

# Design and Technology in the Australian Curriculum

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The 1989 national collaboration among the States and Territories in Australia resulted in common and agreed goals for schooling. The study areas were divided into eight Key Learning areas, they are:

- English
- Mathematics
- Science
- Technology
- Languages other than English
- Health and Physical Education
- Human Society and its Environment
- The Arts

Statements and Profiles were developed for each Key Learning area and provide a framework for curriculum development by education system and schools.

- The Statements provide a framework for curriculum development in each area of learning. They define the area, outline its essential elements, show what is distinctive about it and describe a sequence for developing knowledge, skills and attitudes.
- The Profiles describe the progression of learning, typically achieved by students during their compulsory years of schooling (Years 1 –10) in each area. The profiles are designed to assist in the improvement of teaching and learning and to provide a common language for reporting student achievement.

Through the Technology learning area, students experience a variety of technologies that:

- are relevant to contemporary issues and needs
- have social and economic significance
- improve the quality of life at home and in the workplace
- are ecologically desirable and sustainable
- are particularly relevant to Australia
- relate to student interest and needs

Through Technology programs students learn to reflect on past practices and future opportunities. They develop an understanding of the influence different groups can have on how technologies are developed and used. They learn to think critically about how technology affects them, their local community and the world. They are able to devise criteria for evaluating the impacts of technology on societies and environments.

Tasks and activities in Design and Technology education assist students to identify questions to explore, to synthesize ways of putting ideas into practice and to implement plans. For example students are encouraged to:

- build on their experiences, interests and aspirations in technology
- find and use a variety of technological information and ideas
- show how ideas and practices in design and technology are conceived
- explain design and technical language and conventions
- take responsibility for designs, decisions, actions and assessments
- trial their proposals and plans
- take risks when exploring new ideas and practices
- be open-minded and show respect for individual differences when responding to technological challenges

Design and Technology programs in the schools involve students in generating ideas and taking action as well as in using and developing processes and products that satisfy human needs. In doing so students develop their knowledge and understanding of technology in the past and present, and examine future possibilities and emerging trends.

Design and Technology programs integrate theory and practice. They include much that is scientific, ethical, mathematical, graphical, cultural, aesthetic and historical. They encourage students to explore the synthesis of ideas and practices, and the effects of technology on societies and environments.

The four strands of learning are:

- designing, making, appraising
- information
- materials
- systems

All learning in Design and Technology involves the designing, making and appraising, with equal weighting given to all. The relative emphasis on information, materials and systems varies according to the needs of the students and the nature of the program and activities in which they are engaged.

In the secondary school, Design and Technology brings together a number of different areas of study. For example they include:

- Agriculture and Rural Studies, which gives the students experience of technological systems related to land management, food and fib reproduction, plant propagation, animal keeping and care.....
- Computing/information technology, which presents the students with opportunities to apply information, create networks, manage systems for data input and retrieval, transform data, and to devise programs and solve problems.....
- Food Technology and Textiles Technology, which gives the students experience of production and processing associated with foods and textiles, management and maintenance of services and industries. Issues relating to society and aspects of personal health and hygiene.....
- Media Studies, which provides the students with the opportunities to understand interrelationships between technologies used in mass media communications and multi-media networks, and to manipulate media for presenting information, and to explore the impact of media on individuals and society.....
- Applied Design which encourages the students to design and construct using natural and synthetic materials, to explore the generation and conservation of energy, and to produce electronic and mechanical systems.....
- Industrial Technologies in which students develop comprehensive skills in analysis, investigation and application of engineering concepts and principles in specific contexts.....
- Graphics, which provides students with opportunities to develop communication skills of ideas and concepts using graphic means, thus enabling them to visualize solutions to design problems.....

Design and Technology also involves the development and application of ideas and principles from other areas of learning. They include: the applied sciences, engineering of many kinds, business and commerce. The nature, content and processes for the technology learning area provide coherence for the development of technology programs that incorporate these areas.

## Design and Technology Education in N.S.W. Schools

### The Course

In the secondary schools, the 2 part course (Design and Technology syllabus years 7–10 and the Design and Technology syllabus years 11–12) is built on the educational experiences in the Science and Technology years K-6 course. Both syllabi are built on the design process and its dimensions.

The Design and Technology syllabus years 7–10 is a mandatory 200hour course. This syllabus focuses on the study of technology and its application through design in personal, community, industrial and commercial settings in rural and urban environments.

The Design and Technology 11–12 syllabus builds on the student's educational experiences in Design and Technology 7–10 syllabus and provides the student with the opportunity to pursue areas of inquiry in greater depth and acknowledges that the students become more autonomous in their learning. It is an elective course with an indicative time of 300 hours for a 2 unit course and an additional 150 hours for a 3 unit course. The unusual feature of this course is that the students are to complete a major piece of work (THE MAJOR DESIGN PROJECT) including a design portfolio based on technological contexts.

The Design Projects undertaken throughout the course allows the students to experience and be involved in hands-on activities of design and technology. The students are encouraged to identify the relationship between the activities they undertake in their Design Projects and those design and technological activities that are taken in the wider community. This linking will assist the students to develop abilities to operate and apply their knowledge in other settings. In addition, the students will develop specific knowledge, skills and attitudes by understanding research and development related to an aspect of their Major Design Project.

In the additional 3 Unit course the students will investigate the nature of innovation, success of innovation and the entrepreneurial activity that take place in the wider community. This course caters for those students who are particularly creative, innovative or enterprising and who wish to extend the depth and scope of their study. This 3 Unit course will involve students in undertaking a

SPECIALISED STUDY, which will critically analyze one aspect of the 2 Unit Major Design Project. The Specialist Study will result in the investigation of an innovative application, a new improved resource, a manufacturing system or a marketing strategy.

### The Related Study and Design Projects

The Related Study and Design Projects specify the content of the 2/3 Unit course. The Related Study provides the opportunity for the students to gain knowledge, skills and attitudes about design and activity. The topics in the Related Study include:

- designing and producing
- using resources
- management, communication and marketing
- relating issues to design and technology

Students are encouraged through the Related Study to practice relating knowledge and skills to, and applying their knowledge and skills from, one context to another. The Design Projects are the main activity undertaken during the Related Study. They provide the students with the opportunity to learn within contexts that they may find meaningful. The activities undertaken, may relate to the various roles students may wish to adopt on completion of their school education.

### The Comparative Case Study

A significant component of the Related Study is the Comparative Case Study. This involves the investigation and comparison of two organizations of different size and structure. Through the Comparative Case Study students will develop a broader appreciation of design and technological activity. The knowledge, skills and attitudes gained will reflect the diversity of design and technology in the wider community.

The Case Study consists of a comparison of the operation of two organizations. This comparative approach increases the student's awareness of the diversity of operations and allows the students to identify the reasons underlying the nature of different operations.

The two organizations should differ in size and structure, but may deal with similar or different products, systems or environments. The organizations may

operate in domestic, community, industrial or commercial settings in rural or urban environments.

### The Major Design Project

A major element of the Design and Technology syllabus in NSW schools is the undertaking of a number of Design Projects, chosen from a range of Prescribed Contexts. These contexts address stated Prescribed Dimensions.

These Prescribed Contexts within which design projects must be selected include:

- Agriculture
- The built environment
- Clothing and accessories
- Engineered systems
- Food
- Health and welfare
- Information and communication
- Leisure and lifestyle
- Manufacturing
- Transport and distribution

Each design project must address all of the prescribed dimensions of:

- Resources people, materials, tools, energy, time, skills, finances, information
- Domains personal, commercial/industrial, global
- Human impact cultural issues, environmental sustain ability, ethics, gender issues, historical issues, motivation, quality

In each project it is imperative that the following skills are considered: designing, making, evaluating, communicating, marketing and management.

The Major Design Project is a practical hands-on activity, in which the student develops and realizes a product, system or environment. The Project will be influenced by the student's skills, ability, interests and the availability of resources. The Project may, or may not be related to the organizations investigated in the Comparative Case Study. It is submitted for Higher School Certificate (HSC) Examination marking and should be accompanied by a Portfolio.

## The Portfolio

All activities involved in the design and production of the product, system or environment should be documented in a portfolio. This portfolio is to be submitted with the major design work for HSC Examination marking.

The portfolio should indicate clearly an understanding of the process the student has followed in the development and realization of the project, from the first ideas through to the evaluation of design, product and process. It should state exactly what the student was hoping to achieve and all the plans they put into place to implement their goals. It should show alternatives the student considered at each step of the process, and the evaluation undertaken in order to make sound decisions.

## Design and Technology in the Classroom

Several models for the structuring and implementation of the Design and Technology course are offered. It is the schools decision to select a suitable model for the total course or they may vary their approach from unit to unit.

Three such models are described below:

### Open choice model.

The open choice model involves the group being structured in such a way that the student can select Design projects from a free range of choices. The students are able to follow any area of interest.

### Facilities based model.

The facilities based model involves the group being structured so that the student's choice of Design Projects is limited by the facilities (including rooms, equipment and materials) made available to the students, e.g. agriculture, computing, textiles, woodwork etc.

### Thematic model.

The thematic model involves the group being structured so that the student's choice of Design Projects is focused on an area of application, e.g. sport, theatre, furniture, fashion and accessories, animal husbandry, land care, tourism etc.

### A cross curricula model

The key principles and concept of Design and Technology education provide the ultimate framework for schools to integrate across and between key learning areas,

and thereby focusing on the whole student, rather than individual subject areas. Different approaches to cross curricular activities are considered.

### Vocational Education Integrated in General Education

Training and Further Education (TAFE) Colleges are vocational education colleges. In the past, students could leave after Year 10 and continue to do a TAFE course which would give the student vocational skills and qualifications. By having to choose one path or the other, Year 10 students were to make a fundamental decision by an inflexible system. This situation created two streams of Year 10 graduates: those who chose to stay at school to complete the Higher School Certificate in the hope of going on to University; and those students who would continue on to a TAFE course.

Therefore the need to co-ordinate policy to broaden the options open to Year 10 graduates was clear and the result is that alternative pathways have been created. The policy has established four broad pathways which each offer students access to a range of intersecting studies in a more flexible framework. This allows for students to seek a more active role in our society.

#### PATHWAY 1

Provides for an HSC delivered by schools and focused entirely on a general education, without specific study towards recognized vocational education and training, continuing a traditional pathway into university.

#### PATHWAY 2

An HSC delivered by schools which include both general education and recognized vocational and training components.

#### PATHWAY 3

An HSC delivered by the TAFE Commission, which includes recognized vocational education and training components.

#### PATHWAY 4

Vocational education and training delivered by the TAFE system, industry or private training providers, which – although not leading to an HSC – provides students with a direct pathway into post-school vocational education and training.

These pathways are specifically intended to help young people between the ages of 15 and 19 reach their full potential by giving them access to a broader, more

interesting and equitable range of study options through full- or part-time studies towards their HSC in a school or TAFE environment. So, in effect this means that during their HSC years, candidates can undertake vocational and training courses in High School or TAFE College settings. This is of special benefit to school students who stay at High School to complete their HSC and then wish to transfer to the TAFE system. Vocational and industry-based courses included in the HSC will be accredited and acceptance of these courses make the majority of study credits readily transferable. This means that students who successfully complete a TAFE accredited course at school level, will be granted a first year accreditation in their actual TAFE course.

The inclusion of TAFE accredited courses within High Schools has not only had a major impact on Secondary Design and Technology Education but also on Design and Technology Teacher Education. Several TAFE accredited courses can be team-taught with Design and Technology teachers and TAFE staff. In the joint School/TAFE program the school student ultimately benefits greatly from the coordinated courses offered by the School.

Thus, close links have been developed between local TAFE Colleges and the TAS Department at the University of Sydney, to allow our students during their 4 year course the benefit of working in specially appointed laboratories and workshops in the TAFE Colleges. (For instance in industrial and commercial food preparation areas). Our students, with their education background in design methodology and pedagogy are a very welcome contribution to the TAFE courses.

### Design and Technology and the Wider Community

The effective implementation of this course depends on the information of parents, the community, commerce and industry of the philosophy, rationale and content of the Design and Technology Syllabus.

#### Parental involvement.

Parents are encouraged to provide opportunities for their children to experience a wide range of design and technological activities. They should encourage children to accept challenges and they should draw upon their own expertise in all aspects of design and technology. Parental involvement can include direct involvement such as informative presentations of parent's business or personal skills, demonstrations and student's site visits.

Parents are actively encouraged to participate and share their expertise with their local school community.

### Community involvement.

Schools should incorporate a community focus when planning of design and technology learning experiences. Schools are to encourage and incorporate active community involvement in a similar way that they involve parental participation.

### Industry and Commerce involvement.

The students are encouraged to be involved in the study of industry/commercial activities. The schools can use the programs specifically designed to assist in teaching the industrial/commercial aspects of technology, e.g. schools' "Visit to Industry Program" (VIP) and the "Education Business Partnerships" program.

Through the industry/commerce involvement programs the student will be able to identify organizations for investigation in the Comparative Case Study.

Technology education enables all students to develop skills, understandings and attitudes which cross many disciplines. They understand achievements of different cultures and societies. In coming to appreciate their roles and responsibilities in making ethical and informed decisions about technology, students gain a sense of understanding and control over the applications of technology

## Bachelor of Education (Technological and Applied Studies) Master of Teaching (Technological and Applied Studies) Teacher Education at the University of Sydney

There are almost 40 universities operating in Australia and they are attracting a great amount of interest from Australian and overseas students. The high-quality courses they offer have proven to be very successful. The University of Sydney is the oldest university in Australia and has a proven track record. At the Faculty of Education we have carefully considered the recent changes in education and especially within Design and Technology Education. We have created a new course in 1992, to prepare our students to take Design and Technology Education into the 21st Century. We at Sydney University are the only faculty who offer an undergraduate course in this format and we believe that we offer the best course with the best possible options.

The Bachelor of Education (Technological and Applied Studies) is a 4 year full-time degree course which prepares graduates to teach a variety of subjects in the Technological and Applied Studies Key Learning Area, in NSW Australia. All graduates will be qualified to teach Design and Technology Years 7 – 12, (2 and 3

Unit) as well as two or more of the following: Food Technology, Engineering Studies, Techniques, Textile Technology, Graphics, Industry Studies, Applied Studies, Computing Studies.

The program at the University of Sydney consists of five integrated components: Education, Design & Technology Core Studies, Professional Studies, Practicum and Curriculum Studies. Students undertake Education in Years 1, 2 and 3; Professional Studies (ie. Secondary Education) and Practicum (60 days in total) are undertaken in Years 2, 3 and 4.

Six Curriculum Studies are studied in first year, they are:

- Applied Design
- Applied Graphics
- Computing Studies
- Food Technology
- Industrial Technology
- Textile Technology

Three Curriculum Studies are selected in the second year. In third year two of the three Curriculum Studies chosen in second year must be studied. In fourth year, students continue with the same Curriculum Studies they elected to study in third year.

To allow for in-school experience, a structure has been developed interfacing Education Theory and Teaching Practice through the Practice teaching model. Through this arrangement, students are placed in a High School where they can teach in carefully constructed environments and under supervision. During the 4 year course students will have a minimum of 60 Practice Teaching days.

An Education Honours program is available to those students who pass with sufficient credits to warrant admission.

Students can continue and apply for entry in the Master of Education, Doctorate and PhD courses currently on offer.

The Master of Education, (Technological and Applied Studies) course is a 2 year full time pre-service professional program which is a rigorous and issue centred course, built on successful completion of Technological and Applied Studies courses. The program involves close partnerships with selected co-operating schools and their staff, including an extended Internship for a full term during the final semester.

The objectives of this course will encourage and allow students to generate for themselves issues they need to consider as intending teachers; it will foster independent and small group learning, will encourage throughout critical reflection

on what students are learning and experiencing and will require the development of a portfolio, incorporating a record of their experiences, self evaluations and reflective tasks.

The delivery mode of the courses feature problem-based and case study approaches. This allows Faculty staff members to reflect in their work the latest thinking with respect to effective pedagogical practices and state of the art technology. Their approach will be based on a team approach in order to foster integration and cross-linking amongst program components.

Numerous Professional Development courses in Design and Technology and related courses are also offered by the TAS Department throughout the year.

The Faculty's teaching model prides itself on the educational depth and breadth in the subjects it offers. Considering the diversity of our courses within the TAS Degree, they share a common goal: Education. We prepare our students for a flexible future and generic teaching skills, form the basis of our Bachelor of Education degree. Our aims are to stimulate reflective inquiry to enable our students to become reflective practitioners; to stimulate generative and critical thinking to enhance their teaching skills as well as their design and production skills.

The facilities at the Faculty are first class, in 1994 we have taken possession of a brand new building with all the latest facilities included. This opportunity allowed us in the Department to reconsider the facilities we had and to update and upgrade our equipment. Especially the Information Technology Laboratories are the very best in the country.

Video conferencing is another media which is used at the TAS Department and brings together industries, country students, students and lecturers at other universities in Australia and ourselves. Telecom Australia uses this technique extensively.

Design and Technology Education forms the core component of the TAS degree. Especially the Curriculum Studies contain a healthy component of student centered learning. This approach of self learning enhances not only generic teaching skills but also life skills, design skill sand production skills, all essential to the development of a successful Design and Technology teacher.

The course at the Faculty is not static, but allows for a great deal of individual interpretation. The principles are set and a holistic framework is in operation however, students can select the Curriculum courses to suit their individual needs and goals. Therefore we feel we have created a highly personalized degree-course which delivers a motivated, highly qualified teacher who can contribute positively and successfully to the development of students in a variety of learning experiences and design contexts.

Through the Schools' Visit to Industry Trainee Teachers Program, activities are developed to assist in the professional development of student teachers and professional development for teachers already out in the schools, e.g.:

- workshops with business representatives and educators on: "Industry Expectations in Schools"
- lectures on "Department of School Education Business Partnership Programs".
- visits to company sites.
- on-site training in the development of industry materials for schools etc.

Through the use of such programs as Schools' Visit to Industry Trainee Teachers Program and initiatives from individual lecturers, the TAS Department at the Faculty of Education has developed strong links with business and industry. The Department has benefited in many ways and ultimately the student teachers are experiencing a positive introduction to business and work environments. This will enable our students to prepare their pupils for a more realistic and more holistic view of their future working life.

To prepare our students for this enormous task, several courses have been designed to develop those skills, needed to teach in such diverse and challenging environment.

During their 4th year all students participate in a Major Design Project. This course is essentially a self directed course with an initial set of lectures. Small groups of students are appointed to tutors who then guide them through their project development.

The course has a strong focus on reality based learning. The aim is to broaden the student's often limited perception of problem solving in industry, business, community and organizations. The students are required to combine design, research and technical skills to implement an independent design project. Throughout, they have to demonstrate an understanding of a range of design/problem solving and technological activities and their applications in a variety of settings.

They have to develop knowledge and skills in the management and use of resources and processes; the use of communications technology; the development of creative solutions to design problems as well as show skills in generative thinking. This project is based on reality based learning. The whole process is a journey of exploration for the students where a holistic approach to the project is very much encouraged.