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secondary sources. It is one of four components that describe the scope of the outcome. Thus, the wording of the activity should indicate the intention of the outcome. For example, the activity might ask students to rank the reliability of the various forms of data collected.

It is unlikely and inappropriate that all sub-components of “perform first-hand investigations” could be included in any one learning activity relating to an investigation. The syllabus intends, however, that by the time students have completed all the modules in that course, they would have attempted activities related to all the sub-components of “perform first-hand investigations” at least once. You will need to develop some mapping tools to ensure that you have achieved this across the course.

In relation to the course outcomes themselves, it is unlikely that any student would be able to demonstrate achievement of any one outcome after working through a single module. This is because a particular outcome is addressed over a number of modules. Each of the modules containing that outcome thus contributes to the achievement of the outcome. Teachers would need evidence from more than one task in a module and in more than one module to begin to have confidence that an outcome has been achieved.

Another course requirement is for students to complete at least one open-ended investigation. There are opportunities in each module to turn the activities in syllabus Column 3 into open-ended investigations. The components and sub-components of skill outcomes provide excellent criteria for assessing the students’ efforts.

One format for recording a teaching and learning program is presented below. This model will ensure that you have considered the key elements of the syllabus which you must use in constructing your program. The order of the columns is up to you. You may choose to represent your program in any way that works for you, but it must show the relationships described above in a useful way.

I hope that the above helps you to put together effective programs for your students. The LIG2 workshops and other subject workshops in science will provide you with actual sample programs for one module in each of the courses. To get the most out of those workshops, you should spend some time working through the above before attending the workshop.

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A suggested format for developing a teaching/learning program

Outcomes	Assessment	Teaching and learning activities	Syllabus Column 2 content	Syllabus Column 3 content	Syllabus Section 8.1 content
(B)	(C)	(D)	(E)	(F)	(G)
(B)	Either the words of the outcome or its syllabus number should go in here. Outcomes 1-5 refer to the <i>Prescribed Focus Areas</i> ; 6-10 relate to <i>Domain: Knowledge and Understanding</i> ; 11-15 to <i>Domain: Skills</i> ; and 16 to <i>Domain: Values and Attitudes</i> .				
(C)	This column might include either the assessment tasks you set students or short descriptive statements about the kind of responses from students that you are looking for when assessing students’ work (indicators that the student is on the way to achieving the outcomes).				
(D)	The activities described here should be a professional synthesis of (D), (E) and (F), and should focus on what the student will be doing.				
(E), (F) & (G)	These three columns include the sets of • points and the chosen content from Section 8.1 (or 9.1 for HSC) that you have chunked together to construct the teaching and learning activities. This will be relatively easy to do using “cut and paste” commands. The Board has advised that it will be posting the syllabuses on its web site in formats that enable you to do this relatively easily.				

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Taking a look at assessment and reporting in 2000

Q. What does a standards-referenced approach mean?

A. The new Higher School Certificate (HSC) will use a standards-referenced approach to assessing and reporting student achievement.

This means that the achievements of students are assessed and reported against specified standards that are established for each course. In a standards-referenced approach, students are recognised for what they know, understand and can do. The mark they receive will reflect the standard which the student has achieved in the course.

The current HSC uses a norm-referenced approach. In this approach, fixed percentages of students are placed into bands of marks according to a pre-determined distribution. This occurs regardless of what students know, understand and can do, and fails to recognise the standard which the student has demonstrated in terms of achievement of course outcomes.

Q. What are the “standards”?

A. In the new Higher School Certificate these standards are:

- the knowledge, skills and understanding expected to be learned by students as a result of studying the course, referred to as the *syllabus* standards
- the levels of achievement of the knowledge, skills and understanding (reported in six bands), referred to as the *performance* standards.

Syllabus standards and *performance* standards are based on the aims, objectives, outcomes and content of a course. Together, they specify what is to be learned and how well it is to be achieved.

Q. How will the changes to the new HSC affect school policies and procedures?

A. The Board of Studies ACE Manual remains current for the year 2000. Schools should ensure that they are familiar with the HSC requirements concerning policy and procedures, as set down in this manual.

School policies and procedures will need to reflect the Board’s requirements for the HSC internal assessment, as stated in the ACE Manual (check with the Board of Studies).

Aspects of policy and procedure which must be developed and implemented by schools include:

- informing students in writing of the assessment requirements for each course before the commencement of the HSC course
- ensuring that students are given adequate written notice of the nature and timing of assessment tasks
- providing meaningful feedback on students’ performance in all assessment tasks
- maintaining records of marks awarded to each student for all assessment tasks
- addressing issues relating to illness, misadventure and malpractice in assessment tasks
- addressing issues relating to the late submission and non-completion of assessment tasks
- advising students in writing if they are not meeting the assessment requirements in a course and indicating what is necessary to enable the students to satisfy the requirements
- informing students about their entitlements to school reviews and appeals to the Board
- conducting school reviews of assessments when requested by students
- ensuring that students are aware that they can collect their Rank Order Advice at the end of the external examinations at their school.

Schools will need to ensure that they understand the new mandatory assessment requirements of different courses by checking the relevant syllabuses. These changes to requirements need to be incorporated into school policy and procedures.

The Board still requires schools to develop an internal assessment program that:

- specifies the various assessment tasks and weightings allocated to each task
- provides a schedule of the tasks designed for the whole course.

Q. How will changes to the new HSC affect my assessment practices?

A. The white paper envisaged that changes to assessment practice would occur over several years, commencing in 2001.



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Teachers should follow school policies and procedures and syllabus guidelines for assessment and reporting. They need to ensure that course requirements are followed in terms of the balance and weighting of components and types of tasks. What is important is that the strategies used to assess students are appropriate to the outcomes being assessed.

Teachers need to provide a mark for internal assessment tasks. These marks should be derived from the students' achievement against specified criteria.

Appropriate feedback should be given to students to inform them about what they need to learn and do in order to improve their achievement in a subject.

Q. What are good assessment practices?

A. Teachers demonstrate good assessment practices when they:

- design and use assessment strategies which are directly linked to and reflect the course outcomes and the standards expected
- provide the opportunity for students to demonstrate their achievement of outcomes in a variety of types of task
- consider the type of assessment task being used, ensuring that it is appropriate to the outcomes being assessed
- inform the students of the assessment criteria on which the assessment task is to be judged, before the task is undertaken
- design for each task marking schemes which are aligned to the syllabus standards
- provide students with meaningful feedback about what they are able to do and what is needed to improve performance
- determine rankings and relative difference between students by level of achievement of the standards.

Q. Will the new HSC examination be different from the current examination?

A. HSC examination questions will be developed from the examination specifications. Teachers will need to check the examination specifications for each course they teach. Most courses have had changes

made to their exam specifications as a result of the review process.

HSC examinations will now assess against standards. They will do this by using a variety of question types to enable students to demonstrate their level of achievement of course outcomes. Questions will be clearly worded and structured to indicate to students what is expected and will reflect a range and balance of course content and outcomes. Marking guidelines will be developed which will align with the performance standards. Examinations will be marked using teachers' professional judgement to determine the standard of students' performance, and the marks awarded will reflect the standard.

Q. What are non-examination type tasks?

A. Some examples of non-examination type tasks include:

- laboratory reports
- computer simulations, multimedia presentations
- interviews, surveys, seminars
- debates, hypotheticals
- case study reports
- oral presentations
- community-based fieldwork
- research reports
- participant observation and analysis
- interpretation of scenarios, statistics
- co-operative learning tasks
- investigation and analysis tasks
- audio-visual presentation or analysis
- practical performances to demonstrate theoretical understanding.

Q. What are performance scales and performance bands?

A. Students who successfully complete the HSC Course will have their performance reported against performance bands on a course report.

The course report includes a performance scale which describes five levels (bands) of achievement above a minimum standard expected. Each band on the performance scale (except band 1) includes

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descriptions that summarise the attainments typically demonstrated on that band.

Students who meet or exceed the minimum standard receive a mark of 50 or more. The mark awarded to a student will reflect the standard achieved in the course.

Performance scales can assist in internal assessment programs as they can be used to determine the wording of marking schemes and feedback to students.

Q. What do I need to understand about performance bands?

A. Teachers need to understand that the performance bands are used only to report students' achievement at the end of the course. They provide a summative description of a student's overall performance in a subject, based on internal assessment and the external examination.

Teachers need to recognise that the development of performance bands is an evolving process, in which the bands will continue to be refined to include information from performance in the new HSC courses and the outcomes assessed internally.

Support for teachers in developing an understanding of performance bands will include:

- State-wide workshops (LIG events) in November, which will specifically focus on assessment in the new HSC.
- New HSC Bulletins. Four HSC Bulletins are being developed to address issues concerning assessment and reporting in the HSC. The first bulletin is on *Assessment—A Standards-Referenced Approach*. Other issues that will be addressed include: the role of internal assessment; developing assessment tasks; reporting student achievement.
- Board of Studies support documents, including the *Examination, Assessment and Reporting Supplement* for each course.

Q. At the end of the HSC, what will I need to submit to the Board of Studies?

A. As in previous years, schools will provide the Board with a mark only. These marks are the product of the internal assessment program and should indicate the rank order of the students and the relative differences between the students.

This mark will provide a summation of each student's achievement, measured at points throughout the course.

Teachers will make informed judgements about the relative difference between students, based on their differing achievement of standards.

Q. What will happen to the internal assessment mark which I submit to the Board?

A. For each school course group, the school assessment marks submitted to the Board of Studies will be moderated on the basis of the group's performance in the HSC examination. The approach to be used will be the same as at present, except that the raw examination marks will be used in the moderation process.

For each course, the moderated assessment and the examination mark will be averaged to provide a composite mark.

Experienced markers will follow a structured procedure, employing their professional judgement to determine what composite marks will correspond to the borderline between each performance band. This step provides a set of "mapping points" that enable students' marks to be aligned with the performance scale.

For each student in a course, the moderated assessment mark and the examination mark are separately aligned with the performance scale.

The average of a student's assessment mark and the examination mark, after alignment to the performance scale, is then reported as the student's HSC mark.

Q. What will students receive in terms of an HSC?

- A. Students will receive:
- The HSC testamur (if all requirements are met).
 - A Record of Achievement which summarises results awarded in each course.
 - A course report for each Board-developed course. This will show the moderated internal assessment mark, the external examination mark and the averaged HSC mark on a performance scale. This report also includes statements of a typical performance which a student would demonstrate in each band.
 - VET credentials.



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Transition Stages 4-5 to Stage 6 (Year 10, 1999)

Stage 6 syllabuses assume students will have certain knowledge and understandings from Stage 5. The requirement for each Stage 6 module is given in the *Assumed Knowledge* section and through the recall statements in the *Students learn to:* column (Column 2).

The Science Unit has analysed the new Stage 6 syllabuses and produced some lists (below) which may be useful for teachers and students until Stages 4-5 science programs based on the new syllabus take effect.

Here are some other suggestions for using these lists to help with the transition:

1. Use the lists to check the coverage of assumed knowledge in your current Year 10 programs. Where current topics address a general area of knowledge content, you can use the specific language of the statements below to focus your teaching.
2. Where your programs do not make explicit the knowledge content, you could either try to modify your current programs to accommodate the assumed knowledge or modify your Year 10 programs to cover the assumed knowledge that is not addressed in the *recall* statements of the Preliminary course. The assumed knowledge in the recall statements could be taught as part of the preliminary modules.

Subject lists

Note: *Recall* statements include knowledge content from both Stage 4 and Stage 5. *Assumed knowledge* statements in each module include only Stage 5 knowledge content.

Physics

The *assumed knowledge* which is not addressed in *recall* statements (Preliminary Stage 6 Physics):

- 5.6.2d analyse qualitatively common situations involving motion in terms of Newton's Laws (8.4)
- 5.6.3a design, construct and draw circuits containing a number of components (8.3)

- 5.6.3b describe voltage, resistance and current using analogies (8.3)
- 5.6.3d compare advantages and disadvantages of series and parallel circuits (8.3)
- 5.6.4a distinguish between the absorption, reflection, refraction and scattering of light and identify everyday situations where each occurs (8.2)
- 5.9.1b identify that some types of electromagnetic radiation are used to provide information about the universe (8.2) (8.5)
- 5.9.1c describe some of the difficulties in obtaining information about the universe (8.5)
- 5.9.2a discuss evidence that suggests crustal plates move over time (8.5)
- 5.9.3a relate some major features of the universe to theories about the formation of the universe (8.5)
- 5.9.3b describe some changes that are likely to take place during the life of a star (8.5)
- 5.11.1a discuss the importance of energy as a resource and identify renewable sources of energy (8.3)

Collated list of *recall* statements (Preliminary Stage 6 Physics):

- Recall that waves are carriers of energy (8.2) *
- Recall that the features of a wave include frequency, wavelength and speed (8.2) *
- Recall that sound waves are vibrations or oscillations of particles in a medium (8.2)
- Recall that different types of radiation make up the electromagnetic spectrum (8.2) *
- Recall that electromagnetic radiation has some everyday uses and effects, including applications in communication technology (8.2) *
- Recall the behaviour of electric charges and the field associated with them (8.3)
- Recall the use of the terms *current*, *voltage*, and *resistance* in electric circuits (8.3) *
- Recall the behaviour of the poles of magnets when they are brought close together (8.3)
- Recall average speed in terms of the qualitative relationship between distance and time (8.4)
- Recall the relationship between distance, speed and time (8.4) *
- Recall the qualitative relationship between force, mass and acceleration (8.4) *
- Recall that acceleration is related to a change in speed and/or direction as a result of a net force (8.4) *

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- Recall and define the terms “mass” and “weight” with reference to the effects of gravity (8.4)
- Recall that a moving object possesses kinetic energy (8.4)
- Recall the law of conservation of energy (8.4)
- Recall Newton’s Third Law qualitatively (8.4) *
- Recall Newton’s First Law of Motion in qualitative terms (8.4) *
- Recall the features and location of protons, neutrons and electrons in the atom (8.5)
- Recall current scientific thinking about the origin of the universe (8.5) *
- Recall the inverse square law of intensity of light and use it to relate the brightness of a star to its luminosity and distance from the observer (8.5)
- Recall that energy may be released from the nuclei of atoms (8.5) *

Chemistry

The *assumed knowledge* which is not addressed in *recall* statements (Preliminary Stage 6 Chemistry):

- 5.7.1c identify properties of different substances that can be explained in terms of their subatomic structure (8.3)
- 5.7.1d describe an appropriate model that has been developed to describe atomic structure (8.3)
- 5.10b describe the importance of cycles of materials in ecosystems
- 5.11.2a relate pollution to contamination by unwanted substances.

Collated list of *recall* statements (Preliminary Stage 6 Chemistry):

- Recall the difference between elements, compounds and mixtures in terms of particle theory (8.2)
- Recall that compounds are classified into groups based on common chemical characteristics (8.2)
- Recall the atom as the smallest unit of an element and distinguish between atoms and molecules (8.2)
- Recall some relationships between elements using the Periodic Table (8.2)
- Recall that matter is made of particles that are continuously moving and interacting (8.2)
- Recall the model for atomic structure and the distribution of electrons, protons and neutrons (8.2)

* These *recall* statements incorporate *assumed knowledge*

- Recall that particles with opposite charges will attract each other and identify that the attraction forms ionic compounds (8.2)
- Recall construction of word equations from observations and written descriptions of a range of chemical reactions (8.2) (8.3)
- Recall qualitative descriptions of reactants and products in decomposition reactions (8.2)
- Recall a range of common compounds, using their common names and chemical formulae (8.2)
- Recall that a new compound is formed by rearranging atoms rather than by creating matter (8.2)
- Recall qualitative descriptions of reactants and products in corrosion, acids on metals and carbonates, and neutralisation (8.3)
- Recall descriptions of some relationships between elements using the Periodic Table (8.3)
- Recall distinctions between elements, using information about the numbers of protons, neutrons and electrons (8.3)
- Recall the terms *solute*, *solvent* and *solution* (8.4)
- Recall the importance of water as a solvent (8.4)
- Recall qualitative descriptions of reactants and products in precipitation and combustion reactions (8.4) (8.5)
- Recall the role of photosynthesis in ecosystems (8.5).

Biology

Note: All listed *assumed knowledge* statements have been addressed within module recall statements.

Collated list of *recall* statements (Preliminary Stage 6 Biology):

- Recall the difference between biotic and abiotic features of the environment (8.2) *
- Recall the importance of cycling of materials in ecosystems (8.2) *
- Recall some impacts of human activities on ecosystems (8.2)
- Recall the relationship between pollution and contamination by unwanted substances (8.2)
- Recall strategies used to balance human activities and needs in ecosystems to conserve, maintain and protect the quality of the environment (8.2)
- Recall that diffusion involves random movement of particles (8.3)



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- Recall that most multicellular organisms have specialised cells, tissues, organs and systems that carry out particular functions (8.3)
- Recall that tissues, organs and organ systems in multicellular organisms consist of different types of cells (8.3)
- Recall that systems in multicellular organisms supply the needs of cells (8.3) *
- Recall that word equations can be used to describe a range of chemical reactions (8.3) *
- Recall the role of cell division in growth, repair and reproduction in multicellular organisms (8.3) *
- Recall that information is transferred as DNA on chromosomes when cells reproduce (8.3) *
- Recall that genes consist of DNA (8.3) *
- Recall the conditions under which fossils form (8.4) *
- Recall that the fossil record is related to the time over which living things have been evolving on earth (8.4) *
- Recall evidence that present-day organisms have developed from organisms in the distant past (8.4) *
- Recall that crustal plates move over time (8.5) *
- Recall the theory of evolution by natural selection (8.5) *
- Recall what is meant by the refraction of light (9.5)
- Recall that sound is a form of energy that requires a medium for propagation (9.5).

Earth and Environmental Science

The *assumed knowledge* which is not addressed in *recall* statements (Preliminary Stage 6 Earth and Environmental Science):

- 5.9.1a discuss current scientific thinking about the origin of the universe (8.2)
- 5.9.1b identify that some types of electromagnetic radiation are used to provide information about the universe (8.2)
- 5.9.1c describe some of the difficulties in obtaining information about the universe (8.2)
- 5.9.3a relate some major features of the universe to theories about the formation of the universe (8.2)
- 5.9.4a identify that geological history can be interpreted from the formation, by sediments, of horizontal layers in which the oldest are at the base and the youngest are at the top (8.5)
- 5.9.4d relate movements of the Earth's plates to convection currents in the asthenosphere and to gravitational forces (8.5)
- 5.9.4e explain how earthquakes, volcanic activity and new landforms result from the interactions at plate boundaries (8.5)
- 5.9.4f explain some impacts of natural events including cyclones, volcanic eruptions and earthquakes on the atmosphere, hydrosphere, lithosphere and/or biosphere (8.4) (8.5)
- 5.10.a distinguish between biotic and abiotic features of the local environment (8.3) (8.4)
- 5.10b recognise some differences between igneous, metamorphic and sedimentary rocks (8.3) (8.4)
- 5.10c describe some impacts of human activities on ecosystems (8.3)
- 5.10d discuss strategies used to balance human activities and needs in ecosystems with conserving, protecting and maintaining the quality of the environment (8.3)
- 5.11.2a relate pollution to contamination by unwanted substances (8.4).

Collated list of *recall* statements (Preliminary Stage 6 Earth and Environmental Science):

- Recall the explanation of density using a simple particle model (8.2)
- Recall the distribution of the atmosphere, hydrosphere, lithosphere, and biosphere on Planet Earth (8.4)
- Recall the water cycle in terms of the physical processes involved (8.4)
- Recall an appropriate model that has been developed to describe atomic structure (8.5)
- Recall evidence that lithospheric plates move over time (8.5) *.

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