

Earth and Environmental Science

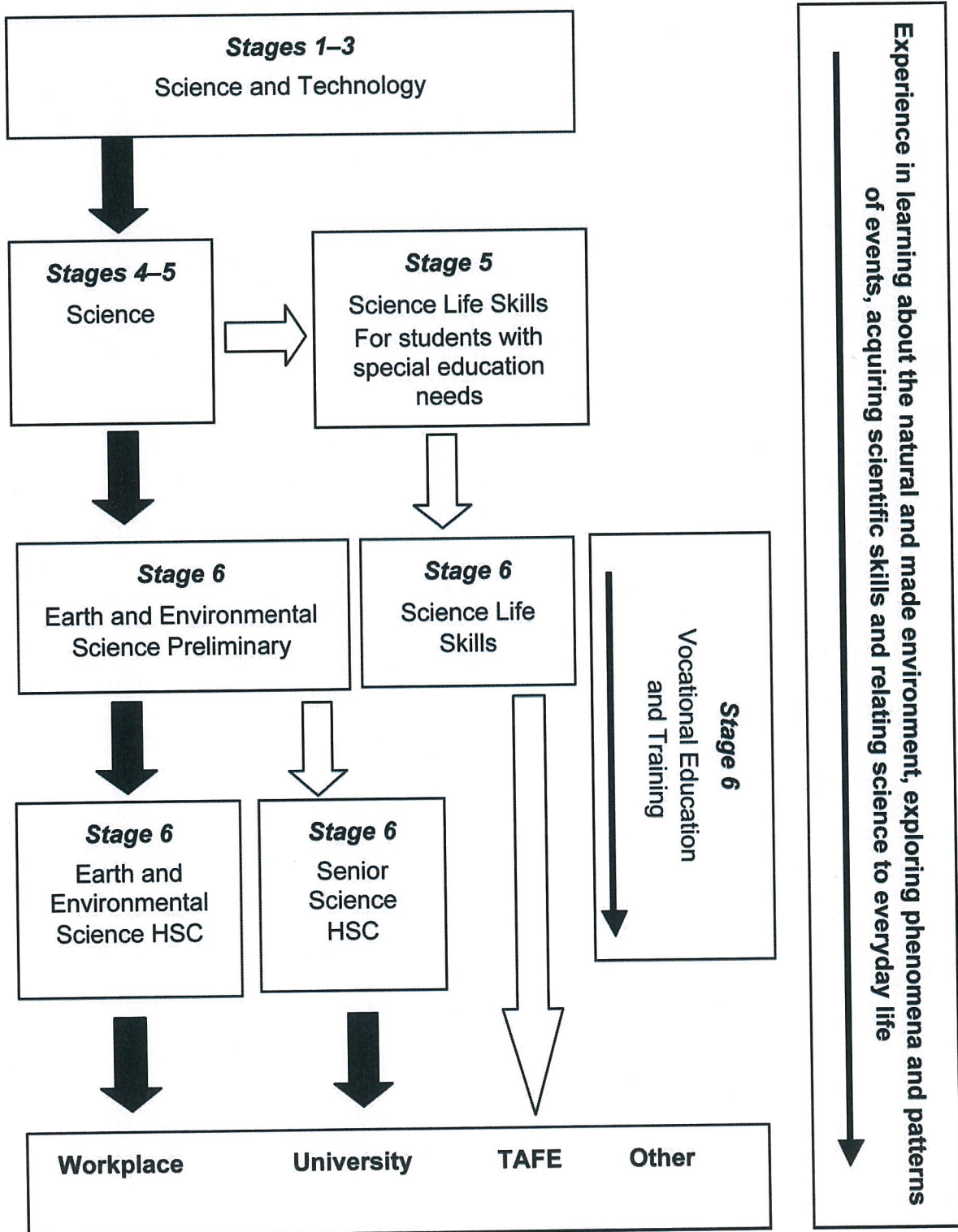
Stage 6 Syllabus

Amended October 2002

Contents

1	The Higher School Certificate Program of Study	4
2	Rationale for Earth and Environmental Science in Stage 6 Curriculum.....	5
3	Continuum of Learning for Earth and Environmental Science Stage 6 Students	6
4	Aim.....	7
5	Objectives.....	7
6	Course Structure.....	8
6.1	Preliminary Course (120 indicative hours)	8
6.2	HSC Course (120 indicative hours)	9
6.3	Overview.....	10
6.4	Other Considerations.....	14
7	Objectives and Outcomes.....	15
7.1	Table of Objectives and Outcomes	15
8	Content: Earth and Environmental Science Stage 6 Preliminary Course	17
8.1	Earth and Environmental Science Skills	17
8.2	Planet Earth and Its Environment – A Five Thousand Million Year Journey	20
8.3	The Local Environment	24
8.4	Water Issues	28
8.5	Dynamic Earth	31
9	Content: Earth and Environmental Science Stage 6 HSC Course	34
9.1	Earth and Environmental Science Skills	34
9.2	Tectonic Impacts	37
9.3	Environments Through Time	41
9.4	Caring for the Country	45
9.5	Option – Introduced Species and the Australian Environment.....	49
9.6	Option – Organic Geology – A Non-renewable Resource	53
9.7	Option – Mining and the Australian Environment.....	56
9.8	Option – Oceanography	60
10	Course Requirements	66
11	Post-school Opportunities	67
12	Assessment and Reporting	68
13	Appendix.....	69

3 Continuum of Learning for Earth and Environmental Science Stage 6 Students



4 Aim

The aim of the Earth and Environmental Science Stage 6 Syllabus is to provide learning experiences through which students will:

- acquire knowledge and understanding about fundamental concepts related to planet Earth and its environments, the historical development of these concepts and their application to 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 Earth and Environmental Science terms; from the collection and organisation of information to problem-solving; and from the use of simple communication skills to those which are more sophisticated
- develop positive attitudes towards the study of planet Earth and its environments, and towards the opinions held by others, recognising the importance of evidence and critically evaluating differing scientific opinions related to various aspects of Earth and Environmental Science.

5 Objectives

Students will develop knowledge and understanding of:

- 1 the history of Earth and Environmental Science
- 2 the nature and practice of Earth and Environmental Science
- 3 applications and uses of Earth and Environmental Science
- 4 the implications of Earth and Environmental Science for society and the environment
- 5 current issues, research and developments in Earth and Environmental Science
- 6 the resources of the Earth, particularly air, soil, water, minerals, their distribution and their role in supporting living systems
- 7 the abiotic features of the environment
- 8 models to explain structures and processes of change affecting the Earth and its environments
- 9 Australian resources
- 10 biotic impacts on the environment.

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 attitudes about and values towards:

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

6 Course Structure

The Earth and Environmental Science Stage 6 Syllabus has a Preliminary course and an 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 and one option covers 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 both 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 integrated open-ended investigation in both the Preliminary and HSC courses.

Practical experiences should emphasise hands-on activities, including:

- undertaking laboratory experiments, including the use of appropriate computer-based technologies
- fieldwork
- research using the library, the 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 flow charts, 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:

- 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).

6.2 HSC Course (120 indicative hours)

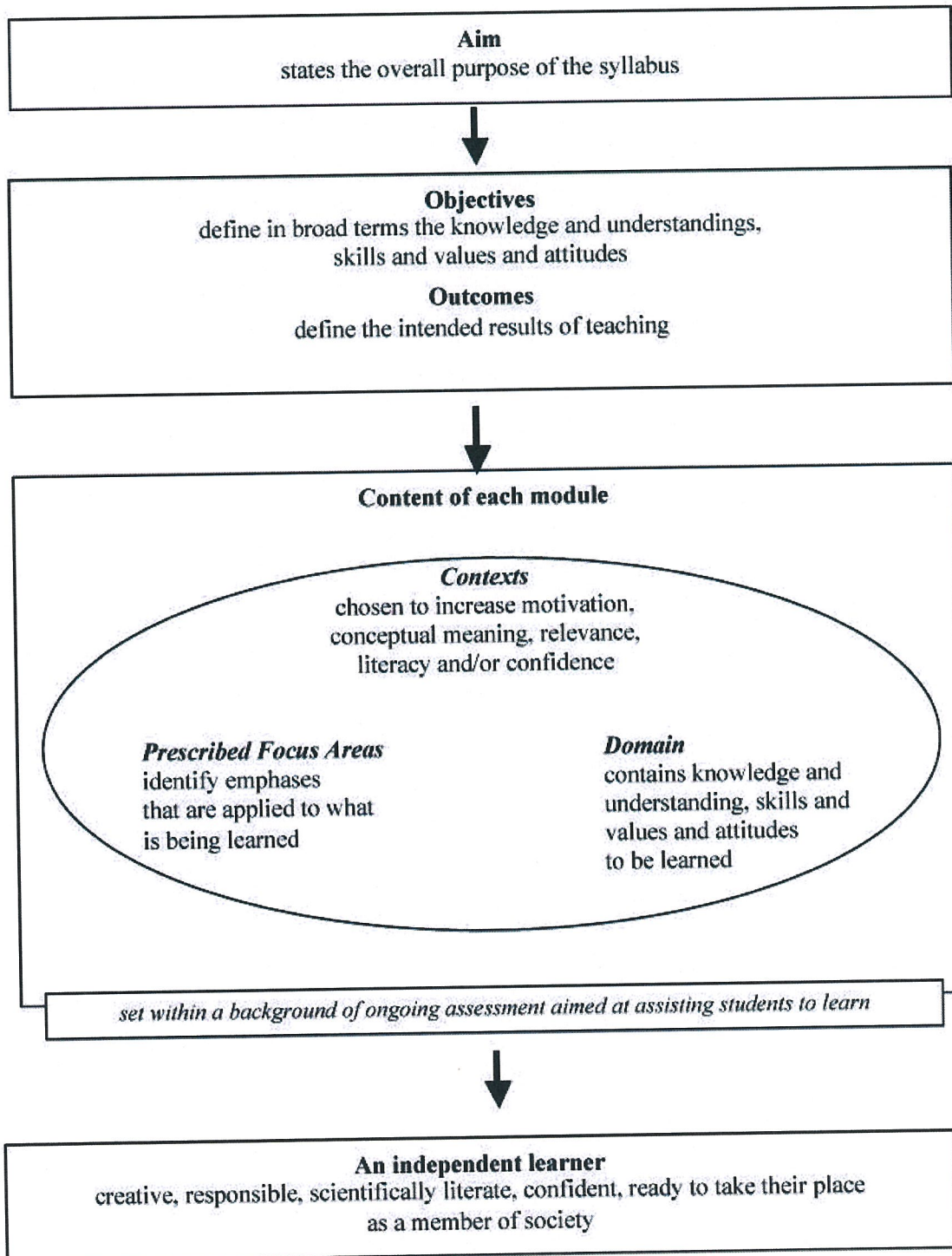
The HSC course builds upon the Preliminary course. The Preliminary course contains content that is considered assumed knowledge for the HSC course.

The HSC course incorporates the study of:

- a) the core, which constitutes 90 indicative hours and includes:
 - Tectonic Impacts (30 indicative hours)
 - Environments Through Time (30 indicative hours)
 - Caring for the Country (30 indicative hours)
- b) ONE option, which constitutes 30 indicative hours and may comprise any one of the following:
 - Introduced Species and the Australian Environment
 - Organic Geology – A Non-renewable Resource
 - Mining and the Australian Environment
 - Oceanography.

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: Earth and Environmental Science as an ever-developing body of knowledge, the provisional nature of scientific explanations in Earth and Environmental Science, the complex relationship between evidence and ideas in Earth and Environmental Science, and the impact Earth and Environmental Science has on society.

The following Prescribed Focus Areas are developed across the modules of the syllabus:

History of Earth and Environmental Science

Knowledge of the historical background of Earth and Environmental Science is important for an adequate understanding of the functioning, origins and evolution of the planet and its environment.

Students should develop knowledge of:

- the developmental nature of knowledge about the Earth and its environments
- the part that an understanding of the Earth and its environments plays in shaping society
- how our understanding of the Earth and its environments is influenced by society.

Nature and practice of Earth and Environmental Science

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

- existing Earth and Environmental Science 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 Earth and Environmental Science
- the constraints imposed on understanding Earth and Environmental 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 Earth and Environmental Science

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

- the relevance, usefulness and applicability of concepts and principles related to Earth and Environmental Science
- how increases in our understanding of Earth and Environmental Science have led to the development of useful technologies and systems
- the contributions Earth and Environmental Science has made to society, with particular emphasis on Australian achievements.

Implications for society and the environment

Earth and Environmental Science has an impact on our society and the environment. Students need to develop knowledge of the importance of positive values and practices in relation to society and the environment. The study of Earth and Environmental Science 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
- an awareness of the social and environmental responsibility of a scientist
- an awareness of areas of Earth and Environmental Science that relate to distinctively Australian environments.

Current issues, research and developments in Earth and Environmental Science

Current issues, research and developments in Earth and Environmental Science are more readily known, and more information is available to students than ever before. The Earth and Environmental Science Syllabus should develop students' knowledge of:

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

Domain

Knowledge and understanding

As a course that focuses on a major discipline of science, Earth and Environmental Science presents a particular way of thinking about the world. It encourages students to use inference, deductive and inductive reasoning and creativity. It presumes that the interactions within Earth processes, between the atmosphere, hydrosphere and lithosphere, and between the abiotic and biotic features of the environment occur in consistent patterns that can be understood through careful, systematic study.

The Stage 6 courses extend the study developed in the Science Stages 4–5 course, particularly in relation to students' knowledge and understanding of the big bang theory, plate tectonics and models for the rock cycle. It assumes some elementary knowledge and understanding of processes of evolution of the universe, solar system and Earth as well as Earth systems and structures and interactions involving the hydrosphere, lithosphere and atmosphere. The interactions between living things, including humans and their environment and the fundamentals of the classification, properties and uses of common substances, are assumed knowledge at a fundamental level.

Skills

The Earth and Environmental Science course involves the further development of the skills students have developed in the Science Stages 4–5 course through a range of practical experiences in both the Preliminary and HSC courses.

Practical experiences are an essential component of both the Preliminary and HSC courses. Students will complete **80 indicative hours of practical/field work across both the Preliminary and HSC courses with no less than 35 indicative hours of practical experiences in the HSC course**. Practical experiences have been 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 Earth and Environmental 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 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 Earth and Environmental Science.

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

This involves further increasing students' skills in clarifying issues and problems relevant to Earth and Environmental 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 to each other in a team.

Values and attitudes

By reflecting about past, present and future involvement of Earth and Environmental 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 recognising 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 should balance commitment, tenacity and, at times, inflexibility with a willingness to take risks and make informed judgements. As well as knowing something of and/or about Earth and Environmental Science, students need to value and appreciate Earth and Environmental 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 legislative 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 *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 the Education and Training, available through 3A Smalls Road, Ryde.