computer simulations for modelling or manipulating data
- using and reorganising secondary data
- extracting and reorganising information in the form of flowcharts, tables, graphs, diagrams, prose and keys
- using animation, video and film resources to capture/obtain information not available in other forms.

6.1 Preliminary Course – 120 indicative hours

The Preliminary course incorporates the study of:

- Water for Living (30 indicative hours)
- Plants (30 indicative hours)
- Humans at Work (30 indicative hours)
- The Local Environment (30 indicative hours).

6.2 HSC Course – 120 indicative hours

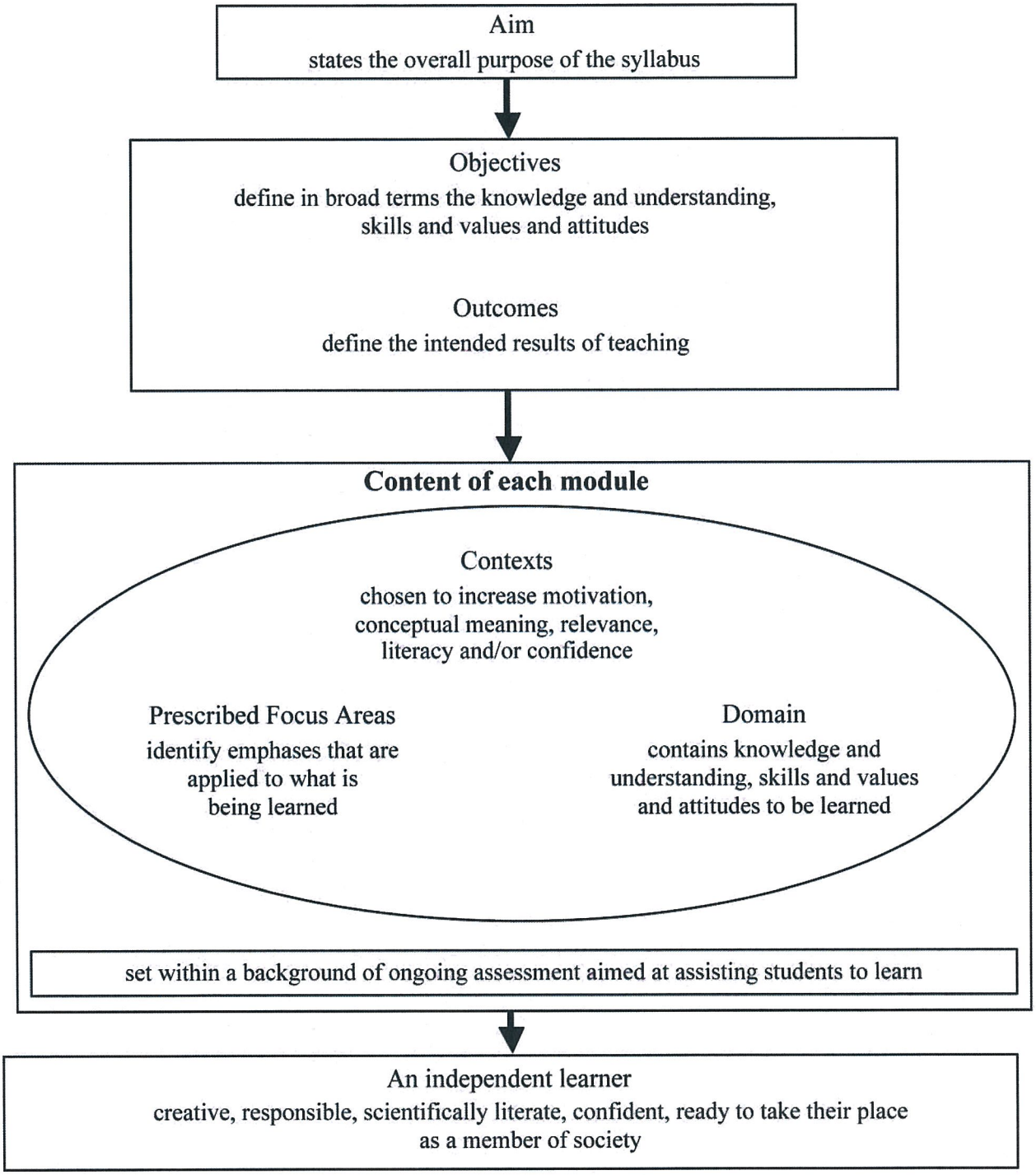
The HSC course builds upon the Preliminary course. The Preliminary course contains content that is considered assumed knowledge for the HSC course. The HSC course incorporates the study of:

a) the core, which constitutes 90 indicative hours and includes:
   - Lifestyle Chemistry (30 indicative hours)
   - Medical Technology – Bionics (30 indicative hours)
   - Information Systems (30 indicative hours)

b) the option constitutes 30 indicative hours and may comprise any ONE of the following:
   - Polymers
   - Preservatives and Additives
   - Pharmaceuticals
   - Disasters
   - Space Science.

6.3 Overview

The following diagram summarises the relationship between the various elements of the course:



Context

Contexts are frameworks devised to assist students to make meaning of the Prescribed Focus Areas and Domain. Contexts are culturally bound and therefore communicate meanings that are culturally shaped or defined. Contexts draw on the framework of society in all aspects of everyday life. The contexts for each module encourage students to recognise and use their current understanding to further develop and apply more specialised scientific understanding and knowledge.

Prescribed Focus Areas

The Prescribed Focus Areas are different curriculum emphases or purposes designed to increase students' understanding of science as an ever-developing body of knowledge, of the provisional nature of scientific explanations in science, of the complex relationship between evidence and ideas in science and of the impact of science on society.

The following Prescribed Focus Areas are developed in this syllabus.

History of science

Knowledge of the historical background of science is important for an adequate understanding of a range of scientific concepts and ideas. Students should develop knowledge of:

- the developmental nature of science
- the part that an understanding of science plays in shaping society
- how our understanding of science has been influenced by society.

Nature and practice of science

A study of Senior Science Stage 6 should enable students to participate in scientific activities and develop knowledge of the practice of science. Students should develop knowledge of the provisional nature of scientific explanations and the complex relationship between:

- existing scientific views and the evidence supporting these
- the process and methods of exploring, generating, testing and relating ideas
- the stimulation provided by technological advances in understanding science
- the constraints imposed on understanding science by the limitations of current technology and the stimulation this provides for the development of the required technology and technological advances.

Applications and uses of science

Setting the study of Senior Science Stage 6 into broader contexts allows students to deal with real problems and applications. The study of Senior Science Stage 6 should increase students' knowledge of:

- the relevance, usefulness and applicability of scientific concepts and principles
- the way in which increases in our understanding in science have led to the development of useful technologies and systems
- the contributions science has made to society, with particular emphasis on Australian achievements.

Implications for society and the environment

Science has an impact on our society and the environment and students need to develop knowledge of the importance of positive values and practices in relation to society and the environment. The study of Senior Science Stage 6 should enable students to develop:

- understanding about the interrelatedness among people and their surroundings
- skills in decision making about issues concerning society and the environment
- awareness of the social and environmental responsibility of the scientist
- awareness of science that relates to the distinctive Australian environment.

Current issues, research and developments in science

Issues and developments related to science are more readily known and more information is available to students than ever before about current issues, research and developments in science. The syllabus should develop students' knowledge of:

- areas currently being researched in science
- career opportunities in science and related fields
- events reported in the media that require an understanding of some aspect of science.

Domain

Knowledge and understanding

As a course that focuses on the disciplines of science, the Senior Science Stage 6 course presents a particular way of thinking about the world. It encourages students to use creativity, inference and deductive reasoning. It presumes that the interactions within biological and physical systems and between organisms and their environments occur in consistent patterns that can be understood through careful, systematic study.

The Preliminary course focuses on skill development and consolidation of the basic laws, theories and principles of Biology, Chemistry, Earth and Environmental Science and Physics. The HSC course focuses on the development of further understanding of the underlying laws, theories and principles of Biology, Chemistry, Earth and Environmental Science and Physics and their application to technology and society.

Skills

Senior Science Stage 6 involves the further development of the skills students have developed through the Stages 4–5 Science course through a range of practical experiences.

The course provides experiences that specifically focus on the skills of investigation and organisation of information, using information technology, including spreadsheets, databases and word processing and develops skills in the use of scientific instrumentation and practical work.

Practical experiences are an essential component of both the Preliminary and HSC courses. Students will complete 80 indicative hours of practical/field work during the Preliminary and HSC courses with no less than 35 indicative hours of practical experiences in the HSC course. Practical experiences are designed to utilise and further develop students' expertise in each of the following skill areas:

- **planning investigations**

  This involves increasing students' skills in planning and organising activities, effectively using time and resources, selecting appropriate techniques, materials, specimens and equipment to complete activities, establishing priorities between tasks and identifying ways of reducing risks when using laboratory and field equipment.

- **conducting investigations**

  This involves increasing students' skills in locating and gathering information for a planned investigation. It includes increasing students' skills in performing first-hand investigations, gathering first-hand data and accessing and collecting information relevant to science from secondary sources using a variety of technologies.

- **communicating information and understanding**

  This involves increasing students' skills in processing and presenting information. It includes increasing students' skills in speaking, writing and using nonverbal communication such as diagrams, graphs and symbols to convey scientific information and understanding. Throughout the course students become increasingly efficient and competent in the use of both technical terminology and the form and style required for written and oral communication in science.

- **developing scientific thinking and problem-solving techniques**

  This involves further increasing students' skills in clarifying issues and problems relevant to science, framing a possible problem-solving process, developing creative solutions, anticipating issues that may arise and devising appropriate strategies to deal with those issues and working through the issues in a logical and coherent way.

- **working individually and in teams**

  This involves further increasing students' skills in identifying a collective goal, defining and allocating roles and assuming an increasing variety of roles in working as an effective member of a team within the agreed time frame to achieve the goal. Throughout the course, students are provided with further opportunities to improve their ability to communicate and relate effectively with each other in a team.

Values and attitudes

By reflecting about past, present and future involvement of science with society, students are encouraged to develop positive values and informed critical attitudes. These include a responsible regard for both the living and non-living components of the environment, ethical behaviour, a desire for critical evaluation of the consequences of the applications of science and a recognition of their responsibility to conserve, protect and maintain the quality of all environments for future generations.

Students are encouraged to develop attitudes on which scientific investigations depend such as curiosity, honesty, flexibility, persistence, critical thinking, willingness to suspend judgement, tolerance of uncertainty and an acceptance of the provisional status of scientific knowledge. Students need to balance these with commitment, tenacity, at times inflexibility and a willingness to take risks and make informed judgements. As well as knowing something of and/or about science, students need to value and appreciate science if they are to become scientifically literate persons.

6.4 Other Considerations

Safety issues

Schools have a legal obligation in relation to safety. Teachers will need to ensure that they comply with the *Work Health and Safety Act 2011* (NSW) and the *Work Health and Safety Regulation 2011 (NSW)*, as well as system and school requirements in relation to safety when implementing their programs.

Schools should refer to the resource package *Chemical Safety in Schools* (DET, 1999) to assist them in meeting their legislation obligations.

Animal Research Act

Schools have a legal responsibility in relation to the welfare of animals. All practical activities involving animals must comply with the *Animal Research Act 1985* (NSW) as described in the *Animals in Schools: Animal Welfare Guidelines for Teachers (2002)* produced on behalf of the Schools Animal Care and Ethics Committee (SACEC) by the NSW Department of Education and Training.