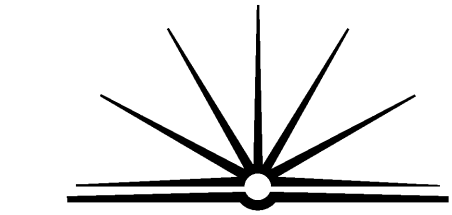


# Report on the development of a K–12 Technology Statement

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# Background

## The current technology curriculum

Currently the technology curriculum K–12 includes:

- K–6 Science and Technology

- 7–10 mandatory syllabus:
  - Design and Technology (mandatory)

- 7–10 elective syllabuses:
  - Agriculture
  - Computing Studies
  - Design and Technology
  - Food Technology
  - Sheep Husbandry and Wool Science
  - Technical Drawing
  - Technics
  - Textiles and Design
  - A range of Board Endorsed school developed courses including Marine and Aquaculture Technologies

- Stage 6 syllabuses:
  - Agriculture
  - Design and Technology
  - Engineering Studies
  - Food Technology
  - Information Processes and Technology
  - Industrial Technology
  - Software Design and Development
  - Textiles and Design
  - Computing Applications (CEC)
  - Marine Studies (CEC)

- other Stage 6 syllabuses that relate to the technology learning area include:
  - Information Technology Industry Framework VET course
  - Primary Industries Industry Framework VET course
  - Tourism and Hospitality Industry Framework VET courses
  - Construction Industry Framework VET course
  - Electrotechnology CEC VET course
  - Furnishing CEC VET course.

## The need for a statement that guides future technology curriculum development

The K–6 Science and Technology syllabus was developed in 1991 and the outcomes and indicators revised in 2000. The current syllabus integrates the content of science and technology. This makes the articulation of the continuum of learning for K–10 science and for K–10 technology difficult. In Stage 3 discrete outcomes and content for science and for technology may be of benefit.

The Year 7–10 Design and Technology (mandatory) syllabus was released in 1991 for implementation in 1992. It is the foundation course for a range of elective courses in the Technological and Applied Studies Key Learning Area (TASKLA).

Eight Years 7–10 elective syllabuses range in age from 6 to 30 years. These include Agriculture, Computing Studies, Design and Technology (additional), Food Technology, Technical Drawing, Sheep Husbandry and Wool Science, Technics and Textiles and Design.

The syllabuses from K–10 were developed in various periods of curriculum reform over the past 30 years. The structures and approaches to objectives, outcomes and content vary across the syllabuses. While they all involve the study and use of technologies the approaches used for project and practical work differ.

Emerging technologies and developments in the use of technology for industrial, commercial, domestic and leisure pursuits make it desirable for the range of subjects and their content to be reviewed.

Stage 6 Technology syllabuses were revised as part of the development of the New Higher School Certificate in 1999, using the Board's syllabus development process. They reflect national and international directions and provide the opportunity for continuity of study into relevant university courses and related vocational education fields.

In this context the Technology Statement K–12:

- broadly defines the continuum of learning in technology syllabuses K–12
- defines identified areas of study and elective syllabuses in the TASKLA that appropriately address advances in technology.

Stage 4 and Stage 5 syllabuses are to be revised and developed in terms of the Board of Studies K–10 Curriculum Framework that guides the revision of all Years 7–10 syllabuses.

This report includes:

- A description of the process used to develop the report
- A purpose statement for technology as an area of learning
- the key issues impacting on the technology curriculum
- broad directions to apply to all syllabus development in the 7–10 Technological and Applied Studies Key Learning Area (TASKLA)
- an overview of a proposed K–12 continuum in technology curriculum
- more detailed description of the way each individual syllabus in the 7–10 TASKLA will reflect the broad directions
- recommendation concerning Marine and Aquaculture Technology
- appendices:
  - syllabus evaluation summaries
  - Technological and applied Studies symposium summary statements
  - Professional Teacher Association consultation report.

## The process used for development of the statement

The development of this K–12 Technology Statement has been informed by:

- the full evaluation of each existing syllabus for Years 7–10 in the TASKLA using the Board's syllabus development process including:
  - evaluation of the existing syllabus against the criteria approved by the Board
  - consultation with teachers and key groups
  - a review of literature and practice in Australia and overseas.

  The outcomes of the syllabus evaluations for each subject are briefly summarised in Appendix 1 on page 18.

- the Technological and Applied Studies Years 7–10 symposium held on 8th December 2001. Delegates were nominated by education systems, professional teacher associations, parent groups and school principals. Academics and student representatives were also invited. The symposium included keynote speakers and the opportunity for delegates to discuss future directions in the TASKLA.

  The outcomes of the symposium are summarised in Appendix 2 on page 21.

- seminars and workshops held at Professional Teacher Association conferences in 2000 and 2001 including:
  - the Computer Education Group conference
  - the combined Technology Educators Association and Institute of Technology Education conference
  - the Computing Studies Teachers Association meeting
  - the Association of Agriculture Teachers conference
  - the mid-North Coast TAS Association.

  The overall outcomes of the consultation workshops at Professional Teacher Association conferences are summarised in Appendix 3 on page 23.

- broader technology statements such as:
  - Curriculum Corporation, 1994, *A statement on technology for Australian schools*, Curriculum Corporation, Canberra. This document provides a national framework for technology within the curriculum that is based on the application of a design/make/appraise process to the strands of information, materials and systems.

## The purpose of technology as an area of learning in NSW

Technology Education is recognised nationally as catering for the broad range of student interests, abilities and backgrounds through the practical application of knowledge and the development of skills and attitudes. Technology education engages students in a diverse range of practical activities that provide opportunities for them to achieve success in areas relevant to them as individuals and to society.

Technology education provides students with opportunities to be involved in creative and practical experiences using a range of technologies. These technologies may be used for researching, designing, manipulating and producing products, systems and environments. Students develop critical thinking skills and learn about and use a variety of resources, materials, tools and techniques to solve problems and meet identified needs.

A diverse and changing range of technologies are in development and use across society. The technological fields explored in schools should relate to those technologies that are particularly significant in the wider community, including the personal, commercial, industrial and global areas of human activity. The nature of the technological fields studied at school will continue to evolve in response to change.

For example information and communication technology (ICT) is having a significant impact on society. Syllabuses across the curriculum will integrate relevant ICT as they are reviewed. The technology learning area has a particular role in providing more in-depth study of ICT.

Technology education assists students to develop a holistic understanding of the impact of technologies on culture, society and the environment. It promotes capacity for innovation, creativity, enterprise, management, collaboration and communication.

## Key issues impacting on the technology curriculum

Key issues for curriculum development in technology education include:

- **providing for emerging technologies**: the nature of technology is dynamic. Syllabuses in technology need to remain current in terms of new and emerging technologies and to reflect current practices and trends in industrial, commercial, domestic and leisure activities

- **providing project based learning**: content and syllabus structures should include student-directed learning and problem solving activities that link to students' background knowledge and prior learning and that take into account the nature of the learner

- **continuity**: in the current Years 7–10 Design and Technology syllabus, there is little differentiation or increased depth of study between the mandatory and additional course. Equally, the continuity from Stage 4 Design and Technology to various Stage 5 elective courses varies depending on school and teacher interpretation of the broad range of general outcomes and content in the Stage 4 course. The mandatory course should more clearly define outcomes and content that are considered foundational for further study in the key learning area. Continuity of learning as students progress from Stage 3 to Stage 4, and to more specialised study in Stages 5 and 6, should be more clearly defined

- **syllabus flexibility**: the diversity of the areas of study and electives in the technology curriculum means that syllabuses must be flexible to allow schools and teachers to structure programs that take account of student and community needs and interests, the availability of resources and teacher expertise

- **occupational health and safety**: recent changes to Occupational Health and Safety (OH&S) legislation need to be recognised in the development of all syllabuses so that students and teachers are aware of their responsibilities and are able to work in safe environments.

The following issues were identified during the evaluation of the 7–10 technology syllabuses and will be addressed through consultation with education systems during syllabus development:

- **teacher training and professional development**: teachers benefit from the provision of opportunities to update their skills and knowledge in relation to new and emerging technologies that are reflected in syllabuses. Teachers require opportunities to build upon previously acquired knowledge and skills to ensure currency of delivery in the classroom

- **resourcing**: new and revised syllabuses will need to reflect current resource provisions in schools so that schools are able to implement new syllabuses with an achievable change in resource requirements.

## Broad directions for syllabus development in the 7–10 Technological and Applied Studies Key Learning Area (TASKLA)

**Direction 1 – Subject provision**
The technology curriculum in NSW will include a mandatory technology syllabus linked to Stage 4 standards and a range of elective subjects linked to Stage 5 standards that represent significant fields of technology content. These content areas should relate to significant areas of technological development in industries and in domestic and leisure activities.

**Direction 2 – The nature of the mandatory course (focus and general direction and relationship with electives)**
The mandatory course, while providing essential broad-based technology learning, will build on learning in K–6 Science and Technology and will serve as the foundation course for subsequent learning opportunities within the secondary TASKLA. It will therefore provide opportunities for students to experience and develop broad skills and knowledge in areas fundamental to and aligned with the more specialised Stage 5 elective courses.

**Direction 3 – Core and options model for syllabuses**
A standardised structure will be adopted across technology syllabuses that maintain sufficient flexibility for schools to respond to student needs, interests and abilities. This model will allow all students to develop a range of skills and knowledge essential to and underpinning all other learning in syllabuses.

**Direction 4 – Incorporating new technologies and contemporary industrial practice within a syllabus structure that caters for future developments**
Technology syllabuses will accommodate the incorporation of new and emerging technologies into content as technology and industrial practice change.

**Direction 5 – Common approach to underpin each syllabus**
The design, make, appraise paradigm is a valued pedagogy in technology subjects. It will be reflected in all syllabuses within the TASKLA and will include the development of quality project work. Within individual syllabuses the terms design, make and appraise may be defined and applied differently within the paradigm. For example:

- the emphasis on design theory and the study of designers will differ in the Stage 5 Design and Technology, Agricultural Technologies and Industrial Technologies syllabuses
- the emphasis on the in-depth study of systems, tools and/or properties of materials will differ across elective syllabuses
- project work and/or practical applications can be used as an organiser to integrate all learning in some subjects, while being used at varying stages to clarify and apply knowledge and skills developed in others.

## The K–12 continuum in technology education

The technology curriculum should provide clearly articulated areas of study (ie strands or options) and elective subjects that are developmentally sequenced to form a continuum of learning K–12.

Outcomes from K–12 should be clearly sequenced and provide for the progressive development of skills, knowledge and understanding. Teachers K–12 need to be aware of and have access to relevant outcomes and stage statements.

The K–12 continuum should allow for the development of skills, knowledge and understanding from K–6 Science and Technology and the mandatory Stage 4 Technology course through to specialist electives in Stages 5 and 6.

The developmental sequence of outcomes would provide for the progressive development of skills, knowledge and understanding in a range of technologies, materials, tools and techniques from K to Stage 4 and allow students to start to specialise in technology areas of interest in Stage 5 and 6 to provide a continuum after the compulsory years of schooling.

Technology programs in primary schools give students a broad foundation for further learning. Secondary school programs become more specialised as students progress towards Year 12.

Future revision of K–6 Science and Technology should provide for:

- a structure which continues to support the integration of Science and Technology learning with activities in other key learning areas
- curriculum which integrates Science and Technology learning from Early Stage 1 to Stage 2
- a clear delineation of outcomes and content for Science and for Technology in Stage 3 in preparation for the two distinct mandatory courses in Stage 4.

## **The K–12 continuum** (continued)

### STAGE 6

Board Developed Courses

- Agriculture
- Design and Technology
- Engineering Studies
- Food Technology
- Information Processes & Technology
- Industrial Technology
- Software Design and Development
- Textiles and Design

**VET Frameworks and CECs**

- Construction
- Information Technology
- Primary Industries
- Tourism and Hospitality
- Computing Applications CEC
- Electrotechnology CEC
- Marine Studies CEC
- Furnishing CEC

### STAGE 5
### (elective 7–10 syllabuses)
**Proposed Electives based on areas of technological development, industry, materials and leisure activities**

- Agricultural Technology
- Design and Technology
- Food Technology
- Graphics Technology
- Industrial Technology
- Information and Software Technology
- Textiles Technology

### STAGE 4
### (mandatory 7–10 syllabus)
**Technology: Areas of Study based on recognised fields of design in the community and in industry**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Agricultural Design | Architectural Design | Engineering Design (Structures and Systems) | Information Design | Textiles Design | Food Design | Graphic Design | Industrial Design | Interior Design |

### STAGE 3

| Technology content strands | Science content strands |
|---|---|
| Information and Communications, Built Environments, Products and Services | Living Things, The Earth and its Surroundings, Physical Phenomena |
| Designing, researching, making and appraising | Scientific investigation |
| Using technology | Using technology |

### STAGES 1-2
**Science & Technology: Content strands**

| | | | | | |
|---|---|---|---|---|---|
| Information and Communications | Built Environments | Products and Services | Living Things | The Earth and its Surroundings | Physical Phenomena |
| Investigating | | | | | |
| Designing, making and appraising | | | | | |
| Using technology | | | | | |

## Description of the way syllabuses in the 7–10 TASKLA will reflect the broad directions

### 7–10 Technology (Mandatory) syllabus

The 200 hour mandatory Stage 4 Technology syllabus will include a revision of the current Design and Technology syllabus. It will build upon the technology-related outcomes and content achieved by students at the end of Stage 3 Science and Technology so that students are provided with a clearly articulated progression of technology learning from primary to secondary schooling. This is similar to progression from Stage 3 Science outcomes into the mandatory Stage 4 Science syllabus.

The revised Stage 4 Technology syllabus will also assist in the progression of students to the elective Stage 5 and Stage 6 technology courses.

The revised syllabus will provide clearer guidance as to what students are required to learn about and learn to do. The content will be organised to specify the tools, materials, techniques, design, management and communication strategies to be taught, as well as the social, ethical and environmental issues to be considered.

It is proposed that the Areas of Study in the Stage 4 Technology (mandatory) syllabus be based on recognised fields of design in the community and in tertiary institutions. Proposed areas of study are:

- Agricultural Design
- Architectural Design
- Engineering Design (Structures and mechanisms)
- Textiles Design (Apparel and non-apparel)
- Food Design
- Graphic Design
- Industrial Design
- Information Design
- Interior Design.

The structure of the mandatory Technology syllabus would provide for:

- core content which is specified in terms of ‘learn to’ and ‘learn about’ statements in relation to areas such as design processes, design theory, the work of designers, research, innovation, enterprise and creativity, graphics, production and manufacture, ICT, managing, marketing and evaluating. This will provide a scope and sequence of learning across the whole 200 hour course
- a minimum of four projects, each from a different defined area of study. Design projects could be flexible or specialised to suit school needs and priorities. Students would, however, be required to use a range of different materials, tools and techniques, including ICT, in the four areas of study
- content in relation to a range of tools, materials and techniques to be defined in the syllabus in the form of ‘learn to’ and ‘learn about’ statements. The development of quality products will be emphasised.

The integration of Information and Communication Technologies will be required across all K–10 syllabuses. In the mandatory Technology syllabus, Information and Communication Technologies will be integrated throughout all areas of study and detailed in the required content for each. It is envisaged that the specified ICT content in this course will not greatly alter the current time and computer resources allocation necessary for the mandatory technology course.

Additional study of content relating to any Stage 4 Technology area of study should be at the discretion of schools in the form of extension work in Stage 4. Broad directions for content in extension work will be defined in the syllabus. For example Agricultural High Schools may choose to offer additional hours in Stage 4 in the Agriculture context area. The syllabus will include guidelines for this extension work.

## Stage 5 Elective Courses

Stage 5 elective courses in the TASKLA will provide opportunities for a broad range of experiences in the field of technology learning. While they will not be prerequisite or assumed knowledge for students entering Stage 6, they will foster knowledge, skills and attitudes which provide a solid grounding for transition into a range of Stage 6 technology-based courses.

### Agricultural Technology syllabus

In the Agricultural Technology syllabus, students will continue to be given the opportunity to engage in their own learning through an emphasis on practical activities. They will develop a sound understanding of Agriculture through the study of a number of plant and animal enterprises, gaining valuable knowledge and skills related to each. Study of issues related to agriculture and its interaction with wider society will allow students to form opinions and express them in a variety of ways, each contributing to the formation of values.

Major changes to the content of the existing Agriculture syllabus are not necessary. The flexibility to study a range of plant and animal enterprises will be retained as options within the syllabus.

More detailed content relating to Aboriginal land management practices, heath and safety including OH&S and chemical safety, the world of work and possible career paths will be provided.

To provide schools the option of increased depth of study in individual enterprises, the requirement to study a minimum of six enterprises will be reduced. Beyond the core, options will provide flexibility for students to study specific enterprises in more detail to suit local needs. Additional enterprises could include equine studies and aquaculture. The course will also allow the flexibility for more in-depth study relating to Sheep Husbandry and Wool Science.

While it may be possible to extend this to include an aquaculture enterprises option, this paper makes reference to a view that a stand-alone Marine and Aquaculture Technology elective syllabus should exist.

In relation to the current Sheep Husbandry and Wool Science syllabus, there is insufficient evidence to justify its retention as a stand-alone syllabus. There is significant overlap with the Primary Industries VET Framework. The syllabus does not reflect modern sheep production and does not include sufficient cross-curriculum perspectives. OH&S issues for Stage 5 students, access to specialised equipment, a lack of teachers specifically experienced or trained in sheep and wool production, and the very small number of candidates have been identified as further arguments against its retention. It may be possible to cater for the specialised nature of these courses through the provision of up to 100 hours of options within the Agricultural Technology syllabus to cater for the needs of rural communities that support the wool industry.

Some schools have expressed a need to offer Agriculture from Years 7 to 10 for up to 400 hours. This can be flexibly achieved by:

- offering students additional 100 hours of extension work in the mandatory Stage 4 Technology syllabus in relation to the Agricultural Design area of study and its associated content; and
- offering an additional 100 hours of options from the Agricultural Technology elective course which links to Stage 5 outcomes (ie 300 hours in Years 8–10).

**Design and Technology syllabus**

The revised Stage 5 Design and Technology elective syllabus will differ in content and increased depth of study from the mandatory course. It will enable students to focus on specific areas of design that are reflected in the workplace and in society. Students will be introduced to different fields of design and the work of designers. Greater emphasis will be placed on design and production, and their relationship to creativity, innovation and enterprise.

The study of new and emerging technologies, the consideration of possible futures, invention and innovation, the implications of technological developments for society and the environment, appropriate technology and ethical decision-making will all be covered in the course. Students need to understand the cultural and intellectual foundations of design and the place of design in society and the workplace.

The elective course will continue to emphasise students' learning through design projects.

**Food Technology syllabus**

The Years 7–10 Food Technology syllabus will encompass a core of study that incorporates key elements of the current Food Technology syllabus, including food safety and hygiene, nutrition, food properties and basic food preparation skills.

The syllabus revision will ensure that:

- areas of overlap between the optional focal issues, eg the relationships between content components, perspectives and processes, are removed
- the content in all focal issues are updated to reflect contemporary developments
- nutritional information is updated and students are aware of the basic scientific principles underpinning food preparation
- reference is made to careers in the food industry
- information and communication technologies are clearly integrated in a revised syllabus.

**Graphics Technology syllabus**

The Graphics Technology syllabus will reflect contemporary practice in relation to a range of design fields that have a major focus on the use of graphics technologies. These include:

- technical graphics (engineering and product drawing, architectural, 3D modelling and pictorial representations)
- town planning, surveying and cartography
- entertainment product design (animation and gaming design)
- technical training instruction.

While cognitive development and manual manipulation of equipment and images remain important, developments and current practices in industry will need to address the integration of computers into all sections of the core content. Computing software knowledge and skills are essential for today's graphics industry and in the workplace generally.

The new syllabus will include contemporary areas of application including:

- computer-aided modelling
- Computer-aided Design (CAD)
- Computer-aided Manufacturing (CAM)
- presentation methods, including the use of multimedia applications, computer animation and digital graphics.

A 100 hour core component will be developed with a range of optional modules to provide in-depth study to suit local needs and student interests.

**Industrial Technology syllabus**

The Industrial Technology syllabus will include an emphasis from the current Technics syllabus. There is also a need to incorporate new and emerging technologies and a closer alignment of syllabus content with current industrial and domestic practice, including OH&S issues.

The inclusion of materials and systems content within each lobe, and the reading, modification and use of appropriate engineering drawings will broaden the scope and appeal of the subject.

Strands should be clearly identified in formal School Certificate reporting rather than more generally in terms of 'Technics I' and 'Technics II' as at present. The term 'Technics' on its own, without defining the strands studied, does not identify or associate with a specific field of learning and is open to interpretation by parents and employers. This will require appropriate School Certificate codes in the various strands, and a choice of either 100 or 200 hours of study in each strand.

There are some strands and lobes which may need to be reconsidered in relation to inclusion in the revised syllabus for reasons of overlap with other syllabuses, low candidatures and/or difficulties in meeting OH&S requirements. Those that will not be included are:

- technology 1 and 2 (originally designed as the Stage 4 introductory lobes for technics)
- photography (overlap with Visual Arts)
- ceramics (overlap with Visual Arts)
- graphic arts (overlap with Visual Arts and Technical Drawing)
- foundry (emerging OH&S issues make this unsuitable for schools).

The following strands will be added to the syllabus to reflect current national and international practice in new and emerging technologies and areas of study:

- control technology, robotics and mechatronics
- engineering principles, structures and mechanisms
- computer construction/repair.

Current lobes of study in boatbuilding and building construction appear in the wood-related strands of the Technics syllabus. This will need to be revised as these technology areas commonly now use a variety of materials.

**Information and Software Technology syllabus**

The Information and Software Technology syllabus will be based on a revision of the current Computing Studies syllabus. The revised syllabus will comprise of a core with options.

The syllabus will reflect the importance of students learning about new technologies and creativity through project work. Greater depth should be provided in areas such as multimedia and web-based information systems.

The revised syllabus will consider current Information and Communications Technology (ICT) practices in K–6 syllabuses, the ICT provision in the Stage 4 mandatory Technology syllabus, and the three Stage 6 ICT courses, as well as the cross-curriculum ICT perspective in all 7–10 syllabuses.

**Textile Technology syllabus**

Innovations in materials and equipment, careers in the industry, folio development, leisure pursuits, modern technologies, information and communication technologies and current industry practices need to be included in a revised syllabus. These changes will assist to make the syllabus more relevant for all students.

A greater emphasis should be placed on the development of knowledge and skills in relation to tools, materials and techniques, and manipulative skills. The revised syllabus must consider study in relation to a broad range of apparel and non-apparel items.

## Consideration of Marine and Aquaculture Technology as an elective syllabus

During the review of the Year 7–10 provision, a case was presented for the inclusion of an elective Board-developed Marine and Aquaculture Technology course. Reasons presented include:

- 98% of the country's population lives within an hour's drive of water.
- Australia now controls an area of water mass, both inland and oceanic, which is 1.2 times the size of its land mass, yet the current emphasis in ecological studies in the NSW curriculum is on terrestrial ecosystems.
- The marine environment and its management is now a focus of all Australian governments. The *Senate Report on Marine Pollution* (October 1997), the *SOMER Report*, and the *1997 NSW Coastal Conference* all highlighted the need for formal Marine Education in Australian schools.
- The increasing role of technologies in developing products, systems and environments relevant to marine issues, enterprise and problems.
- Marine and/or Nautical Studies courses are offered in other states but they differ in focus and standard.
- Universities and TAFE offer Marine Science and Aquaculture-related degrees and certificate studies.
- In recent years there has been an increasing demand for secondary school studies relating to marine education. In 2001 there were approximately 700 students entered for the NSW School Certificate from 27 schools in Marine Technology related Board Endorsed, school designed courses.
- The syllabus structure offered by these schools is in the form of a core with options that provide for local needs in coastal, metropolitan and rural areas.
- A Board Developed Course would allow for the establishment of standards consistent with other Stage 5 courses.

It was proposed that a Marine Technology course could comprise a core of:

- marine and aquaculture environment design
- marine equipment design, manufacture and use, and OH&S
- marine and aquaculture enterprises
- marine and aquaculture management.

Optional modules could include areas such as:

- marine plants and creatures
- marine and estuarial ecology management
- marine ecology
- marine danger and pest control
- marine and aquaculture enterprises in the industrial domains
- marine and aquaculture enterprises in the commercial domain
- marine and aquaculture enterprises in the domestic domains
- marine craft design and maintenance.

The feasibility of a new course in Marine and Aquaculture Technology should be explored through the development of a paper that would refer to the *Criteria for approval of Board of Studies syllabuses* in the *K–10 Curriculum Framework*.

# Appendix 1: Syllabus Evaluation Summaries

Further details about each of the Syllabus Evaluation Summaries can be found in the Evaluation Report for the syllabus.

## Agriculture

The Years 7–10 Agriculture syllabus meets the learning-centred principles of the K–10 Curriculum Framework. It is recognised that establishment of syllabus standards is necessary.

Directions for syllabus revision include: updating of content; inclusion of more clearly defined content in relation to individual examples of enterprises in the study of plants and animals; provision for high schools to offer agricultural studies 7–10; and the clarification of content relating to perspectives in Aboriginal land management practices, heath and safety including OH&S and chemical safety, the world of work, possible career paths and information and communication technologies.

The evaluation report recommends that the Years 7–10 Agriculture syllabus be retained in the Technological and Applied Studies Key Learning Area (TASKLA).

## Computing Studies

The Years 7–10 Computing Studies syllabus meets the learning-centred principles of the K–10 Curriculum Framework. It is recognised that some principles could be strengthened.

Directions for syllabus revision include: updating of content; establishment of explicit links between theory and practical components; integration of Key Competency content including working with others and with teams, and gender issues need to be enhanced; and, decisions about syllabus content need to be made in relation to the cross-curriculum integration of information and communication technologies and the three Stage 6 computer-based syllabuses.

The evaluation report recommends that the Years 7–10 Computing Studies syllabus be retained in the TASKLA.

## Design and Technology

The Years 7–10 Design and Technology syllabus meets the learning-centred principles of the K–10 Curriculum Framework. It is recognised that some principles could be strengthened.

Directions for syllabus revision include: the establishment of a continuum of study between Stage 4 Design and Technology and the Stages 5 and 6 electives in the technology learning area; more specificity in content provision particularly in relation to tools, materials and techniques; development of a core of design theory and processes with options for study in related design fields; development of separate syllabus documents for the mandatory and elective courses; review of syllabus structure, including naming of prescribed context areas and content related to current prescribed dimensions; reduction in the current requirement to study six projects and context areas; and, ensuring that learning experiences build upon and connect previous learning within the syllabus.

The evaluation report recommends that the Years 7–10 Design and Technology syllabus be retained in the Technological and Applied Studies Key Learning Area and be renamed 'Technology' to reflect the fact that this is the foundation course in the TASKLA.

### Food Technology

The Years 7–10 Food Technology syllabus meets the learning-centred principles of the K–10 Curriculum Framework. It is recognised that establishment of syllabus standards is necessary.

Directions for syllabus revision include: the integration of cross-curriculum content areas of numeracy, and information and communication technologies; development of a core of study that includes key elements such as nutrition, food safety and hygiene, food properties and basic food preparation skills; updating of content to reflect contemporary developments considered in line with the current content and structure of focal issues; and consideration of issues of overlap with the Years 7–10 PDHPE and Commerce syllabuses.

The evaluation report recommends that the Years 7–10 Food Technology syllabus be retained in the Technological and Applied Studies Key Learning Area.

### Sheep Husbandry and Wool Science

The Years 7–10 Sheep Husbandry and Wool Science syllabus has the potential to meet the learning-centred principles of the K–10 Curriculum Framework.

The extremely low candidature in this subject makes it difficult to sustain as a discrete syllabus within the TASKLA. It is recognised that the content of the syllabus still remains highly relevant to a small number of students and communities in certain geographical regions. Therefore options should be explored for the integration of revised content into a broader syllabus area, namely Agriculture.

The evaluation report recommends that aspects of the Years 7–10 Sheep Husbandry and Wool Science syllabus be integrated into the Years 7–10 Agriculture syllabus as an optional area of study.

### Technical Drawing

The Years 7–10 Technical Drawing syllabus meets the learning-centred principles of the K–10 Curriculum Framework. It is recognised that some principles could be strengthened.

Directions for syllabus revision include: integration of computer applications into all sections of the core content; updating of methodology with relevant topics and integration of both manual and electronic graphical representation; alignment of content with industry practices; incorporation of greater flexibility for the optional lobes to be expanded; incorporation of computer-based skills and knowledge in the performance standards; and, renaming of the syllabus to better reflect contemporary practice in graphics and associated fields.

The evaluation report recommends that the Years 7–10 Technical Drawing syllabus be retained in the Technological and Applied Studies Key Learning Area and be renamed 'Graphics Technologies' to better reflect current industry practice.

## Technics

The Years 7–10 Technics syllabus meets the learning-centred principles of the K–10 Curriculum Framework. It is recognised that establishment of syllabus standards is necessary.

Directions for syllabus revision include: integration of new and emerging technologies to better reflect industrial practice; review of the strands which maintain breadth and variety while incorporating new and emerging technologies; clear definition of core and extension activities; explicit direction in relation to integration of cross-curriculum content and OH&S issues; and clarification of School Certificate reporting through identification of strands of study undertaken with Technics.

The evaluation report recommends that the Years 7–10 Technics syllabus be retained in the Technological and Applied Studies Key Learning Area and be renamed 'Industrial Technologies' to better reflect the range of technologies offered in the course.

## Textiles and Design

The Years 7–10 Textiles and Design syllabus meets the learning-centred principles of the K–10 Curriculum Framework. It is recognised that some principles could be strengthened.

Directions for revision include: updating of content to develop continuity with the Stage 6 syllabus with equal emphasis on each of the three content areas; inclusion of practical projects in each content area with equal weighting of practical and theory components; inclusion of innovations in materials and equipment, careers in the industry, folio development and leisure pursuits; integration of opportunities for creativity and innovation, modern technologies, information and communication technologies and current industry practices. These changes may assist to make the syllabus more attractive to both male and female students. A greater emphasis should be placed on the development of knowledge and skills in relation to tools, materials and techniques, and manipulative skills. Terminology consistent with the Stage 6 syllabus should be included.

The evaluation report recommends that the Years 7–10 Textiles and Design syllabus be retained in the Technological and Applied Studies Key Learning Area.

# Appendix 2: Technological and Applied Studies Symposium summary statements

## Workshop One — The Big Picture of Technology Education K–12

***What are the aspects of Technology Education that distinguish it from other curriculum areas in terms of process and content?***

Technology Education caters for a broad range of student interests and abilities through practical application of knowledge and development of skills that can be applied to contexts beyond the classroom. It engages students in a diverse range of practical problem-solving activities, providing opportunities for students of differing abilities and backgrounds to achieve success in areas of interest.

***What core of knowledge, skills and understanding are important in Technological and Applied Studies curricula to equip students to engage with technology in the contexts of school, employment, leisure and living in a technological society?***

The core areas in the TAS curriculum include designing, making, evaluating and using technology to solve problems and address needs — all within contexts and including collaboration, teamwork, innovation, sustainability and communication — delivered through a range of practical experiences in every TAS subject and the development of tangible products.

***What are the critical issues to be considered when designing future Technological and Applied Studies curricula?***

The critical issues include the need to address new and emerging technologies, professional development of teachers, resourcing, syllabus flexibility, K–12 continuum and transition between stages, preparing students for now and in the future, and assessment.

## Workshop Two — The Continuum of Technology Education K–12

***What should the continuum of K–12 Technology Education look like?***

The continuum should have clearly articulated and sequenced outcomes from K to 12 and it should provide for the progressive development of skills, knowledge and understanding. Secondary teachers need to be aware of and have access to relevant Stage 3 outcomes and Stage Statements.

***What are the elements of Technology Education that are specific to a Stage 4 mandatory course and other TAS School Certificate courses?***

The developmental sequence of outcomes would provide for the progressive development of skills, knowledge and understanding in a range of materials, tools and techniques and allow students to start to specialise in technology areas of interest to provide a continuum after the compulsory years of schooling.

***What shape should Year 7–10 Technology Education take to clarify the K–12 continuum given that:***

- ***Stage 6 has been revised***
- ***K–6 has had recent revision of outcomes and the syllabus is likely to be reviewed in coming years.***

The general picture conveyed in workshops is that the current structure, K–6 Science and Technology, 200 hrs mandatory Design and Technology in Stage 4, and a range of 7–10 School Certificate elective courses is appropriate, acknowledging that there is a need for better alignment between stages.

## Workshop Three — Proposals for Future Syllabus Offerings in TAS

***Considering state, national and worldwide trends in technology education and the K–10 Curriculum Framework, what are your suggestions for 7–10 subjects in the Technological and Applied Studies Key Learning Area?***

The existing structure appears to be sufficient and acceptable; however, there is a need to review the naming of syllabuses and possibly the learning area to better reflect the areas of learning across the KLA and to bring the name of the syllabuses into line with current trends and technologies.

***What would be the broad differences between these proposed subjects and the current related syllabus/es?***

Revised syllabuses need to incorporate new and emerging technologies with content which reflects these technologies and current industrial trends.

There is a need for standardisation across all syllabuses whilst maintaining a degree of flexibility to allow schools to deliver them in a context that is appropriate to their student population and community interests. Naming of syllabuses needs to identify with the learning area, ie Technology, and indicate links across the technology learning area.

# Appendix 3: Professional Teachers Association consultation report

## Review of the Years 7–10 Technology Curriculum

During 1999, 2000 and 2001 consultation meetings on the current technology curriculum were held with Professional Teacher Associations in the Technology Learning Area. These associations included the: Technology Educators Association; Institute of Technology Education; Computing Studies Teachers Association; Coffs Harbour TAS Teachers Association; Computer Education Group; and the Association of Agriculture Teachers.

The following text provides an overall summary of the discussions that were held with all of the associations.

**What is technology education?**

Technology Education is students learning about and using a range of materials, tools and equipment along with application of the decision-making process to solve a problem or meet an identified need. Technology education also involves appropriate integration of computer-based technologies as part of the teaching/learning process.

**What is the K–12 continuum?**

The K–12 continuum should be sequential and allow for the progressive development of skills and knowledge in all syllabus content areas from Early Stage 1 through to the Years 7–10 mandatory content and electives and Stage 6 electives. Information and communication technology skills should also be incorporated across the K–12 curriculum.

**What do we want our students to have achieved by the completion of Year 10?**

Students should have developed a range of quality practical skills and related theory in relation to materials, tools and equipment that are then transferable to other areas in the curriculum. Specifically, students should be confident users of a range of technologies, they should develop skills and knowledge in problem solving, management, design, thinking skills, information technology skills, and an awareness of environmental issues. Students should also be able to work both independently and as part of a team.

**What should be common amongst technology subjects?**

The common components across all technology syllabuses should include: making, communicating, problem solving, research, design process, occupational health and safety, information and communication technologies, evaluating, knowledge of a range of technologies and the development of quality practical skills (materials, tools, techniques), development of independent and group work skills.

**Should there be mandatory study/hours in technology?**

All associations agreed that the current mandatory provision should remain (possibly increased?) and followed by electives in Stage 5. One association suggested making it compulsory that all students study one technology elective syllabus in Stage 5. Information and communication technologies should also be integrated across all syllabuses.

**If there is mandatory study/hours, what does it look like?**
The mandatory component in relation to hours should equal that of other learning areas to ensure equity and it should also include a core of knowledge and skills that can be transferred to elective syllabuses. The mandatory component should also include opportunities for study in a range of technologies including information and communication technologies as well as the provision for practical experiences.

**Should there be electives and why?**
Yes, there should be electives so that students are able to further develop their skills and knowledge in specific areas of interest. Opportunities that may arise from the elective arrangement may be in the areas of employment, leisure and further study as well as leading onto further study in Stage 6.

**What should these electives be?**
While the current elective arrangement is satisfactory, a review of content, syllabus names and the role of computer-based technologies is required to ensure a continuum of learning.

**Other issues raised during the consultation workshops**
These included: class sizes; funding for additional computer resources; training and development of existing teachers to update and introduce new skills; teacher training in the technology learning area; the role of computer studies as an elective; restructuring of high schools into junior and secondary schools; the need to reinforce information and communication technologies across all Years 7–10 syllabuses; the K–12 continuum; occupational health and safety issues; and the need for schools to provide students with experience in a range of technology areas and not limited to those that teachers are comfortable teaching.