Science and Technology

Working Technologically in K – 6
Overview

Welcome

*Working Technologically in K-6* is designed to assist teachers in their understanding of the skills strand Working Technologically, from the *Science K-10 (incorporating Science and Technology K-6) Syllabus*. The skills strands of Working Scientifically and Working Technologically are at the centre of teaching and learning in this syllabus.

This resource aims to support K-6 teachers to:

- clarify what Working Technologically is about
- develop students’ understanding of the skills and content within Working Technologically
- consider how approaches to teaching the processes of Working Scientifically and Working Technologically can work together to develop students’ knowledge and understanding of the Natural and Made Environment
- consider programming implications and tailor learning sequences to individual circumstances
Overview

This resource explores the Working Technologically strand and its role in the K-6 component of the syllabus. Teachers will have the opportunity to develop their understanding of this skill strand and the concepts that underpin it. The development of the skills and processes through the stages is critical to the understanding of science and technology and its place as a strong foundation for the Essential design-related content from the Technology (Mandatory) syllabus in Years 7-8.

Review how the content is organised in the WT-org-of-content document derived from the K-6 component of the syllabus.

This resource is organised into five sections:

Working Technologically – what it means

• This section provides an outline of what it means to be working technologically through a process of design and explores content that is relevant to students. Documents and videos demonstrate the processes in action in real classrooms.

Skills and processes developed

• The provision of syllabus extracts will describe how Working Technologically develops across the stages and supports identification of key aspects within a sequence of learning.

Bringing it all together

• This section looks at how approaches to teaching these skills strands can work together as the importance of the processes of Working Scientifically and Working Technologically in science and technology becomes more apparent. You will consider how the processes of Working Scientifically and Working Technologically can be used to develop students’ knowledge and understanding of the Natural and the Made Environments.

Implications for programming

• In this section you will have an opportunity to identify issues to consider when programming explicit technology learning and reflect on how the approach taken by others may be adapted for individual circumstances.

Where to next?

• Information about courses, resources and websites which support the implementation of the Science K-10 (incorporating Science and Technology K-6) syllabus into the classroom.
Rationale

Working Technologically plays an important role within the syllabus. The development of the skills and processes through the stages is critical to the acquisition of deep understanding of technology and the transfer of this understanding in the world beyond the classroom.

Technology and the comprehension of design processes enable students to manage and shape their environment to improve their quality of life and involve solving real problems and creating ideas.
Working Technologically - what it means

An introduction to Working Technologically

Together with Working Scientifically, the Working Technologically strand is one of two skills strands. These strands are at the centre of teaching and learning through which students develop specific skills. This occurs when students are actively engaged in a range of contextualised hands-on design projects and scientific investigations. They need to have regular, active, collaborative and individual practical experiences.

The Working Technologically strand describes the skills developed by students as they work through the processes of designing and producing solutions.

People engage in designing when they envisage the end product and make decisions about how it should be created through the use of technology.

In essence:

- **designing** is...
  - the thinking that occurs in advance of action

- **technology** is...
  - the practical application of knowledge that transforms the thinking into solutions
**Working Technologically**

Students recognise problems and respond to opportunities, needs and wants in their world for which possible solutions can be designed and produced. They explore and define design tasks, generate and develop ideas, produce solutions and evaluate their processes and solutions. In developing design solutions, students will often use the findings from their investigations.

The Working Technologically strand involves the development of student’s skills in both thinking and doing. In this way this syllabus is similar in its role and content to the learning process from the previous syllabus as described in a NSW DEC Curriculum Support for Primary Teachers newsletter article: [CS-newsletter-technology-PDF](#)

To better understand what the syllabus is referring to by working technologically, compare the syllabus description of Working Technologically with the document – [WT-technology-process-common-language](#) which was formulated by the DET Technology Unit to support the Board of Studies NSW Science and Technology K-6 Syllabus 1991.
While the term *Working Technologically* might be new, the content of the strand represents strong parallels to the past syllabus. Although it’s described in the syllabus as a skills strand the content contained within it is organised in steps of a design process.

The following PowerPoint displays the outcome for each stage with its related content.

While proceeding through the PowerPoint: [Working-Technologically-allstages](#) view the outcome and organisation of content for each stage.

Reflect on the relationship of each step and its related content:

- with the description of Working Technologically in the [syllabus](#)
- with the document: [WT-technology process-description](#) which contains a description of the Technology process, generated to support the Board of Studies NSW *Science and Technology K-6* Syllabus, 1991.
Print the Working Technologically syllabus pages provided for either Early Stage 1 or Stage 3
Science K – 10 (incorporating Science and Technology K – 6) syllabus (BOS NSW 2012)

- WT-ES1-PDF or WT-S3-PDF

NOTE:
As you review the video and images, highlight on the syllabus PDF both the content statement and related content that is evident.

View the video of the related designing in action in a primary classroom for the stage you have chosen
(Supporting SciTech in the Primary Classroom QTP 2003)

- ES1-CA-DESIGN or S3-CA-DESIGN

View the accompanying images of design in a primary classroom
(Supporting SciTech in the Primary Classroom QTP 2003)

- ES1-design-photos (open index file) or S3-design-photos (open index file)
Skills and processes developed

The provision of syllabus extracts will describe how Working Technologically develops across the stages and support identification of key aspects within a sequence of learning.

In the syllabus, content is taught through the development of skills in the Working Scientifically and Working Technologically strands.

It is essential that teachers recognise the key differences that are identified from stage to stage in the outcome and content of each.

Progression in process expertise and skill development tends to be incremental with increasing levels of sophistication as students move through the stages.

Review the table of Working Technologically objectives and outcomes from ES1 to Stage 4 from the WT-progressionbystage document and compare to the summary of progression below it.

Increasing skill development in the selection and manipulation of tools, materials and techniques

Background information

A description of the progression of intended learning for each stage of Working Technologically is included in the Background Information section of the syllabus accompanying the skill outcome and content description. This section identifies the stage in which a new skill begins.

Review the following Background information excerpts for Early Stage 1 and Stage 1:

<table>
<thead>
<tr>
<th>Early Stage 1</th>
<th>Stage 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>• students are only required to identify 'purpose and use'</td>
<td>• students are expected to relate a design process to the more abstract idea of 'needs and wants'</td>
</tr>
<tr>
<td>• little distinction need be made between developing ideas and producing solutions</td>
<td>• students begin to treat production as a discrete phase of the process</td>
</tr>
<tr>
<td>• modelled ideas may often be regarded as a solution</td>
<td>• they begin to use methods, for example drawing and modelling to assist design development</td>
</tr>
</tbody>
</table>
Review the *Background information* section at the bottom of each *Working Technologically* page in the syllabus.

Consider the expected development of skills at the end of a stage as students’ progress to the next stage.

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**Bringing it all together**

**The links**

*Working Technologically* plays an important role within the science and technology K-6 component of the syllabus. The development of the skills and processes through the stages is critical to the understanding of science and technology and the concepts that underpin them.

When teachers and their students have a deep understanding of the processes of *Working Scientifically* and *Working Technologically*, they are better able to see how science and technology are used in the world beyond the classroom.

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View the [following animation](#) of two teachers sharing strategies of how this might look as they plan and program.
Now, view the following video to see a real world perspective of the role of the processes of Working Scientifically and Working Technologically.

Dr Rylie Green is a biomedical engineer who has gained national attention for her work on conductive plastics for the bionic implants of the future.

The relationship between science and technology in the school curriculum has been a topic of discussion for some time and in a variety of contexts.

This syllabus is more explicit about the relationships of science and technology than earlier curriculum documents. It suggests that science and technology are linked through problem solving and by the skills and processes of working scientifically and working technologically. It further states that teaching programs integrate the skills and processes with content from the knowledge and understanding strands and substrands.

This means that as students work through the process(es) of design in a design project, they will seek and require knowledge and understanding of both the natural environment and the made environment.

Also, as part of the solution of the design brief, they will employ the processes of scientific inquiry to develop new knowledge and understanding.
How the skills and processes of the Working Scientifically and Working Technologically strand can be integrated with the content of the Natural Environment strand is illustrated in the sample teaching activities outlined in the WT-WS-through-MW-activities document.

Knowledge and Understanding content in the syllabus has been linked to processes through the use of process terms - as the lead word of content dot points. The following are examples of the terms used in the syllabus to describe knowledge and understanding: ‘identify’, ‘observe’, ‘record’, ‘explore’, ‘generate’, ‘redesign’.

Review the Knowledge and Understanding strands for a stage, and highlight process terms that are used in the ‘dot point’ descriptors.

Attached is a document called WT-scientific-K&U… a flowchart demonstrating a sequence of activities in a process of designing a kitchen garden. Some examples of opportunities to address scientific knowledge and understanding are shown on the chart.

Reflect on the need for relevant scientific knowledge and understanding and suggest further examples in the spaces provided in the document.

Attached also is a document called WS-and-WT-Flowchart showing the same sequence of activities for the design process, however examples of opportunities for scientific inquiry are also shown.

Reflect on the need for scientific inquiry to provide new scientific knowledge and understanding and suggest further examples in the spaces provided in the document.
As teachers begin to plan teaching and learning activities, there are a number of opportunities where the processes of both skill strands can work together in a rich task.

Consider how the development of a sequence of teaching activities can demonstrate this. Review the document called: WT-connecting-WT&WS and reflect possible ways of how this could be done.

Finally, reflect on your approach to teaching the previous Science and Technology K-6 syllabus and consider how the interrelated nature of strands in this syllabus may change your teaching practice.
Implications for programming

Information on programming Board of Studies NSW syllabuses based on Australian Curriculum can be found at:

The Board of Studies NSW Support Material notes that continuity of learning in all aspects of the syllabus is provided when teaching programs:

- are based on contexts that:
  - are relevant to students’ learning needs, interests, experiences and cultural backgrounds
  - relate to the nature, development, use and influence of science and technology
- draw on content from the Natural Environment and the Made Environment strands in each year
- incorporate the strands and substrands within each stage
• integrate the skills and processes of Working Scientifically and Working Technologically with content from the Knowledge and Understanding strands/substrands

• include a range of hands-on scientific investigations and design projects in each year from K–6 in which students apply the processes of Working Scientifically and Working Technologically

• address the objectives and outcomes for the values and attitudes through the relevant skills, knowledge and understanding content for each stage.

Both the structure of the syllabus and the Board’s advice on programming suggest that the processes of working scientifically and working technologically are the central elements in the planning of an effective program.

A process-driven approach to teaching and learning has significant implications for the planning of learning activities. Consider issues which may emerge when planning a teaching sequence based on a design process.

Where to next?

Further learning

Implementing the new curriculum

There are a number of registered courses designed to assist with the implementation of the new curriculum. The following are specific to science and technology:

The following are specific to Science and Technology:
Implementing the new curriculum – A process for programming a unit of learning: Science and Technology K–6

The Programming for quality teaching and assessing course provides a guided approach to curriculum planning and development of teaching programs and assessments.
Follow the link to the NSW syllabuses for the Australian Curriculum: Implementation support website for comprehensive information, links to courses and resources.

…and now?

You have now engaged with the Working Scientifically resource. Other suggested DEC resources are:

- **Working Scientifically in K-6**

  This resource is designed to assist teachers in their understanding of the skills strand Working Technologically

- **Exploring the Material World in science and technology K-6**

  This resource supports teachers in their understanding of the new content area: Material World.