Stage 6 Design and Technology syllabus support

Resource booklet

NEW SOUTH WALES DEPARTMENT OF EDUCATION AND TRAINING

Curriculum K–12

NEALS

Acknowledgements

The Technology Unit of the Curriculum K–12 Directorate has developed professional learning workshops for secondary technology teachers in NSW public schools to provide practical strategies and resources to support teachers of Design and Technology.

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Contents

Links

Syllabus, support document, specifications, links to examination notes.
http://www.boardofstudies.nsw.edu.au/syllabus_hsc/syllabus2000_listd.html

Curriculum support
http://www.curriculumsupport.education.nsw.gov.au
Click on *Years 7-12* → *Technology*

Design and Technology electronic content allocation tool
http://www.curriculumsupport.education.nsw.gov.au/secondary/technology/11_12/design/index.htm

Tale
http://www.tale.edu.au/tale/

NSW Department of Education and Training's curriculum planning policy
https://www.det.nsw.edu.au/policies/curriculum/schools/curric_plan/PD20050290.shtml

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Stage 6 Design and Technology syllabus changes since 2008

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9	Preliminary Course. The study of: • safety	9	Preliminary Course. The study of: • Occupational, health and safety~~safety~~
9	HSC Course. The study of: • Project Proposal & Project Management – selection and use of resources	9	HSC Course. The study of: • Project Proposal & Project Management ~~- selection and use of resources~~
9	HSC Course. The study of: • Project development and realisation	9	HSC Course. The study of: • Project development and realisation - selection and use of resources
9	HSC Course. The study of: • Project Development and Realisation – study of practices in industrial and commercial settings as they relate to the Major Design Project.	9	HSC Course. The study of: • Project Development and Realisation - study of practices in industrial and commercial settings~~ as they relate to the Major Design Project~~.
10	HSC Course Structure The students relate the techniques and technologies used in industrial and commercial settings to those used in the development of their Major Design Project.	10	HSC Course Structure The students relate the techniques and technologies used in industrial and commercial settings to those used in the development of design projects~~their Major Design Project~~.
12	H6.1 – justifies technological activities undertaken in the major design project and relates these to industrial and commercial practices.	12	H6.1 – justifies technological activities undertaken in the major design project through the study of industrial and commercial practices~~and relates these to industrial and commercial practices~~.

Page	Syllabus Prior to 2008	Page	Tracked Changes
13	Students learn about: • factors affecting designing and producing including: – appropriateness of the design solution – needs – function – aesthetics – short and long term consequences of cost – ergonomics – use of the design – sustainability – energy – recyclability – safety – quality – durability – obsolescence – life cycle analysis	13	Students learn about: • factors affecting designing and producing including: – appropriateness of the design solution – needs – function – aesthetics – finance~~short and long term consequences of cost~~ – ergonomics ~~–~~ occupational, health and safety~~use of the design~~ ~~– sustainability~~ ~~– energy~~ ~~– recyclability~~ – ~~safety~~ – quality – short-term and long- term environmental consequences~~durability~~ – obsolescence – life cycle analysis
14	Students learn about: • creative approaches including: – cognitive organisers – strategies for problem solving and solution creating – cooperative structures. – ideas generation	14	Students learn about: • creative approaches including: – cognitive organisers ~~–~~ strategies for problem solving and solution creating – ~~cooperative structures.~~ – ideas generation

14	Students learn to: • recognise the advantages of cooperative structures compared to individualistic and competitive approaches.	14	Students learn to: ~~recognise the advantages of cooperative structures compared to individualistic and competitive approaches.~~
15	Students learn about: • using materials, tools, techniques and other resources – characteristics and properties – functions and uses – experimentation – criteria for selection – consequences of use – health and safety issues	15	Students learn about: • using materials, tools, techniques and other resources – characteristics and properties – functions and uses – experimentation – criteria for selection – consequences of use ~~health and safety issues~~
16	Students learn about: • factors affecting management including: – identifying available resources – clarifying values – setting goals – setting standards – seeking possible alternatives – evaluating the costs and benefits of each alternative – making and implementing decisions – task descriptions and sequencing – documentation	16	Students learn about: • factors affecting management including: – identifying available resources – clarifying values – setting goals setting standards – ~~seeking possible alternatives~~ – evaluating the costs and benefits of each alternative – making and implementing decisions – task descriptions and sequencing – documentation of plans.

16	Students learn about: • use appropriate standards and conventions for drawing and diagrams	16	Students learn about: • use appropriate standards and conventions to visualise and communicate ideas and solutions.~~for drawing and diagrams~~
18	Students learn about: • factors affecting designing and producing including: – appropriateness of the design solution – needs – function – aesthetics – cost – ergonomics – use of the design – sustainability – energy – recyclability – safety – quality – durability – obsolescence – life cycle analysis	18	Students learn about: • factors affecting designing and producing including: – appropriateness of the design solution – needs – function – aesthetics – finance~~cost~~ – ergonomics ~~–~~ occupational, health and safety~~use of the design~~ ~~– sustainability~~ ~~– energy~~ ~~– recyclability~~ – ~~safety~~ – quality – short-term and long- term environmental consequences~~durability~~ – obsolescence – life cycle assessment~~analysis~~
19	Students learn about: • ethical and environmental issues – ethical and environmental considerations for designers and society – sustainable technologies – protection of intellectual property, including patents, copyright and plagiarism – rights and responsibilities of the designer – impact on Australian society	19	Students learn about: • ethical and environmental issues – ethical and environmental considerations for designers and society – sustainable technologies – protection of intellectual property.~~, including patents, copyright and plagiarism~~ – rights and responsibilities of the designer – impact on Australian society

19	Students learn about: • factors that impact on success of innovation including: – timing, available and emerging technologies, historical and cultural, political, economic and legal factors, marketing strategy including size, demand and product promotion.	19	Students learn about: • factors that impact on success of innovation including: – timing, available and emerging technologies, historical and cultural, political, economic and legal factors, marketing strategiesy ~~including size, demand and product promotion~~.
19	Students learn about: • agencies including the patents office and small business council	19	Students learn about: • the role of a variety of agencies that may impact upon the success of innovation.~~agencies including the patents office and small business council~~
19	Students learn about: • entrepreneurial activity – nature of entrepreneurial activity – role in design and technological activity – agencies which affect entrepreneurial activity, e.g government, commercial and industrial – management and entrepreneurial activity	19	Students learn about: • entrepreneurial activity – nature of entrepreneurial activity – role in design and technological activity – agencies which influence~~affect~~ entrepreneurial activity.~~, e.g government, commercial and industrial~~ – management and entrepreneurial activity – legal and ethical issues
20	Students learn about: • needs analysis – developing ideas – identifying opportunities – formulating an individual design proposal – market research	20	Students learn about: • needs analysis – researching and developing ideas – identifying opportunities – formulating an individual design proposal – ~~market research~~
20	Students learn to: • respond to the findings of experimentation and research including market research.	20	Students learn to: • respond to the findings of experimentation and research ~~including market research.~~

21	H6.1 justifies technological activities undertaken in the major design project and relates these to industrial and commercial practices	21	H6.1 justifies technological activities undertaken in the major design project through the study of~~and relates these to~~ industrial and commercial practices
21	Students learn about: • practices in industrial and commercial settings as they relate to the major design project including: – safe work practices using selected resources – production techniques – selection of processes appropriate to the identified need or opportunity – collaborative designing and design teams.	21	Students learn about: • practices in industrial and commercial settings as they relate to~~-~~the major design project including: – safe work practices using selected resources – production techniques – selection of processes appropriate to an ~~the~~ identified need or opportunity – collaborative designing and design teams.
21	Students learn to: • identify design and production processes used in domestic, community, industrial and commercial settings in comparison to those used in the major design project • implement safe work practices using selected materials and techniques in design and production of the major design project • explain the principles underlying safe working practices and environments	21	Students learn to: • identify design and production processes used in domestic, community, industrial and commercial settings. ~~in comparison to those used in the major design project~~ • implement safe work practices using selected materials and techniques in design and production of the major design project • explain the principles underlying safe working practices and environments

			Assessment and Reporting in Design and Technology Stage 6
28	Suggested tasks which relate to internal assessment of aspects of the major design project may include: • a report where students account for the processes carried out in industrial and commercial settings in relation to those used in their major design project.	5	
28	Suggested tasks which do not relate to the internal assessment of aspects of the major design project may include:	5	
31	**Project Proposal & Project Management**	9	**Project Proposal & Project Management**
31	Selection and use of ideas and resources	9	~~Selection and use of ideas and resources~~
31	**Project Development and Realisation**	9	**Project Development and Realisation**
31	Documentation of research, experimentation and testing of – design ideas – materials – tools – techniques	9	Appropriate research and experimentation of materials, tools, techniques and testing of design solutions.~~Documentation of research, experimentation and testing of~~ ~~design ideas~~ ~~materials~~ ~~tools~~ ~~techniques~~
31	Identification and justification of ideas and resources	9	Identification and justification of ideas and resources used.

31	Evidence of testing of design solutions and application of conclusions	9	~~Evidence of testing of design solutions and application of conclusions~~
31	Consideration of the practices in industrial/commercial settings as they relate to the major design project.	9	~~Consideration of the practices in industrial/commercial settings as they relate to the major design project.~~
31	**Evaluation**	9	**Evaluation**
31	Final evaluation with respect to the project proposal and the project's impact on society and the environment.		Final evaluation with respect to the ~~project proposal and the~~ project's impact on the individual, society and the environment.

Summary of external and internal HSC assessment

External examination	Mark
Written examination *Section I* Objective response questions	10
Section II Short-answer questions	15
Section III One structured extended response question	15
Major Design Project	60
	100

Internal Assessment	Weighting
Innovation and emerging technologies: - case study of an innovation - other tasks	 20 20
Designing and producing	60
	100

Major Design Project examination criteria

Components	Criteria	Marks
Project proposal and project management	Identification and exploration of the need Areas of investigation Criteria to evaluate success Action, time and finance plans and their application	15
Project development and realisation	Evidence of creativity - ideas generation, degree of difference and exploration of existing ideas Consideration of design factors relevant to the Major Design Project Appropriate research and experimentation of materials, tools, techniques and testing of design solutions Application of conclusions Identification and justification of ideas and resources used Use of communication and presentation techniques Evidence and application of practical skills to produce a quality project	35
Evaluation	Record and application of evaluation procedures throughout the design project Analysis and evaluation of functional and aesthetic aspects of design Final evaluation with respect to the project's impact on the individual, society and the environment Relationship of the final product, system or environment to the project proposal	10
		60

Quality project tasks

The most significant decision a technology teacher makes in a project is what task and why. If the answer is "because it is in the program" or that "it's the task we always do" then an important opportunity may have been lost.

Technology syllabuses provide teachers with a lot of flexibility in their choice of project tasks. Building on the findings of middle years research we should use this flexibility to select tasks which will most engage our students and recognise student interests and backgrounds.

The following points outlined below are considerations for the teacher in choosing a quality project task.

For teachers a quality project task will:

- allow the teaching of programmed syllabus outcomes and content
- provide a vehicle for engaging students and demonstrating quality teaching practices
- be sufficiently open-ended to allow curriculum differentiation to meet the needs of different learners in the class
- provide an opportunity to collect evidence of significant student learning, for assessment and reporting purposes
- be manageable and sufficiently focused to allow student depth of understanding and success.

For students a quality project task will be a rich context for technology learning that:

- is 'real' or authentic, providing clear benefits to someone in their community
- is engaging because it builds on areas of interest or relevance in students' lives
- enables deep understandings and skill development because it builds on existing student knowledge or allows substantial time to develop background knowledge
- allows the student to gain feedback from the user that informs the development of the student's design ideas
- requires students to use an authentic process of design and production that is relevant and is used beyond the classroom.

Developing a quality project task

The following steps can assist in choosing a quality task that meets the teacher's and students' needs.

Step 1: Know what you are required to teach

- Know what you are required to address from the syllabus at this point in the course. What specific content and outcomes do students need to learn?
- Identify what you will need students to show you as evidence of significant learning.

Step 2: Know the limitations for the project

- Identify the design project limitations.
  - What is the total time you have available?
  - Do you have a budget?
  - Are materials and other resources available?
  - What equipment and facilities do you have available?

Step 3: Look for an authentic need

- An authentic need/opportunity is meaningful to the student and has:
  - a real benefit, purpose and use
  - a real user who can provide feedback on design ideas and developments
  - real limitations such as time, money, materials, equipment
  - a real context influenced by specific social, ethical and environmental issues.
- Is there someone in the community who may have a product need? (e.g. local pre-school).
- Is there an opportunity arising in the community to develop a product? (e.g. a local community event).
- Are there an abundance of resources available to be used? (e.g. seasonal food, leftover materials).
- Is there expertise keen to help? (e.g. a parent or a community member who is willing to share their expertise with students such as architect, textile artist, craftsperson).

Step 4: Negotiate with your students

- Introduce the project to your students. Make clear to your students the non-negotiable aspects of the project and the negotiable aspects. You will need to make explicit the learning and assessment expectations and may specify aspects such as:
  - time, money, materials, facilities available
  - expertise and community support available
  - need or opportunity
  - the user.
- Negotiate with students those areas with which there is flexibility.
- Have an explicit and agreed decision making process for determining the task/s with the students.

At this point you are ready for your students to get going with the project: *Exploring and defining the task, Generating and developing ideas, Producing solutions, Planning, managing and evaluating*.

Source: Technology Unit (2006) Technology learning: Putting some principles into practice, *Curriculum Support for teaching in Technology 7–12*, Volume 11, Number 4, pp. 1–3.

Implementing the Technology learning process in the classroom

Questioning techniques are important for teacher planning processes in a project, for guiding student thinking and assisting students to become creative, critical, innovative and enterprising. Use the following questions to implement the technology process in the classroom.

Exploring and defining the task

The need or opportunity

- Is there a product, a system or an environment that is not doing its job effectively?
- Can we think of ways to do it better? (Cheaper, stronger, more attractive etc)
- Is there something we can use in a new way or for a different purpose?
- Is there a need that has no practical solution?

The user

- Who will use the design?
- How will they use the design?
- What will the design have to do to meet the users' requirements?
- What qualities (aesthetic) will the design need for the user to appreciate it?

The client

- Who has requested the design? Why?
- What will the design have to do to meet the client's requirements? (functional and aesthetic)

Resources

- What is the budget?
- How much time is available?
- What other resources are available? (Skilled people, information, materials, processes, equipment etc)

Social and environmental considerations

- Who else might the design affect? How?
- Is there an environmental impact?
- Are there laws, rules or regulations that you need to consider?

Criteria for success

- What will the design have to do to be successful?
- What are the most essential success-criteria and which are desirable?
- What is the priority order for the success-criteria?

Defining the task

- How can we bring all these considerations together into a clear and concise statement of the design task or design brief?

Generating and developing ideas

Generating ideas

- What design solutions exist that address similar needs, problems or opportunities?
- What are the advantages and disadvantages of these solutions?
- What creative thinking techniques can we use to generate new ideas?
- What ideas can we come up with?

Representing ideas

- What techniques can we use to represent my ideas (sketching, story-boarding, drawing, modelling, flow-charts, diagrams etc)?
- Who is the audience (me or others) and what is the purpose of the representations (rough ideas, resolving ideas, presenting ideas etc?)
- Which techniques can we use to represent ideas as they become more resolved?
- How can we improve skills in representing ideas?

Exploring resources

- What materials/processes/equipment/etc could be used for the design?
- What are the performance properties the design requires?
- What risks (safety, cost, environmental) are associated with using the materials/processes/equipment/etc?
- How can we test the suitability of the materials/processes/equipment?
- How can I improve my skills in using the materials/processes/equipment/etc proficiently and safely?
- If we are unable to use the materials/processes/equipment/etc, can someone else help?
- Which materials/processes/equipment/etc will we choose and how do they relate to the success criteria?

Resolving ideas

- What are the advantages and disadvantages of each idea in relation to the success criteria?
- Have we considered the long-term (social and environmental impact) as well as the short-term (money, time, appearance) consequences of the design?
- What do the client and user think?
- What design idea/s will we choose and why?
- Will the chosen design meet the success criteria? (essential? desirable?)
- Do we need any further modifications to the design?

Finalising the concept

- Do we know exactly what is involved in producing the design?
- Do we need to further detail the design? (technical construction drawings, pattern pieces, layout, storyboarding, flowcharts, models)
- Which equipment and material is required?
- How much will it cost?
- What is the step-by-step sequence that will need to occur to produce the design?
- Do we have the skills needed to do each step or will we need more time to practice?
- How long is each step likely to take?
- Who is responsible for each step?
- Does our proposed time plan and budget meet the success criteria?
- Will modifications be required?

Producing solutions

Managing safety risks

- What safety risks can we identify? (user capability and behaviour, materials, equipment, facility, teacher expertise)
- Where can we find sound advice?
- How can we eliminate or control the risks?
- If the risks cannot be controlled how will we modify the design?

Managing production

- Have the necessary information, materials and equipment been acquired?
- Is the equipment set up safely and working effectively?
- How and who will manage storage and equipment maintenance issues?
- Do we need particular skills to be modelled (demonstrated) or reviewed with us or are we able to proceed independently?
- Do we need an expert to supervise our work?
- Is the production proceeding according to time plan and budget?
- Is the quality of production work appropriate to the success-criteria?
- What modifications do we need to make to the planned design and production?

Reflecting on learning after the technology process

Design solution

- What did we produce as a result of the technology process?
- Does it work for the client and user? Do they like it?
- In what ways did our design solution achieve each success-criteria?
- What aspects of the design solution did not achieve the success criteria?
- How would we do it differently next time?

Design process

- What was the technology process we used?
- How could the technology project process be improved?
- Was our documentation processes helpful? Why or why not?
- Did we meet the requirements of the design task? Why or why not?
- What skills did I gain or further develop?
- Did the group work well as a team?

Learning outcomes

- Which syllabus outcomes were we focusing on?
- How well have I progressed towards achieving each outcome?
- What experiences do I need to improve in my progress?

Source: http://www.curriculumsupport.education.nsw.gov.au/designproduce/teach_assess.htm#Strategies

Year 11 Projects – Genuine need

Products

- Design and produce an item with a clearly identified need that considers environmental sustainability.
- Design and produce a toy suitable for children of three to seven years of age – link to community preschool or feeder primary/infants schools.
- Design and produce a furnishing item suited to your bedroom.
- Design and produce an item that would assist you in an area of sport and recreation.
- Use recycled materials to design a product with a completely different function, shape and form.
- Design and produce an item to assist the elderly – link to community retirement village.

Environments

- Redesign your bedroom. Your final design idea should include models and drawings of the final concept.
- The Year 11 Design and Technology class has been asked to redesign the Year 12 playground area. In teams of no more than 3 students you are required to research and investigate appropriate solutions to the brief. Final ideas must be presented to the management committee for approval prior to commencing the final design. You will be required to collaborate with other teams to produce a harmonious whole environment.
  Team 1 – Landscape design: appropriate plants for the area
  Team 2 – Landscape design: suitable garden bed design
  Team 3 – Seating and shade areas for students
  Team 4 – Handball court/area for Year meetings.
  Team 5 – Management: Finance; time and action plans.
- The local council has decided to develop a new recreation area for young people. Ideas for this project have been called upon from the local community, in particular, from young people within the targeted age bracket of 14–18 years old.
  Design a new recreational area for young people from within your local area.

Systems

- Design a new system for students when using the school canteen to ensure a more efficient procedure during Recess and Lunch breaks.
- Design a new road safety campaign for the 18–25 year old target market.
- All students from Years 9–12 will soon receive a laptop. Design a system to be used by your school to manage the distribution, security and use of these laptops by students.

Electronic Content Allocation Tool (ECAT)

What ECAT is and does

ECAT is an *Excel* spreadsheet. It can be used as *either*

- a way of checking that your existing course plan (or program) addresses the content (dot points, *learn tos*, *learn abouts*) from the syllabus

or

- a way of ensuring that a course plan in the process of development covers the content in an even way *as it is written*.

This tool cannot produce a unit of work, course plan or program. It cannot think of strategies or activities. It was never intended to do this.

Provides a somewhat less tedious way (compared to doing it manually) to cross check content from the course plan and the syllabus. It makes it obvious if there is content left out. It also makes the user aware if content is often revisited.

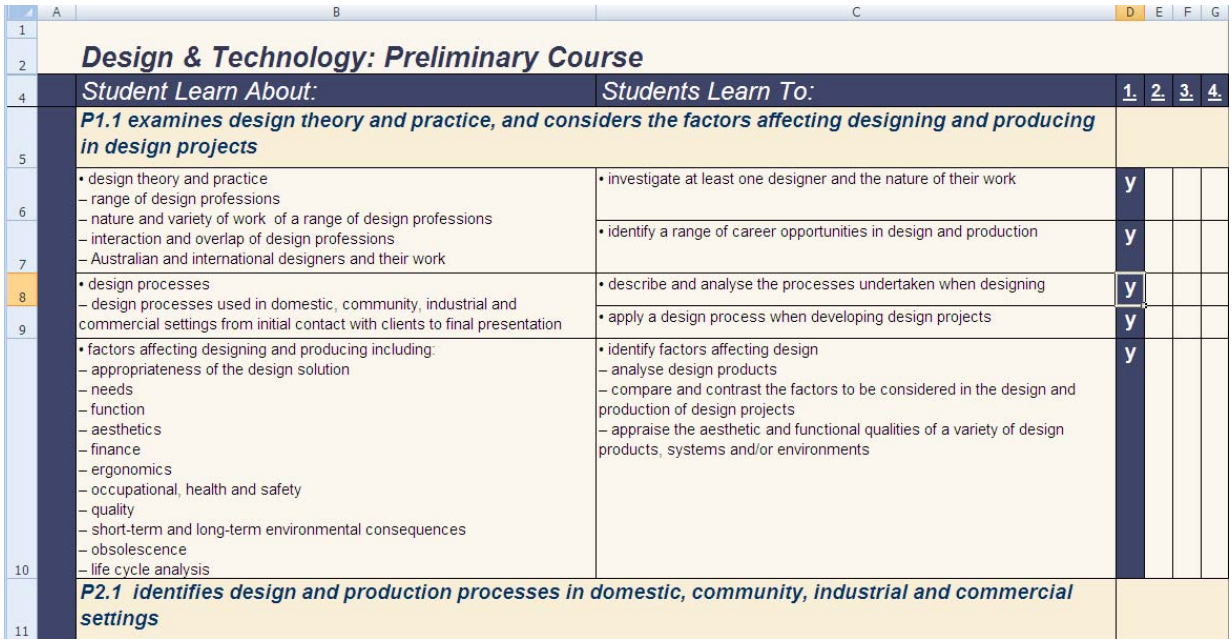
If the course plan or the program is already written, the user would work through the program, entering content in the ECAT. If the plan or program is being developed, the user would work through the ECAT, thinking of strategies and activities.

Instructions

There is an ECAT for the Preliminary course and one for the HSC course. Both spreadsheets work in much the same way. Screen shots are from the Preliminary course.

Open the file and save it immediately using a different name to be sure you are working with a copy, not the original.

When the document opens, you will see the screen below. As you scroll down you will see that the *learn abouts* and *learn tos* from the entire course are listed. Where you find content in the unit of work that matches with the syllabus, fill in a 'Y' in the row matching the syllabus content and in the column matching the unit.



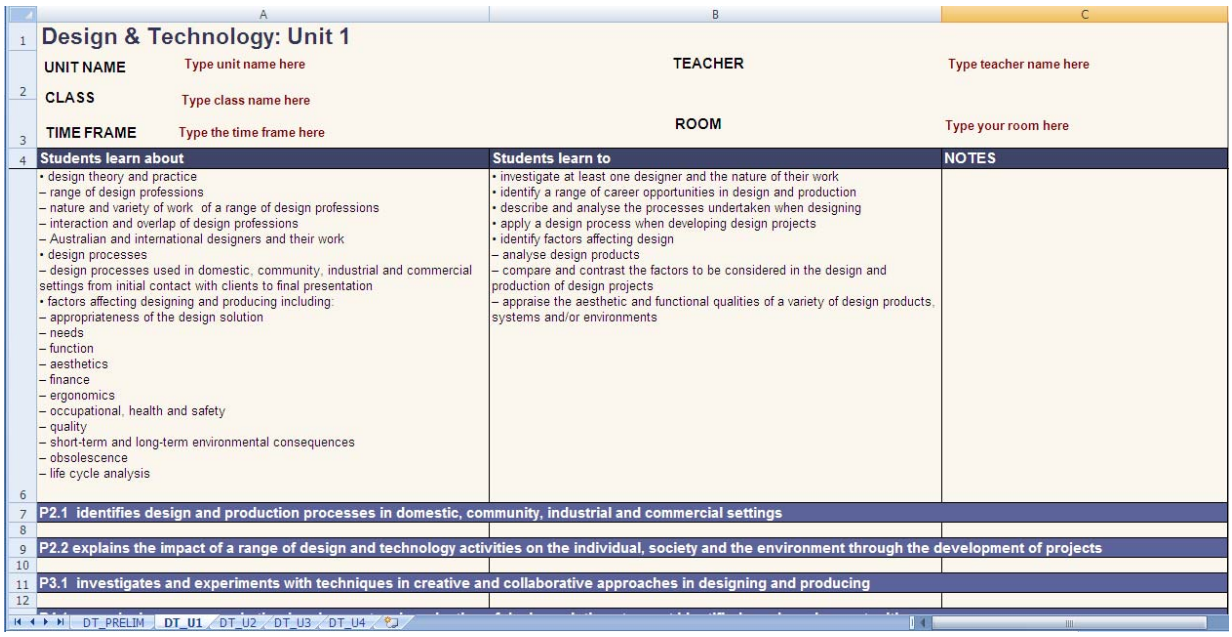
Design & Technology: Preliminary Course

Student Learn About:	Students Learn To:	1.	2.	3.	4.
P1.1 examines design theory and practice, and considers the factors affecting designing and producing in design projects					
• design theory and practice – range of design professions – nature and variety of work of a range of design professions – interaction and overlap of design professions – Australian and international designers and their work	• investigate at least one designer and the nature of their work	y			
	• identify a range of career opportunities in design and production	y			
• design processes – design processes used in domestic, community, industrial and commercial settings from initial contact with clients to final presentation	• describe and analyse the processes undertaken when designing	y			
	• apply a design process when developing design projects	y			
• factors affecting designing and producing including: – appropriateness of the design solution – needs – function – aesthetics – finance – ergonomics – occupational, health and safety – quality – short-term and long-term environmental consequences – obsolescence – life cycle analysis	• identify factors affecting design – analyse design products – compare and contrast the factors to be considered in the design and production of design projects – appraise the aesthetic and functional qualities of a variety of design products, systems and/or environments	y			
P2.1 identifies design and production processes in domestic, community, industrial and commercial settings					

In the example above, a 'y' has been entered in eleven cells. This means that in unit 1, all *learn abouts* have been covered for elements of design and principles of design but only two of the three *learn tos.*

Now select the unit you want to work on from the bottom bar. Save the spreadsheet.

Note that content from the syllabus has been copied to this sheet wherever a 'y' was entered on the previous sheet.



Design & Technology: Unit 1

UNIT NAME	Type unit name here	TEACHER	Type teacher name here
CLASS	Type class name here		
TIME FRAME	Type the time frame here	ROOM	Type your room here

Students learn about	Students learn to	NOTES
• design theory and practice – range of design professions – nature and variety of work of a range of design professions – interaction and overlap of design professions – Australian and international designers and their work • design processes – design processes used in domestic, community, industrial and commercial settings from initial contact with clients to final presentation • factors affecting designing and producing including: – appropriateness of the design solution – needs – function – aesthetics – finance – ergonomics – occupational, health and safety – quality – short-term and long-term environmental consequences – obsolescence – life cycle analysis	• investigate at least one designer and the nature of their work • identify a range of career opportunities in design and production • describe and analyse the processes undertaken when designing • apply a design process when developing design projects • identify factors affecting design – analyse design products – compare and contrast the factors to be considered in the design and production of design projects – appraise the aesthetic and functional qualities of a variety of design products, systems and/or environments	
P2.1 identifies design and production processes in domestic, community, industrial and commercial settings		
P2.2 explains the impact of a range of design and technology activities on the individual, society and the environment through the development of projects		
P3.1 investigates and experiments with techniques in creative and collaborative approaches in designing and producing		

DT_PRELIM | DT_U1 | DT_U2 | DT_U3 | DT_U4

Enter the unit name, class, time frame, teacher and room.

Adjust the height of appropriate cells so that all data can be seen.

You can enter notes that may be useful to you in the programming process.

You can also transfer the syllabus content and comments to a teaching and learning sequence by copying and pasting.

Before you print the document, ensure that the correct print area is set. This may save you accidentally printing pages of empty cells. The simplest way to do this is to adjust the page breaks

Check on *Print Preview* which pages you need to print.

Sample Electronic Content Allocation Tool – printout page

	A	B	C
1	**Design & Technology: Unit 1**		
2	**UNIT NAME** Type unit name here	**TEACHER**	Type teacher name here
3	**CLASS** Type class name here		
	TIME FRAME Type the time frame here	**ROOM**	Type your room here
4	**Students learn about**	**Students learn to**	**NOTES**
6	• design theory and practice – range of design professions – nature and variety of work of a range of design professions – interaction and overlap of design professions – Australian and international designers and their work • design processes – design processes used in domestic, community, industrial and commercial settings from initial contact with clients to final presentation • factors affecting designing and producing including: – appropriateness of the design solution – needs – function – aesthetics – finance – ergonomics – occupational, health and safety – quality – short-term and long-term environmental consequences – obsolescence – life cycle analysis	• investigate at least one designer and the nature of their work • identify a range of career opportunities in design and production • describe and analyse the processes undertaken when designing • apply a design process when developing design projects • identify factors affecting design – analyse design products – compare and contrast the factors to be considered in the design and production of design projects – appraise the aesthetic and functional qualities of a variety of design products, systems and/or environments	

Stage 6 Design and Technology Preliminary unit of work: *Recycle Cycle* Time Allocation: 14 weeks

Week & Outcome	Students learn about:	Students learn to:	Strategies and Activities	Resources
Weeks 1 - 2 P1.1	Design and Technology Syllabus requirements and Preliminary Course Outline. • design theory and practice – range of design professions – nature and variety of work of a range of design professions • design processes – design processes used in domestic, community, industrial and commercial settings from initial contact with clients to final presentation • factors affecting designing and producing including: – appropriateness of the design solution – needs – function – aesthetics – finance – ergonomics – occupational, health and safety – quality	Outline the requirements for the course. • identify a range of career opportunities in design and production • describe and analyse the processes undertaken when designing • apply a design process when developing design projects • identify factors affecting design – analyse design products – compare and contrast the factors to be considered in the design and production of design projects – appraise the aesthetic and functional qualities of a variety of design	- Handout course overview. Read and discuss this and team teaching approach. - Discuss the role design plays in our lives. Handout notes: 1. What is Design? 2. Design in our Lives. Read and discuss. Complete activities and watch video. - Develop a design target. - Brainstorm – what is a design process? Students to develop a design process based upon activities they have undertaken at home or school. - Comprehension: The Industrial Innovation Cycle – a design process in industry. - Discuss factors affecting design. Handout: Factors to Consider when Designing. Students to complete related activities. - Watch video: Ergonomics and Design. Students to complete worksheet. - Additional notes: Structural and Aesthetic features of Design.	Texts: 1. Excel D&T, p. 19. 2. Studio Design at Work 3. Glover, D&T, p. 2. 4. Cambridge D&T, p. 3 Video: The One That Didn't Get Away. A case study of design processes and innovation. Text: Making It, p. 9–17, and comprehension questions. Texts: 1. Excel D&T, p. 32. 2. Glover D&T, p. 18. Video: Ergonomics and Design.

Week & Outcome	Students learn about:	Students learn to:	Strategies and Activities	Resources
P1.1	– short-term and long-term environmental consequences – obsolescence – life cycle analysis	products, systems and/or environments	- Relate life cycle analysis to products students are familiar with, e.g. cotton T-Shirt. Watch DVD Life Cycle Assessment. - Students to relate short and long term environmental consequences of design to Design Task No.1 – Re-design a product.	DVD: Life Cycle Assessment VEA
Weeks 3 - 4 P2.2	• environmental and social issues including: – personal values – cultural beliefs – sustainability – safety and health – community needs – individual needs – equity	• assess the impact of the activities undertaken in the development of design projects on the individual, society and the environment • evaluate examples of design and production and relate these to environmental and social issues	- Read notes and discuss: Impacts on the Individual, Society and Environment. - Discuss. Relate to current designs – construct a table of how examples provided impact upon the individual, society and the environment. - Read newspaper article: Bagging Up Groceries. Discuss this and other case studies. - Continue with Design Task 1.	- Video: Right from the Start – The Axis Kettle and worksheet. 1. Glover D&T, p. 35 - 40
P3.1	• creative approaches including: – cognitive organisers – strategies for problem solving and solution creating – ideas generation • collaborative approaches – design teams: roles and tasks of members – communication between and within design teams – team responsibilities	• select and apply a variety of cognitive organisers • apply problem solving techniques to identified problems • identify the factors that contribute to successful work and collaboration • collaborate and participate in design teams • work cooperatively	- Discuss terminology ‘cognitive organisers’ and ‘collaborative approaches to design’ using practical examples. Handout of information to support discussion. - In design teams, research and then present to the class a five minute talk on the impact of one of the following aspects of design and technology upon the individual, the society and the environment. * Wind power technology * Genetic engineering * Global Positioning System: GPS * Wave power technology * Biometrics * Nanotechnology	Texts: 1. Excel D&T, p. 64. 2. Glover D&T, p. 42. 3. Cambridge D&T, p. 32. Current newspaper articles, provided by the Librarian. Excursion to Powerhouse Museum to examine issues in sustainability via seminars and DesignTech exhibit.

Week & Outcome	Students learn about:	Students learn to:	Strategies and Activities	Resources
Weeks 5 & 6 P4.1	• project analysis – design briefs – appropriateness of design solutions – criteria for evaluation and factors to consider	• formulate and analyse design briefs • identify the parameters of design • identify criteria for success of design projects • produce functionally and aesthetically appropriate design projects	- Handout and discuss Design Project No. 1. - Model appropriate sections, using past student folio samples. - Students to complete their Project Proposal, using appropriate computer technology.	Supply of student project work from previous years.
P4.3	• evaluation - developing and refining ideas - criteria for evaluation - methods of evaluation	• establish the parameters for design and identify criteria for the evaluation of design projects • examine processes undertaken in design projects • conduct continual evaluation throughout design and production	- Discuss what evaluation is, and its purpose. - Model methods for recording of ongoing evaluation.	
P6.2 ongoing throughout design project	• computer-based technologies and their application including: - modelling - research - simulation and graphics - communication - presentation.	• discriminate in the choice and use of computer-based technologies to develop, communicate and present design ideas and processes.	- Students develop skills in relevant computer technology in relation to their individual design project.	Text: Glover D&T, pp. 135-41.
Week 7 P5.1	• project management • management techniques and tools, including those used by designers in industrial and commercial settings	• identify a variety of management techniques and tools	- Model examples of time, action and finance plans using examples of past work. Discuss the variation of management between small scale and large scale projects. - Homework notes relating to factors that impact upon management.	Text: Glover D&T, pp. 101-8

Week & Outcome	Students learn about:	Students learn to:	Strategies and Activities	Resources
	• factors affecting management including: – identifying available resources – clarifying values – setting goals – setting standards – evaluating the costs and benefits of each alternative – making and implementing decisions – task descriptions and sequencing – documentation of plans	• plan, implement and evaluate a sequence of operations for the completion of design projects	- Students to complete their Project Management, using appropriate computer technology.	
Week 8 P5.2, P6.2	• communication - forms of communication including verbal, written, graphical, visual, audio - elements of the communication process which include sender, receiver, medium, message - criteria for evaluating communication including clarity of message, appropriateness of method chosen, ease of interpretation - communicating information through a variety of media - visualising solutions - the purpose of prototypes and/or models	• use appropriate design and technology terminology • experiment with a range of techniques and forms to visualise and communicate ideas and solutions • communicate design ideas and solutions effectively using a range of technologies • use appropriate standards and conventions to visualise and communicate ideas and solutions • justify the selection and use of communication techniques • select appropriate materials, tools, techniques and other resources	- Handout: Communication - Demonstrate with use of past work, creative methods used to communicate design ideas. - Students divided into appropriate groups to learn appropriate methods of communication in relation to their design project e.g. technical; fashion drawing; rendering. - Students to communicate their design ideas for Design Project No. 1, appropriately via rough sketches, final design drawings and CAD.	Texts: 1. Excel D&T, p. 101. 2. Glover D&T, p. 110. 3. Cambridge D&T, p. 82.

Week & Outcome	Students learn about:	Students learn to:	Strategies and Activities	Resources
	• presentation techniques suited to the needs of design clients and design projects	• justify and explain the selection and use of resources in design projects • test and evaluate the appropriateness of design solutions • develop and demonstrate proficiency in using an appropriate range of materials, tools, techniques and other resources	- Research appropriate materials, tools and techniques to be used on Design Project Number 1.	
Weeks 9 - 13 P4.2, P6.2	• using materials, tools, techniques and other resources – characteristics and properties – functions and uses – experimentation – criteria for selection – consequences of use	• implement safe work practices when designing and producing		
P4.3	• evaluation - developing and refining ideas		- Experiment with a variety of construction techniques and methods.	
P4.2	• the realisation of ideas through the manipulation of materials, tools and techniques and other resources		- Commence construction of design idea for Project No. 1.	
	• safety – safety in the use of materials, tools and techniques – legislative requirements including Occupational Health & Safety		- Discuss OH&S issues in relation to the completion of design projects. Handout notes. Students to complete activities in relation to OH&S, using *WorkCover* website.	OH&S work sheet

Week & Outcome	Students learn about:	Students learn to:	Strategies and Activities	Resources
Week 14 P4.3	• evaluation - criteria for evaluation - methods of evaluation	• assess the impact of designing and design projects on society and the environment.	- Observe past students work and refer to samples of evaluation of final design; criteria and impact upon society and environment. - Discuss the difference between global and intended environments. - Submit Design Project No. 1	Past student folios.

Activity 2a article

This article first appeared on the following website October 26, 2006 http://news.thomasnet.com/IMT/archives/2006/10/sustainable_design_economic_social_ecological_materials_products_buildings.html , accessed 31/01/10.

This US industry retail site provides links to many industrial design trends including sustainable and eco design.

Sustainable Styles by David R. Butcher

Low-flow toilets, recycling your Mazda, rebuilding New Orleans, Foo Go and Brad Pitt: What do all these have in common? Sustainable design. The need to integrate sustainability into design practices is becoming increasingly more apparent — from objects as small as appliances to applications as large as towns — due to design's ability to overcome difficult obstacles with measured creativity.

"Sustainability" is a word that may not mean much to a lot of people, and to many people is a synonym for "environment." Building or producing with the environment in mind is still a relatively new goal for many companies. Yet sustainable design is increasingly becoming a consideration for every project and every designer, not just a design specialty. In fact, for those in the know, sustainable design is simply good design.

Sustainable design can be defined broadly as designing physical objects to comply with the principles of economic, social and ecological sustainability. It ranges from designing small objects for everyday use through to designing buildings, cities and even the earth's physical surface. According to the World Commission on Environment and Development, sustainability is understood to be "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

For example, using less materials (lightweighting), fewer (making it easier to recycle) and, if possible, avoiding toxic substances and choosing renewable or recycled/recyclable are issues to consider in design for sustainability. Careful selection of materials and manufacturing processes can often (though not nearly always) create products indistinguishable in price and performance from non-sustainable products.

Dematerialization could include some of the above — lightweighting, for example — but also designing things to be multifunctional, or finding a different way to deliver the same benefit through a service or product-service combination, variously referred to as selling performance or results, or more recently as "product service systems" (PSS).

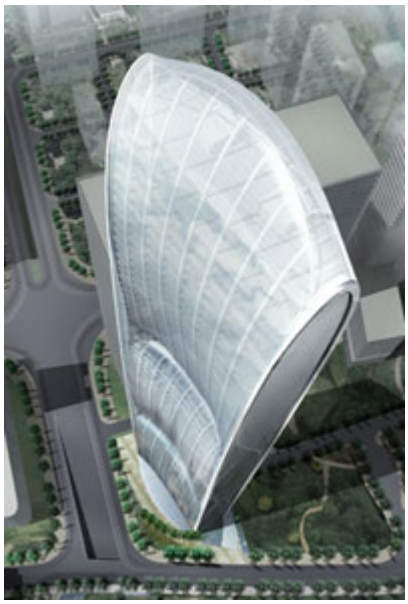
As well, some disposable items can be designed to self-destruct. A good example of a mismatch between the life of a product and the life of its packaging is the average sandwich wrapper. While most wrappers may end up in landfills for a few hundred years, according to Design Council, UK-based Foo Go uses pre-packaged sandwich wrappers that will biodegrade within 14 weeks, using water-based carboard, inks and coatings and windows made of corn starch. While the pre-packed sandwich provider has received much praise for its contribution to the environment, the costs for the 14-week biodegradable packaging are five times more than ordinary packaging.

Or take appliances and automobiles, which can be designed to be taken apart easily so they can be repaired, serviced, upgraded, remanufactured or recycled, such as through modular design or smart materials. Further, they can be constructed from recyclable materials such as steel, aluminium and glass, as well as from renewable materials such as wood and plastics from natural feedstocks.

Even mild design efforts, such as low-flow water appliances, can greatly increase the sustainable content of manufactured items.

Arguably the sustainable design example growing quickest in interest and popularity lies in green building technology. Green buildings are designed to conserve energy, water and resources with limited polluting of indoor or outdoor environments.

"Ten years ago," BusinessWeek recently noted, "…using less energy inherently meant making do with less — less heating, less cooling, less of the symbolism and grandeur that define great architecture. Yet by the turn of the millennium green had become glamorous, and today it's even economical. The cycle of innovation for sustainable building technologies is now staggeringly short, given how long it takes to complete a building.



"In short, we are close to the tipping point at which green design becomes the default option for smart building."

For example, announced in July 2006, Delta Airlines' new Terminal A at Boston's Logan International Airport features a roofing membrane and paving designed to reflect heat from the building and special storm-water filtration devices to remove suspended solids and total phosphorous, thus combating the accelerated heat island effect and storm-water runoff issues typically caused by impervious surfaces on runways, parking lots and large roof areas. Some of the project's other sustainable strategies include the following: water-efficient plumbing and irrigation; extensive day-lighting and high-insulation glass; energy-efficient electric lighting; construction waste recycling; and the use of recycled, local materials.

With 10 percent of all materials on the +640,000-square-foot Terminal A job coming from recycled sources and 75 percent of construction waste being reused, recycled or otherwise diverted from area landfills, the project has saved many thousands of tons of raw materials.

Adrian Smith's designs for Chicago's Trump International Hotel & Tower and the United Arab Emirates' Burj Dubai — both under construction, with the latter set to be the tallest building in the world — have already earned him international attention. Yet this year, Smith's collaboration with designer Gordon Gill on architecture firm Skidmore, Owings & Merrill's Pearl River Tower has also been the subject of escalating excitement in the architectural press. Pearl River Tower is a "zero-energy" project for a Chinese company that uses a unique wind-harvesting technique, powerful turbines and other sustainable technologies to generate most of its own energy.

Similar, autonomous buildings use available resources such as rainwater, solar power or wind turbines to reduce their dependence on fossil fuels and other resources. Often, they can be constructed of recycled materials, as well, reducing their total energy requirements for construction.

And sustainable design is becoming more prevalent in objects and systems larger than appliances, automobiles and even buildings. Urban and rural planning can benefit from including sustainability as a central criterion when laying out roads, streets, buildings and other components of the built environment.

Over the summer, for instance, New Orleans' municipal government floated ideas about focusing rebuilding Hurricane Katrina-destroyed houses in "dry" areas. Believing that only sustainable design would allow their ecologically fragile communities to survive future storms, harder-hit residents appealed to national and local foundations to recruit leading urban planners to help them plan green. That effort, which began with initial workshops earlier this month, will lead to an official proposal for government-funded rebuilding projects — a document called the Unified New Orleans Plan (UNOP).

Housing being the primary issue currently on many residents' minds, Frederic Schwartz of New York's Schwartz Architects, one of 13 firms working with civic groups over the winter in formal planning sessions, recently explained to Plenty magazine, "the challenge is to find a way to build homes quickly, and make them last — and that's where sustainability comes in."

One green UNOP idea involves clustering homes together to reduce short car trips and spread the costs of new technologies (E.g., solar panels) across several homes.

Building from prefabricated materials is also efficient, as it reduces time and truck traffic involved in construction. Designer Matt Berman, who lately has garnered significant attention by winning the Brad Pitt-sponsored Global Green competition for sustainable New Orleans housing, has a design for a low-lying neighborhood that involves prefabricated modular houses, exterior stairwells that absorb sunlight to illuminate homes, and plazas with plenty of bike storage.

Deborah Gans, another UNOP team adviser from New York, stressed the importance of designing with New Orleans' particular ecology in mind. "You can use things that come naturally to the area that everyone understands," Gans said to Plenty. Such steps include building houses to face east for optimal daylighting, using natural ventilation to harness bayou breezes and, as Berman did in his winning design, building houses under tree overhangs to provide shade.

Any business that strives to remain competitive will recognize the opportunities involved with the new demands for environmental quality. Of course, for companies to get involved, they must be sure of their economic survival. Decision-making about sustainable technologies will involve risk, uncertainty and surprise about likely economic implications, and about possible social and environmental impacts. Yet the need to integrate sustainable design into design practices is becoming increasingly more apparent.

Design has a valuable role to play in sustainability — objects as small as appliances and as large as towns — due to its ability to overcome difficult obstacles with measured creativity.

Simona Rocchi, Director of Sustainable Design at Philips Design, agrees. Design, she says, "explores the new and is the bridge between technology, society and business. It is sensitive to cultural conditions, social trends and the potential of new technology, and is able to translate this into valuable propositions for business by envisioning solutions grounded in new ways of production and consumption".

Websites for information relating to design trends

Video clip- Trends of 2010
http://www.youtube.com/watch?v=sYQZDxffdpE
Object- Australian centre for craft and design
http://www.object.com.au
Australia's culture portal
http://www.cultureandrecreation.gov.au/articles/design/
ABC arts
http://www.abc.net.au/arts/default.htm
HSC online
http://www.hsc.csu.edu.au/design_technology/innovation_emerging/trends/
Sydney Morning Herald- technology
http://www.smh.com.au/technology/
Trendspotting
http://www.trendspotting.com.au/
Minimalism
http://www.minimalistdesign.org/
Social trends
http://www.abs.gov.au/ausstats/abs@.nsf/mf/4102.0?OpenDocument
http://www.australianwomenonline.com/australias-top-10-social-and-demographic-trends-for-2008/
Economic trends
http://www.hotelworldnetwork.com/design-trends/design-firms-2010-sustainability-overseas-markets-stay-hot
You tube video sustainable fashion
http://www.youtube.com/watch?v=T_1j5vDEZDo
Design Hub
http://www.dhub.org/
2009 Horizon Report re emerging technologies and their impact on education.
http://wp.nmc.org/horizon2009/chapters/executive-summary/
ABC New inventors
http://www.abc.net.au/tv/newinventors/

Activity 2b article

THE SUN-HERALD June 8, 2008 15+

Our secret weapon in Beijing

Special pill to check body temperature

By HEATH GILMORE

AN ELECTRONIC pill developed by NASA is the secret weapon for our athletes preparing for the heat and humidity at the Beijing Olympics.

The white, silicon-coated pill acts as an internal thermometer to give a true reading of the core body temperature.

The pill – half battery, half radio transmitter – is ingested by an athlete and passes through the stomach into the intestines, where it monitors, records and reports real-time core body temperatures.

It can tell coaches and medical staff through a wireless hook-up how an individual is faring under extreme climate conditions, allowing them to tailor precautionary measures and on-field strategies for each athlete to prevent physical problems.

Sport scientist Matt Brearley, from the Northern Territory Institute of Sport, said heat, rather than the much-publicised pollution from the city of 17 million residents, would be the main problem confronting athletes at the Games in August.

The weather fluctuates wildly at this time of year although temperatures can sit at 35 degrees for days on end, with humidity levels up to 70 per cent. Once an athlete's core body temperature reaches a consistent 40 degrees, physical and mental performance are impaired, with dehydration also an issue.

Body type and workload affect the individual's body temperature in varying ways.

Working closely with Australia's men's and women's hockey teams, Mr Brearley has led the way to popularise the core temperature pill, known by some as the athlete's little helper.

He said the pill was being used as a pre-event monitoring tool but could foreseeably be used during competition.

Outdoor endurance sports such as cycling, triathlons and football had also embraced the use of the pill, which is more popular among athletes than the rectal probes previously used to measure core body temperatures.

Medical experts accompanied the hockey team to conduct and administer tests in trial events in Beijing as well as training camps in Darwin. These tests were used to collate data to find out how best to prepare the team members for the Games when they will defend the Olympic title won at the 2004 Athens Olympics.

Athens gold medallist Nathan Eglington, whose groin injury two weeks ago ruled him out of the Olympic campaign, said swallowing the pill was akin to taking a headache tablet.

"We would have five athletes selected for each game and [medical staff] would notify you the morning of the game, then someone [medical staff] would come around and give you a little pill that slips down into your body like taking a Panadol," he said.

"Then, after four to five hours, [the pill] gets down into the core of the body and acts as a little thermometer where the medical staff can come up and hold a little reader against your chest and read your temperature.

Outdoor endurance sports such as cycling, triathlon and football have embraced the pill, which is more popular among athletes than the rectal probes previously used to measure core body temperatures.

"We play for 70 minutes but for sports like cycling or marathon runners, they may find it difficult [in the heat, humidity and pollution] because they have to extend themselves for such a long period."

Ice baths were also trialled as a preparation technique. Before matches a couple of players were selected to submerge themselves in water at 20 degrees for 20 minutes.

The philosophy behind this exercise was to reduce the athletes' core body temperature before they played to promote their ability to perform during the game; that is, endurance, running for longer in the heat.

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BEATING THE HEAT

The 'thermometer pill'

Originally developed for NASA to monitor the core body temperatures of astronauts during space flights, the ingestible thermal 'pill' is also used to measure the internal heat production of an athlete to signal heat exhaustion.

1. Once swallowed, the wireless temperature-reading pill takes three to four hours to reach the intestines if taken with a meal – about double that time if taken without.

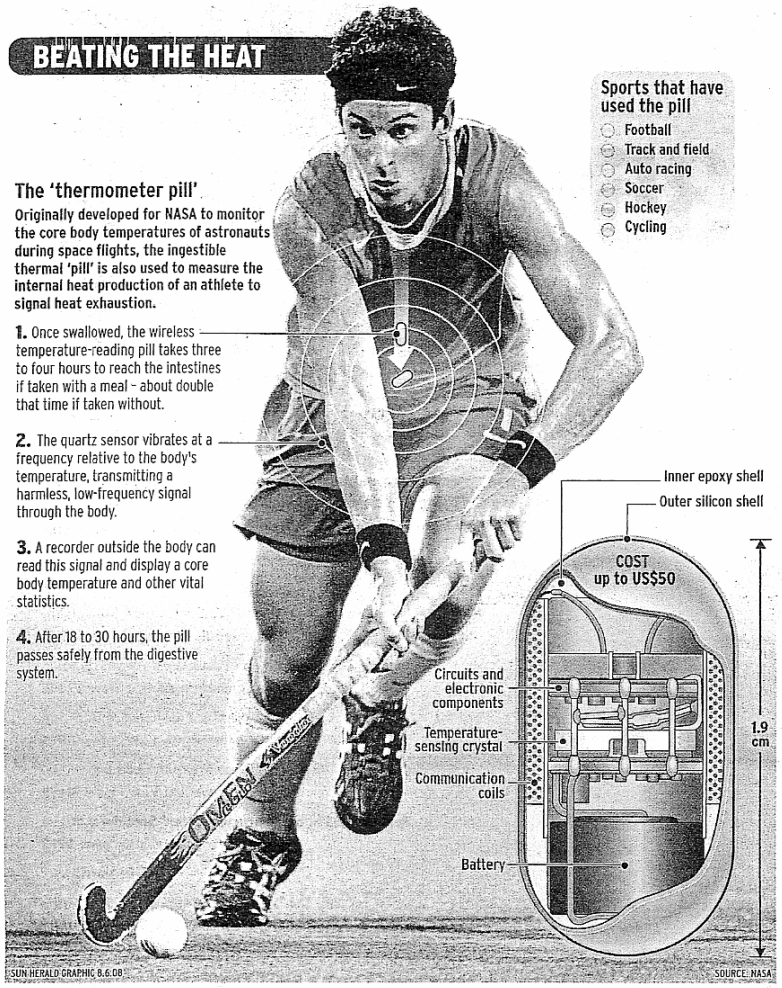
2. The quartz sensor vibrates at a frequency relative to the body's temperature, transmitting a harmless, low-frequency signal through the body.

3. A recorder outside the body can read this signal and display a core body temperature and other vital statistics.

4. After 18 to 30 hours, the pill passes safely from the digestive system.

Sports that have used the pill

- Football
- Track and field
- Auto racing
- Soccer
- Hockey
- Cycling



In 1998, astronaut and US senator John Glenn swallowed a thermometer pill as part of his Space Shuttle Discovery medical experiments. NASA scientists tracked the data produced by the pill to study then 77-year-old Glenn's condition during his stay in space.

During activities such as spacewalks, astronauts may perform strenuous activity that causes a rapid rise in body temperature.

A space suit is insulated against external extremes between 121 degrees celsius (250°F) and -157 degrees celcius (-250°F). The danger of overheating comes from within, as astronauts release body heat and humidity inside the suits, potentially causing heat illnesses.

In 2001, the deaths of two football players in the United States prompted athletic programs to investigate better ways to prevent heat-related illnesses. This led to the use of the thermometer pill.

SOURCE: NASA

Our secret weapon for Beijing Special pill to check body temperature

June 8, 2008

Outdoor endurance sports such as cycling, triathlon and football have embraced the pill, which is more popular among athletes than the rectal probes previously used to measure core body temperatures.

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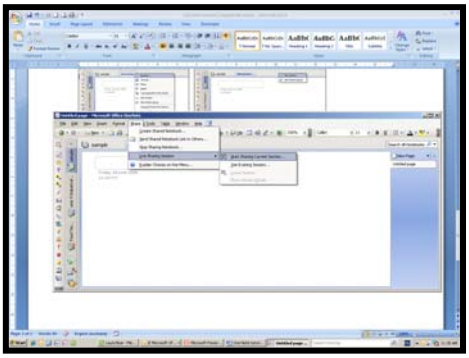
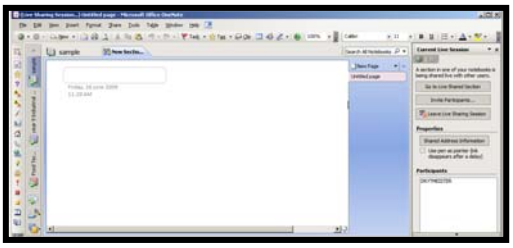
Source: The Sun-Herald

Working collaboratively with Microsoft *OneNote*

You can share a Microsoft *OneNote* section with your students so they can all contribute to the article summary at the same time.



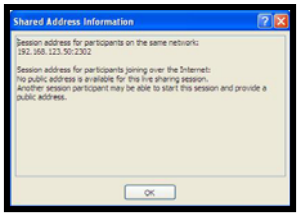


Teacher starts a *Live Sharing Session*:

- Create a *OneNote* section and paste the article onto pages in this section.
- Go to *Share>Live sharing session>Start sharing current section*.
- Enter a password if you wish and click *Start Live sharing section*.
- Click *Shared address information* and give this address to the students.
- The address should be in the format: xxx.xxx.xxx.xxx:2302

Students connecting to a live shared section

- Students go to Share>Live sharing session>Join existing session.
- They enter the address and password you provide. All connected students can now edit the same document at the same time.
- When disconnected all students will retain a *read only* version of the whole section. They can copy this to another section if they want to edit it.



Written paper marking process

- The written marking operation is managed by the Supervisor of Marking supported by the Assistant Supervisor of Marking and Chairperson of the Exam Committee and a number of Senior Markers.
- Each senior marker supervises a team of approximately 10 markers including a pilot marker, all of whom mark a single examination question, e.g. Section 1, Question 1. There may be more than one team that marks the same question.
- When the examination paper is written it includes a set of marking criteria which are used to guide the marking process.
- Marking commences with the Senior Markers reviewing the marking criteria for their question, then the pilot markers test mark a sample of exam scripts to familiarise themselves with the criteria.
- A number of exam scripts are selected and marked by the team of markers to ensure the marking criteria are applied consistently by all markers.
- Markers commence marking written scripts, these are sample checked by Senior Marker for accuracy.
- At regular intervals a common script is marked to ensure markers are not deviating from the marking criteria.

Tips for responding to the written paper

Students should:

- Understand all syllabus outcomes as these are what will be examined.
- Develop an effective examination strategy that students have practiced regularly.
- Apply knowledge of innovation and emerging technologies and designing and producing to responses.
- Be specific and provide relevant examples from their studies to illustrate depth of understanding.
- Write succinctly. The examination is 90 minutes long; this doesn't allow for responses that wander. Students should plan their response prior to writing.
- Read the questions very carefully, ensuring students provide the appropriate level of detail in their response. Many students do not gain full marks for questions because they do not provide the next step —the deeper level of understanding — that takes them to a higher mark range. For example, a question may ask for a student to explain (relate cause and effect; make the relationship between things different; provide how and/or why) but the student limits their response to a description (provides characteristics and features) thereby limiting the marks they can be awarded.
- Relate to themselves as designers and to the work of other designers.

Design and Technology Higher School Certificate Examination 2008

Question 12 (15 marks)
Electricity can be generated from a variety of sources, such as:

- nuclear energy
- solar panels
- hydro electric power
- wind turbine
- biomass
- tidal movement
- wave generation
- clean coal technology

(a) Explain the environmental issues considered during the design and production of innovative methods of generating electricity using examples from the above list. /6

(b) Analyse how social and ethical factors influence the development of innovations. /9

Section III Question 12 (a) *Outcomes assessed: H2.2, H6.2*

Marking guidelines

Criteria	Marks
• Makes the relationship evident between environmental issues and the design and production of an innovation in electricity generation, with specific links to stimulus examples.	5–6
• Describes environmental issues and links these to the design and/or production of an innovation in electricity generation, with reference to stimulus examples.	3–4
• Outlines environmental issues in electricity generation OR • Outlines features of design or production of electricity generation.	2
• Identifies an environmental issue OR • Identifies a feature of design or production, in electricity generation.	1

Sample answer/answers could include:

- When developing innovations with respect to tidal energy, the disruption to marine life habitat must be considered. For example, when the water flows in and out of the tidal pools, some marine life may be stranded in the shallows and die. In addition, the impeller blades may kill marine life if the creatures get caught in the vortex.
- Hydroelectric dams may flood and destroy land areas, which may kill plant and animal life. Further, erosion of land may occur because rivers have changed course. Farmers may not have access to water for irrigation. Algae blooms caused by slow or stagnant water, choking the dam, kills the fish in the rivers.
- Generation of waste products in the production process – by-products.
- Waste products generated through design, production and use.
- Land degradation and habitat destruction.
- Mining of metals for construction of wind towers etc.
- Use of land for wind towers.
- Visual and noise pollution.
- Environmental impact of infrastructure – roads and buildings required for access to these new innovations.
- Short-term vs long-term effects.

Design and Technology HSC sample responses

2008 HSC, Section III, Question 12, Part A: worth 6 marks

Electricity can be generated from a variety of sources, such as:

- Nuclear energy
- Solar panels
- Hydro electric power
- Wind turbine
- Biomass
- Tidal movement
- Wave generation
- Clean coal technology

Explain the environmental issues considered during the design and production of innovative methods of generating electricity using examples from the above list.

Response 1:

Of all the methods listed, nuclear power is the most environmentally dangerous. Although it produces very clean electricity it has toxic waste that takes millions of years to breakdown.

Hydro electric systems also produce clean energy but they require areas which get lots of water as well as the elevation that gives the water enough energy to turn a turbine and create electricity. This part of the hydro electric scheme is environmentally friendly but the creation of huge dams that flood the land is not.

Wind turbines are a new concept in electricity generation. They use the energy contained in wind to turn blades connected to a turbine. A problem that has been discovered with this method is that it is very noisy.

Whatever the method used to create electricity there are impacts on the environment that have to be considered during the design and production phases.

Response 2:

The environment is a big consideration when designing and producing electricity. Factors such as the amount of land needed (hydro electric power), the waste (nuclear power) and the noise (wind turbine) have to be thought of when designing ways of making electricity. Nuclear power produces a lot of electricity but it has waste which is deadly and it lasts for a long time. How to store this waste is an important consideration for designers.

Response 3:

All forms of electricity generation have environmental issues related to them. Environmental issues can occur at all stages of the design and production process. For example, the energy required to produce the blades of a wind turbine or the power (diesel fuel) required for the trucks and excavators used to extract uranium from the earth. Each of which adds to the overall carbon footprint or environmental impact of the product.

Although there may only be a small environmental footprint at the production stage there may be large environmental impacts before or after this process has occurred. An example of this can be found in nuclear energy. This form of energy production is extremely efficient and produces very limited emissions into the atmosphere. Pre production uranium has to be extracted from the ground, usually through the form of an open cut mine which has a huge effect on the local environment through the removal of vegetation and the creation of a massive hole in the ground. Not to mention the effects that the heavy machinery and their use of fossil fuels also has on the local environment.

At the production phase it can produce huge amounts of power which can service large populations. As it is very efficient in creating electricity the benefits to the consumer is lower electricity costs.

Post production it does however, have a by-product in the form of nuclear waste which is extremely toxic and takes thousands of years to breakdown into a safe state. Additional energy is required to create safe storage for this toxic waste in order to prevent it from entering ecosystems and eventually the food chain where it will have devastating effects such as radiation poisoning.

Nuclear power also requires huge amounts of fresh, clean water to cool to core. Dams are required to store this water before and after the production phase and these can have their own environmental impacts due to the surrounding areas being flooded and other waterways further down the system having reduced water flow.

Solar panels produce clean electricity by using the power contained in solar radiation which is generally readily available in large quantities each day (over cast days can result in reduced production). However a limiting factor to this method is the current production efficiency level which is about 30%. Meaning that a lot of panels are required, to produce enough energy to sustain a standard household or business. Further to this is the fact that the set up costs are around $10 000 for the standard home. It is estimated that the breakeven point for this method of electricity production is about 8 years. Meaning that for the investment households/businesses would not see any return for their investment for a

considerable amount of time. Another factor that needs to be considered with this method is the aesthetic appeal of solar panels. The reflective nature of the glass and the standard black/grey colour of the solar panels may not suit the colour scheme of the house / business and thus creating an eyesore on the roof which will impact on the local environment by creating visual pollution. Increases in the efficiency levels of this method of power generation and the creation of more aesthetic panels through innovative design that compliments building design will result in this product becoming a more viable and sought after alternate energy solution.

Whatever the method of innovative electricity production there is always some level of environmental impact. As more efficient methods are developed through innovative design, and developments in engineering and technology, the more that these systems will become economically and socially viable and sustainable.

Major Design Project marking process

'The marking guidelines describe the full range of performance typically demonstrated by students. Descriptions are given for ranges of marks, representing performances at different levels of achievement. In marking a response, the marker initially assigns it to one of these levels, and the judgement is then refined to decide on the mark to be awarded. Markers use a variety of strategies, including sample responses, to assist them in this process.' (BOS: 2001)

Where do the guidelines come from?

- There are clear links between the Design and Technology syllabus outcomes and the *Student learn tos*, project examination criteria and the marking guidelines.
- From these guidelines a marking scheme has been developed to assist markers in determining the appropriate mark range to award.

How is a marking scheme applied?

During the marking process the markers will study the MDP, refer to the marking guidelines and a Project Samples Book (benchmarks) to determine the student's level of achievement. They will use a check sheet to indicate an appropriate mark range for each aspect of the assessment criteria.

Project samples book

- Includes a variety of project samples that have been identified in the current year or in past years to represent the standard of work indicated by the marking guidelines and within specific mark ranges.
- Is used throughout the marking period.

Major Design Project Marking Guidelines 2010

Project Proposal & Project Management / 15	13–15	10–12	7–9	4–6	1–3
Identification and exploration of the need	Identifies and provides a detailed exploration of genuine needs and opportunities, justifying final selection for the development of the MDP.	Identifies and provides an exploration of needs and opportunities, in relation to the development of the MDP.	States a need with some exploration in relation to the development of the MDP.	States a need with limited exploration in relation to the development of the MDP.	Need stated without clarity, nor explored in relation to the development of the MDP.
Areas of investigation	Describes relevant areas of investigation which relate clearly to the need, and provides direction for further action.	Describes some relevant areas of investigation in relation to the need and provides evidence that these were investigated.	Identifies areas of investigation in relation to the need, or shows evidence of being investigated.	Lists areas of investigation in relation to the need which may not relate to further action, or shows evidence of areas being investigated.	Names an area of investigation.
Criteria to evaluate success	Establishes and analyses appropriate criteria to evaluate the success of the PSE.	Describes appropriate criteria to evaluate the success of the PSE, with little analysis of these criteria.	Briefly describes criteria to evaluate the success of the PSE, with no analysis of these criteria.	Briefly describes criteria, some of which may be inappropriate to evaluate the success of the PSE.	Lists criteria, some of which may be inappropriate to evaluate the success of the PSE.
Action, time and finance plans and their application	Formulates and evaluates well-documented action, time and finance plans with clear evidence of their application to the PSE.	Formulates action, time and finance plans, and shows some evidence of their application to the PSE.	Formulates and applies action and/or time and/or finance plans.	Some evidence of the application of action, time or finance planning.	Action, time or finance planning not evident.

Project Development and Realisation / 35	29–35	22–28	15–21	8–14	1–7
Evidence of creativity - ideas generation, degree of difference and exploration of existing ideas	Demonstrates the substantial application of creativity in the development of the MDP.	Demonstrates application of creativity in the development of the MDP.	Demonstrates some creativity in the development of the MDP.	Provides some evidence of ideas generation and/or exploration of existing ideas.	Provides limited evidence of ideas generation and/or exploration of existing ideas.
Consideration of design factors relevant to the major design project	Analyses a range of design factors relevant to the PSE and applies them.	Describes a range of design factors relevant to the PSE and applies them.	Describes some design factors relevant to the PSE and applies them.	Provides some evidence of design factors, most of which are relevant to the PSE and applies them.	Provides limited evidence of design factors, few of which are relevant to the PSE.
Appropriate research and experimentation of materials, tools, techniques and testing of design solutions	Undertakes, evaluates and applies a range of appropriate research experimentation and design solution testing in the development of the MDP.	Undertakes, evaluates and applies appropriate research, experimentation and design solution testing in the development of the MDP.	Undertakes, evaluates and applies some appropriate research, experimentation and/or design solution testing in the development of the MDP.	Evaluates and/or applies limited appropriate research and/or experimentation and/or design solution testing.	Minimal evidence of appropriate research and/or experimentation and/or design solution testing.
Application of conclusions	Applies conclusions drawn from research and experimentation and design solution testing to the MDP.	Demonstrates some application of conclusions drawn from the research and experimentation and/or design solution testing to the MDP.	Demonstrates some selective application of conclusions drawn from research and/or experimentation and/or design solution testing.	Demonstrates limited application of conclusions drawn from research and/or experimentation and/or design solution testing.	Demonstrates minimal application of conclusions drawn from research and/or experimentation and/or design solution testing.
Identification and justification of ideas and resources used.	Justifies the selection and use of ideas and resources used for the PSE.	Explains the selection and use of ideas and resources used for the PSE.	Describes the selection and use of ideas and/or resources used for the PSE.	Describes some ideas and/or resources used in the PSE.	Lists few ideas and/or resources used in the PSE.
Use of communication and presentation techniques	Succinctly demonstrates a range of appropriate quality communication and presentation techniques.	Demonstrates varied and appropriate communication and presentation techniques in a concise manner.	Demonstrates appropriate communication and presentation techniques.	Demonstrates a limited range of communication and presentation techniques.	Demonstrates minimal communication and presentation techniques.
Evidence and application of practical skills to produce a quality project	Applies a range of high-quality practical skills in the development of the PSE.	Applies a range of sound practical skills in the development of the PSE.	Applies sound practical skills in the development of the PSE.	Applies basic practical skills in the development of the PSE.	Applies minimal practical skills in the development of the PSE.

Project Evaluation / 10	9–10	7–8	5–6	3–4	1–2
Recording and application of evaluation procedures throughout the design project	Critically evaluates aspects of the PSE throughout its entire development.	Evaluates some aspects of the PSE throughout its entire development.	Judges the success of some aspects of the PSE through stages of its development.	Describes, with little justification, the success of several aspects of the PSE or exhibits evaluation in the PSE's development.	Describes, without justification, the success of an aspect of the PSE or provides some evidence of evaluation in the PSE's development.
Analysis and evaluation of functional and aesthetic aspects of design	Analyses and critically evaluates the functional and aesthetic aspects of the PSE.	Explains the functional and aesthetic aspects of the PSE.	Describes some functional and/or aesthetic aspects of the PSE.	Describes a functional and/or aesthetic aspect of the PSE.	Names a functional or aesthetic aspect of the PSE.
Final evaluation with respect to the project proposal and the project's impact on the individual, society and the environment	Critically evaluates the impact of the PSE on the individual, society and the environment.	Explains the impact of the PSE on the individual, society and the environment.	Describes the impact of the MDP on the individual and/or society and/or the environment or exhibits evidence that the impact on the environment was considered.	Briefly describes the impact of the PSE on the individual and/or society and/or the environment.	Minimal and/or inaccurate description of the impact of the PSE on the individual, society or the environment.
Relationship of the final product, system or environment to the project proposal	Analyses the relationship of the PSE to the criteria for success identified in the project proposal.	Compares the relationship of the PSE to the criteria for success identified in the project proposal.	Checks the PSE against the criteria for success identified in the project proposal, with little or no explanation.	Checks the PSE against some of the criteria for success identified in the project proposal, without explanation.	Does not clearly relate the PSE to the criteria for success identified in the project proposal.

Frequently asked questions

How do you address issues such as rooming and the supervision of students?

There is no definitive answer to this question. Every school will address this issue in a different way. Issues surrounding the timetable matrix, staffing and room / resource availability will need to be considered when developing a solution to this problem. Possible solutions may be found through team teaching. Some staff may elect to work outside the timetable in order to provide access to required resources. Other staff / faculties may share the load and allow students to enter their classroom and work on their project when required.

Whatever the solution it is recommended that negotiation with the Head Teacher, Senior Executive and the Timetabler(s) occur in order to develop a solution that is supported by the whole school. Staff is reminded of the 'duty of care' that they are required to provide students. Students should NEVER be allowed to work in practical rooms unsupervised. (Please refer to the Equipment Safety in Schools link within the My Applications section of the DET Enterprise Portal)

To what extent can students outsource aspects of major design project?

Student MDP progress must be effectively supervised and sufficient documentation must be kept by both teachers and students to enable the certification of the students' work.

The MDP is the student's work and should be viewed as such. Outsourcing (outside assistance) of any part of the MDP must be approved before it is done and this includes anything that will be done by any other person (teachers, parents, experts etc…). The student must describe the assistance, provide reasons why it is necessary and record this in their folio.

Students will not be given credit for work completed by others. The justification for such work will be recognised in the marking process.

Students must acknowledge the outsourcing on their declaration prior to submitting the MDP. Teachers must ensure that students do this.

Principals must be able to endorse the teacher's declaration that the work:

- has been done under the teacher's supervision
- is the student's own work consistent with earlier drafts and other examples of the student's work
- was completed by the due date.

Best practice for teachers is to keep an ongoing record of the practical progress of each student over the course of the HSC year. This is outlined in the assessment guide. This can be done using a record of practical work which is not to be submitted with the students' MDP but is to be retained by the school with all other assessment records. Refer to the PDF 'Practical project record' on the BOS website. This record may be requested by examiners in exceptional circumstances.

On the BOS website in HSC assessment go to the left navigation bar- *HSC exams: projects, submitted works and performance information for teachers*. Refer to 'Best practice steps to help ensure you will be able to certify student work' on the BOS website.

What are the implications of 'All my own work'?

All students must complete this course and as such should be aware of their ethical scholarship responsibilities. The following is an extract from the 'Rules and Procedures for 2009 HSC' booklet.

> *All students undertaking one or more Preliminary or HSC courses must first complete the HSC: All My Own Work program in ethical scholarship (or its equivalent). This program is delivered through your school and will assist you to understand your rights and responsibilities in HSC assessment.*

Teachers must know the BOS policies and should make reference to 'HSC assessments and submitted works- malpractice guide' on the BOS website for further clarification.

What are the folio requirements?

As a component of their Major Design Project students are required to document the design process they have undertaken from their Identification of a Need through to the development, realisation and evaluation of their design ideas. Currently, there is not a limit to the amount of documentation that students submit for marking. However, students should be mindful of the wording of the examination criteria and marking guidelines that specifically indicate that the process that they undertake be appropriate and relevant and that their design ideas be communicated in a succinct manner. Students should be encouraged to select for presentation in their folio only relevant information that addresses the examination criteria and provides the HSC markers with a clear understanding of the work they have undertaken.

How do you manage multiple projects using a range of materials in the one class?

Staff should be reminded that it is the intention of this course that the MDP be a student centred project. It is your role to be a facilitator to this process. It is impossible to conceive that you will be an expert in all materials / resources which could be used within the scope of this course. What you do posses is the knowledge and skills in how to direct the student to find information and experts that can help solve their problem. Use benchmarking and set dates by which elements of the MDP must be completed by. Use the N award system to make students aware of their responsibilities in relation to the development of their MDP.

What happens if you are team teaching and you are in different parts of the school?

Communication is the key to this solution. Both parties must be aware of the progress of both classes. Utilise technology and email each other regularly with overviews of class progress or arrange a meeting time in which issues may be discussed face to face. You may wish to formalise a time within the timetable for this to occur, again negotiation with the Head Teacher, Senior Executive and Timetabler(s) should occur to prevent staffing issues from arising.

When planning the delivery of the course, divide the content between teachers. For example, in term one of year 11 the unit may be divided into the factors affecting design, safety and communication techniques. One leads factors affecting design and the other safety, while both are supervising the development of the design projects and communication and presentation techniques.

If the folio is presented electronically, do you need a back-up presentation mode?

There are a number of ways that students can present the documentation of the design process they have undertaken, including *PowerPoint*, digital photographs, video and/or audio CD/tape. It is essential however, that students have available for the HSC markers a hard copy of their folio, to ensure that on the day of marking, if the technology fails, the HSC marking process can continue uninterrupted.

Should teachers provide a folio template for students to complete?

A folio template can be an effective tool for guiding students in the completion of their MDP. For those students who struggle to organise thoughts and ideas, have language or learning difficulties, it may be the most effective means to complete the task. For many students however, a template may inhibit the creative process, restricting the story of the creation of their project. The HSC markers seek the information in the MDP and students are encouraged to present their work creatively whilst adhering to the MDP requirements.

Teachers should ensure that students are aware of the project requirements as outlined in the syllabus and the marking guidelines.

How much evidence of research should be provided?

Students need to demonstrate the process or journey that they have taken with the development of their MDP. Research is a key component within this process. Each project depending on its needs will require a different amount of of research. Within the folio refer to research (both primary and secondary) that has occurred, provide relevant pieces of information such as pictures, tables or graphs and discuss how this has impacted on the development of the MDP. Research data, copies of webpages, brochures / pamphlets and excerpts from books should be placed in an appendix. Reference to the specific page within the appendix should be provided in the folio to allow markers to easily access this information should the need arise. A contents page should be provided.

How many projects should be covered before they start MDP?

Students must complete a minimum of two design projects during the Preliminary year. This is to provide them with an opportunity to develop skills in the use of a range of materials, tools and techniques prior to the commencement of their Major Design Project. Through these minor projects aspects of the Major Design Project Examination criteria can be modelled for students, so that they can become familiar with the processes they must undertake prior to commencing their Major Project at the beginning of their HSC year.

When can students start the MDP? Why?

Students may only commence the HSC course after the satisfactory completion of the 120 hour preliminary course. The HSC course usually commences day one of term four in year 11. The MDP will only commence from the start of the HSC course and continue until the due date for marking. This means that no commencement of either folio or practical work is to be completed prior to this time. Individual schools may impose different dates, but the BOS policy is to be followed.

How could the software available on the DER laptops be used to manage and document the MDP?

There are many applications on the DER laptops that could help students manage and document their MDP. Students should make sure that any electronic portfolio or electronic components need to be backed up in another non electronic form.

	*FreeMind* is a free mind mapping tool that students can use to document their idea generation and problem solving. Once created mind maps can be exported as PDFs or images and either printed or embedded into other documents in the relevant location.
	Adobe *Acrobat Pro Extended* can be used to compile and publish the design portfolio. Information from other software can be exported as images, video, sound, text or PDF files and combined into a single PDF document. If needed different files can also be combined into a PDF portfolio. This option allows each file to be presented in a single file package and remain editable. The portfolio can keep a number of different types of file organised and maintains them in a presentable form. PDF forms can also be created to do surveys and automatically collate the results. The data can be exported into Microsoft *Excel* and turned into a chart. More information on Adobe *Acrobat* can be found here: http://www.curriculumsupport.education.nsw.gov.au/secondary/technology/workshops/watch_this_space/index.htm.
	Microsoft *OneNote* is the ideal tool to keep a record of notes and compile any relevant information for the MDP. Dragging or copying content from web pages into *OneNote* automatically records the source of the information and the date it was accessed. It is also a quick way to record activities either by typing text or recording audio and video via the built in webcam and microphone. For example, students could record a verbal or video evaluation of a process and have it saved on the *OneNote* page.
	Microsoft *Excel* is ideal for recording expenses and collating information from any primary research the student undertakes. It can generate charts to give a visual representation of the research outcomes.
	Microsoft *Word* is ideal for producing large bodies of text. Once formatted, the text can be exported into PDFs or into *OneNote* as either text or an embedded file.
	Lenovo *Easy Capture* is a quick and easy way to take still images or video of activities in the classroom.

Resources

Web sites

Curriculum Support

www.curriculumsupport.education.nsw.gov.au/secondary/technology/index.htm

The Curriculum Support web site has been designed to support teachers in public schools and is produced by the Technology Unit, Curriculum K-12 Directorate, NSW Department of Education and Training.

The site is organised into syllabus specific areas for Years 7–10 and Years 11–12 and aims to meet syllabus and learning area specific needs.

The professional learning section provides up-to-date information about the workshops presented by the Technology Unit. Proposed workshops for Semester 1 2009 are:

- Animals and agriculture teaching 7–12
- Quality assessment in technology subjects.

Strategies to facilitate aspects of the design process

http://www.curriculumsupport.education.nsw.gov.au/designproduce/teach_assess.htm#Strategies

A series of teaching and learning strategies have been identified by teachers as particularly useful for students working through the design process. A table illustrates which aspect of the design process the strategy facilitates. The documents are provided as *Word* documents.

These *Word* documents have also been converted to an *OneNote* notebook at http://www.curriculumsupport.education.nsw.gov.au/digital_rev/technology/design/index.htm. Download the file and open it to unpack the notebook onto your computer. Open the Overview file first and follow the instructions provided. Each strategy facilitates a different stage of the design process.

Board of Studies

http://www.boardofstudies.nsw.edu.au/syllabus_hsc/

The Board of Studies website has links to a range of syllabus documents.

Board bulletins and official notices can be accessed from the website or can be emailed to your address.

Accessing Board of Studies Bulletins

http://news.boardofstudies.nsw.edu.au/board-bulletins.cfm

Board bulletins and official notices can be accessed from the website or can be set to you by email or RSS.

RSS stands for Really Simple Syndication and provides a convenient way for you to receive content 'feeds' from a variety of sources straight to your desktop.

Standards Packages

http://arc.boardofstudies.nsw.edu.au/standards-packs/SP02_15200/

The 2001 and 2002 standards packages released on CD to all DET schools can also be accessed from the Board of Studies website.

Teaching and learning exchange (T@LE)

www.tale.edu.au

Tale is an education portal offering quality resources for teachers, parents and the community. When you use Tale you can be assured that all material is authoritative and relevant to learning in NSW schools and TAFE.

HSC Online

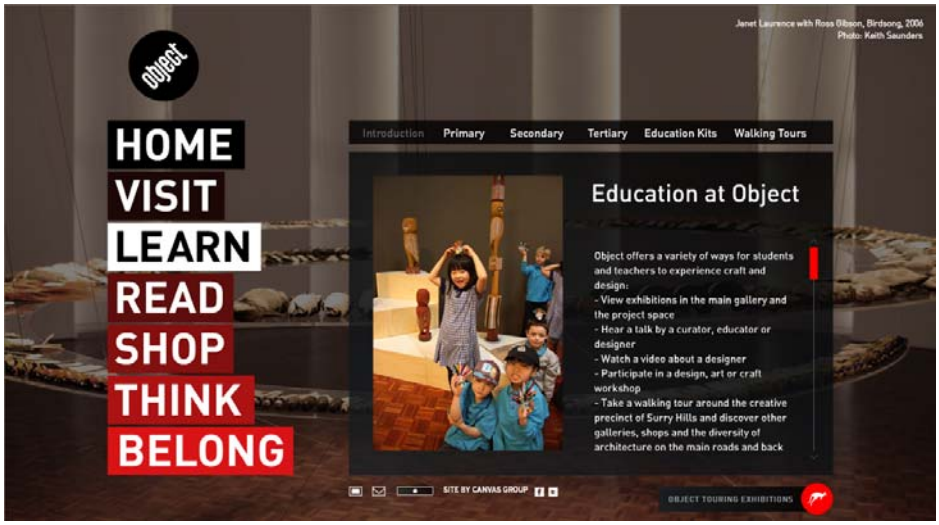
http://www.hsc.csu.edu.au/ind_tech/

HSC Online is an initiative of Charles Sturt University to support students across a wide range of HSC subjects.

The Design and Technology sections contain syllabus content, activities and links to related websites.

Object

http://www.object.com.au/



The *Object gallery* is located in Sydney and is focussed on promoting quality design thinking, creativity and innovation. The web site provides information about exhibitions, gallery tours and a set of education materials.

Other resources

Sydney designers unplugged: people, process, product

http://www.powerhousemuseum.com/unplugged/

This website showcases seven Sydney product design studios. Interviews with the designers reveal the inspirations and challenges involved in bringing some familiar products from concept to reality.

Design studio	Product	Syllabus links	Syllabus outcomes	
			Prelim	HSC
Nielsen Design Associates	The Urban Sports Bike	Factors to consider when designing and producing; collaborative design; practices and processes of designers; using resources effectively. Link to Nielsen Design Associates website, which demonstrates use of a design process in industrial/commercial settings.	P1.1, P2.1, P3.1 P4.2	H1.1, H1.2
BlueSky Creative	Victa Lawnmower	Factors to consider when designing and producing; research methodology; design trends; collaborative design; Australian designers and their work.	P1.1, P2.2, P5.3,	H1.1, H1.2, H2.1
Design Resource	'Millennium' Train Project	Collaborative design; creativity; design ideas.	P1.1, P3.1	H1.1, H3.2
Design+Industry	Ingenico Payment Terminals	Communication; collaborative design; factors to consider when designing and producing; research methodology.	P3.1 P5.2, P5.3 P6.2	H1.1, H1.2,
Breville and Alex Liddy	Breville 800 Class Citrus Press	Communication method; prototyping; CAD.	P5.2, P6.2	H1.1 H1.2
Sunbeam	Sunbeam Mixmaster	Product re-design; market trends; factors to consider when designing and producing.	P1.1	H1.1, H1.2, H2.1
Electrolux	Feature lighting	Design aesthetics	P1.1	H1.1

Smart works: design and the handmade

http://www.powerhousemuseum.com/smartworks/symposium_speakers.asp

The *Smart works: design and the handmade* exhibition was held at the Powerhouse Museum from 30th March to the 4th November 2007. The exhibition displayed the work of around 40 Australian and New Zealand designers and makers. The symposium showcased a number of these designers and the website provides video footage of the talk each designer gave.

D*Hub

D*Hub Online Design Resource

http://www.dhub.org/

News, interviews and articles related to design. Features of the site include:

- current events calendar
- featured articles and design news
- design awards, scholarships and grants
- specific pages for fashion & dress; interior & furniture; craft; graphic design & digital media; product & industrial design; engineering; architecture & landscape.

Global education

>Teaching tools>Case studies
http://www.globaleducation.edna.edu.au/globaled/page1.html

Department of Education and Training – Queensland

http://www.learningplace.com.au/deliver/content.asp?pid=45294

A set of practical strategies that promote the development of higher order thinking skills and collaboration. They provide ideas and methods that teachers can use to support students to analyse, synthesise and evaluate information and ideas, solve complex problems and reach deep understanding. The following practical strategies are currently available to teachers.

Analogous reasoning	Disagreeing reasonably	Making sense of mess	Think, know, do
Appreciation	Fishbone	Metaphor	Think, pair, share
Art spiral	Forum theatre	Mind map	Thinking outside the box
Brainstorming	Graffiti board	My mistake	Uncovering assumptions
Collaborate, consider, combine, create	Hassle lines	Pause and think	What if?
Collage - representing concepts	Hypothesising	Plus, minus, interesting	
Consequence wheel	Imagine this, imagine that	Risk vs benefit	
Consider all factors	LIFE reflection	Self-reflection: creativity	
Creative growth	Lotus diagram	Six degrees of separation	
Creative ideas	Making connections	Team building	