Australian Curriculum: Technologies and STEM Connections

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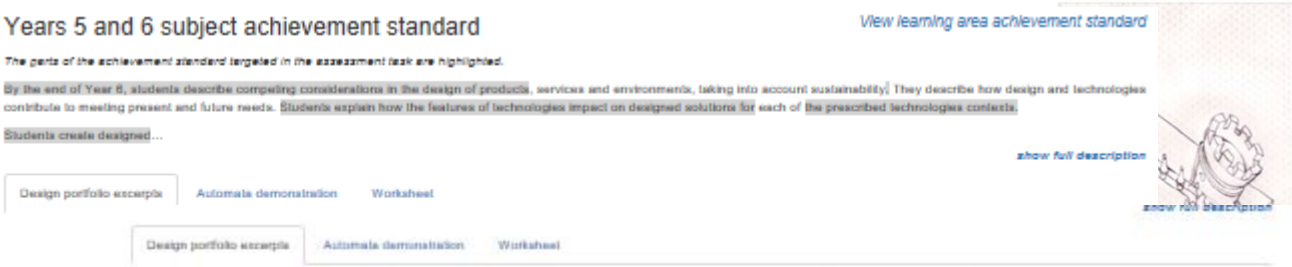

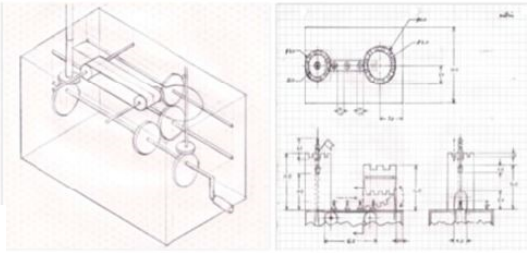

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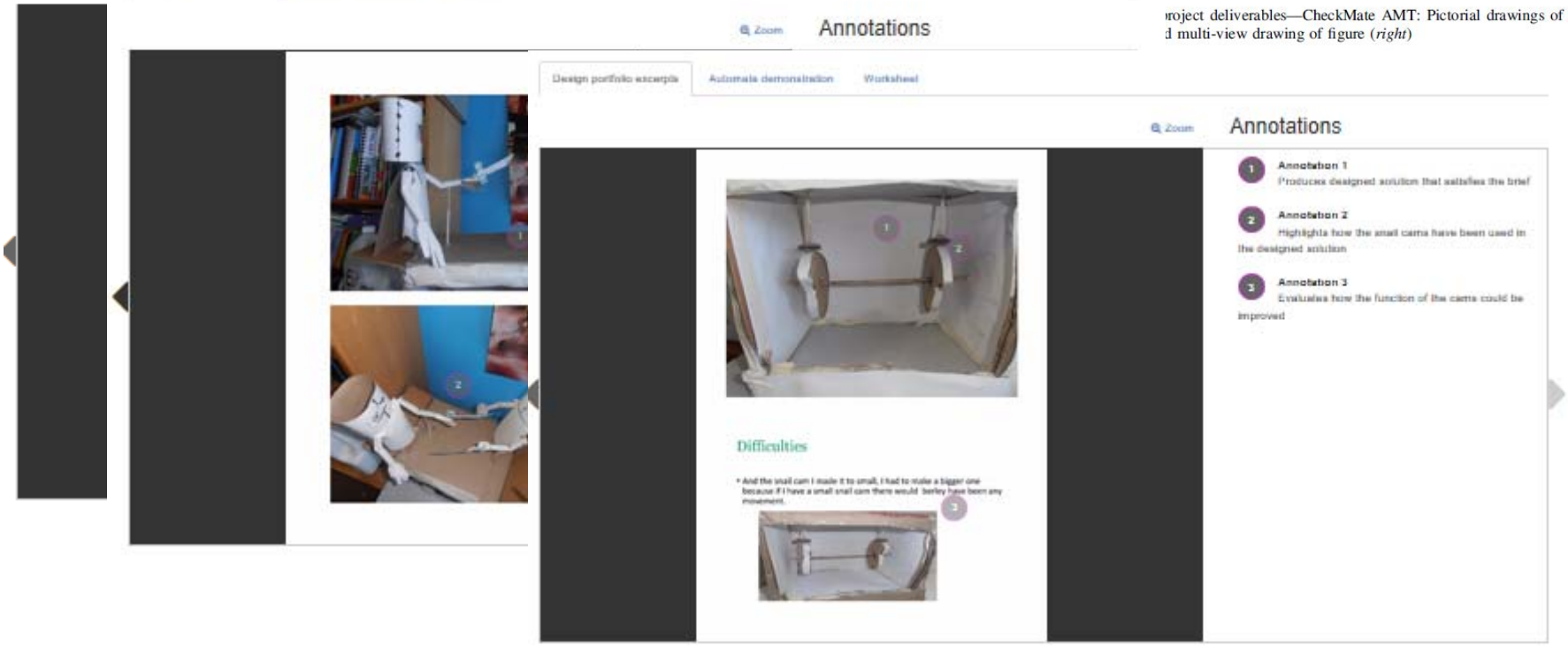

Overview

- STEM in the Australian Curriculum
- STEM Connections project
- The process
- Implementation support

STEM in the Australian Curriculum

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STEM in the Australian Curriculum

STEM is addressed through:

Learning areas:

- Science
- Technologies
- Mathematics

General Capabilities, particularly

- Numeracy
- ICT capability
- Critical and Creative Thinking

Links between learning areas

STEM

Mathematics

Science

Technologies

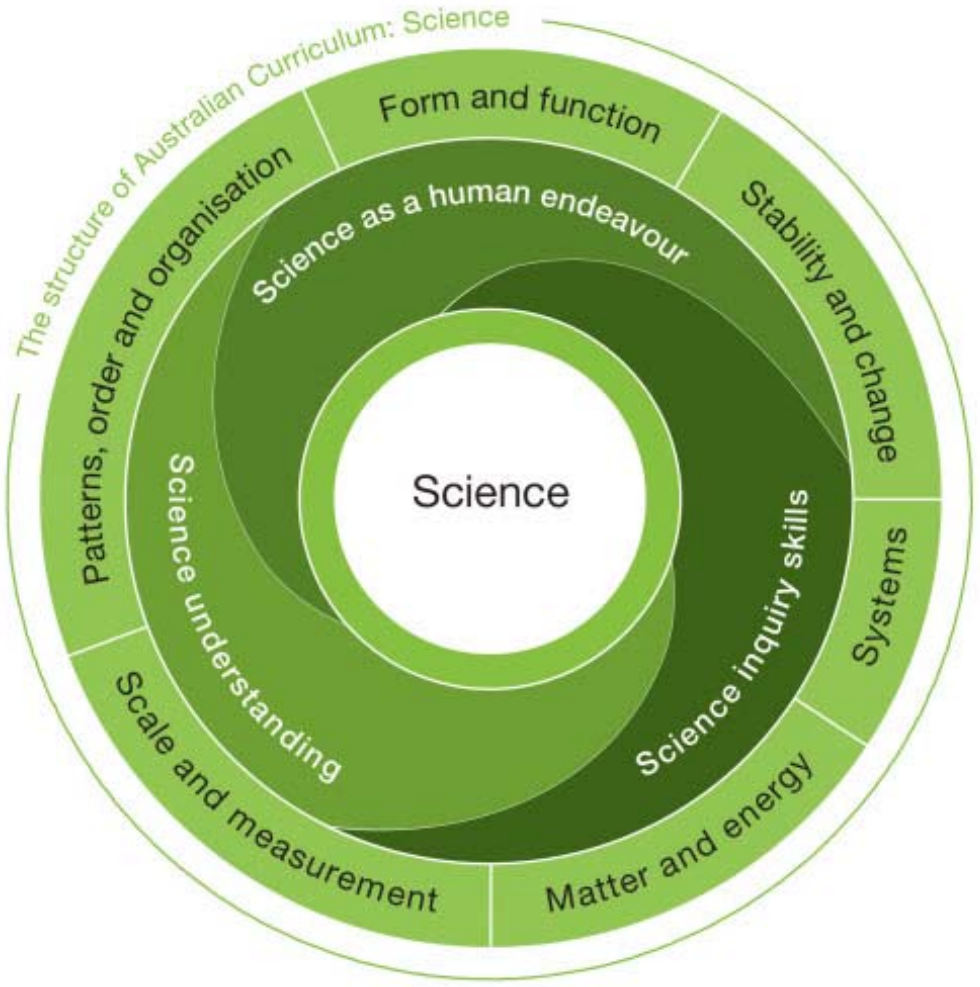
Engineering

Opportunities for STEM

- exist within learning areas themselves
- are strengthened when the connections between learning areas are emphasised
- are richest when learning areas combine to find authentic learning opportunities for students in answer to an identified problem or in the creation of a solution

Australian Curriculum: Science

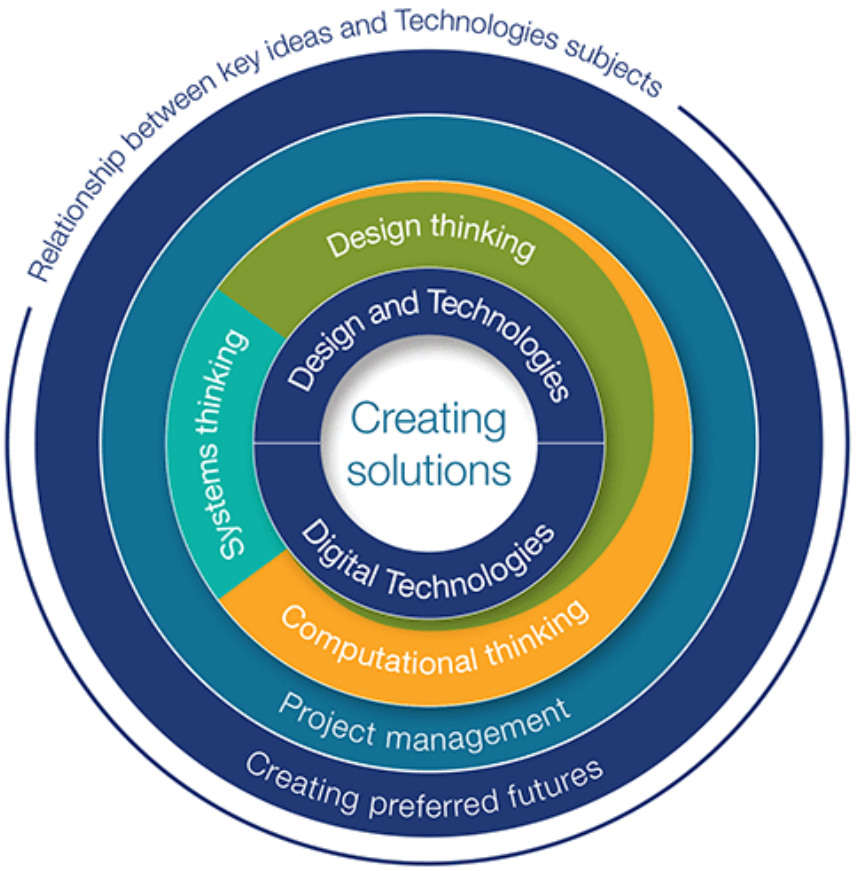
It is through a combination of inquiry skills and science as a human endeavor that the learning from the science understanding strand can be most effectively applied in STEM



Technologies curriculum

Curriculum has been developed:

- from Foundation to Year 8 in two subjects: Design and Technologies and Digital Technologies
- from Years 9 to 10 in two optional subjects: Design and Technologies and Digital Technologies



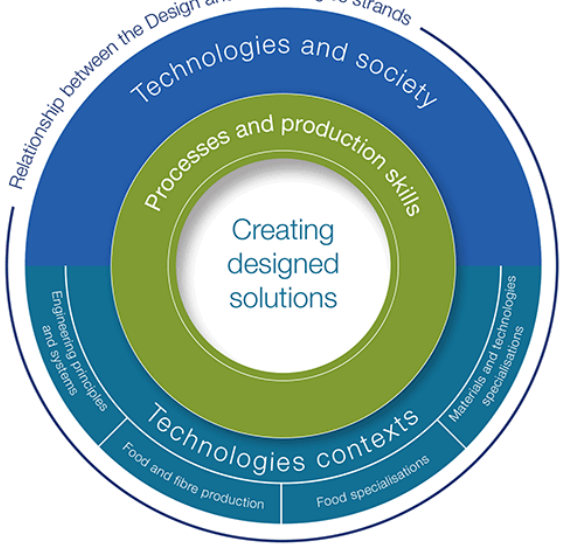
National priorities

- Food and water security
- Health and wellbeing
- Knowledge economy
- Engineering, construction and manufacturing
- Innovation

Design and Technologies

Comprises two related strands:

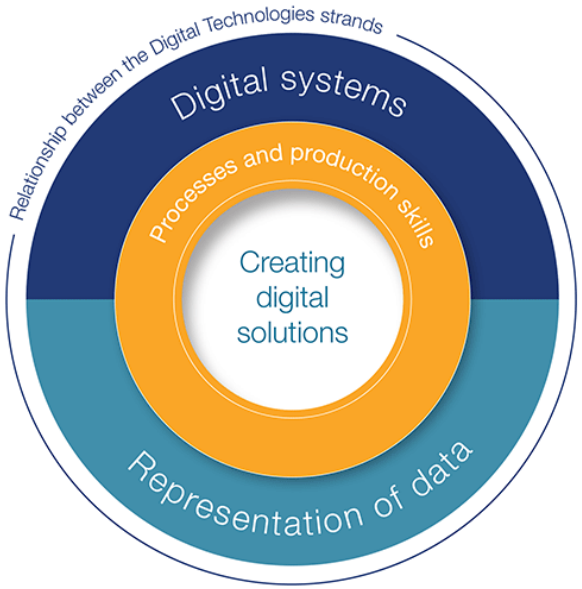
- Design and Technologies knowledge and understanding – the use, development and impact of technologies and design ideas across a range of technologies contexts: engineering principles and systems; food and fibre production; food specialisations; materials and technologies specialisations
- Design and Technologies processes and production skills – the skills needed to design and produce designed solutions.



Digital Technologies structure

Comprises two related strands:

- Digital Technologies knowledge and understanding – the information system components of data, and digital systems (hardware, software and networks)
- Digital Technologies processes and production skills – using digital systems to create ideas and information, and to define, design and implement digital solutions, and evaluate these solutions and existing information systems against specified criteria.



Links: engineering principles to science

Design and Technologies: engineering principles and systems	Science: physical sciences
Investigate how forces or electrical energy can control movement, sound or light in a designed product or system (ACTDEK020)	Electrical circuits provide a means of transferring and transforming electricity (ACSSU097)
Analyse how motion, force and energy are used to manipulate and control electromechanical systems when designing simple, engineered solutions (ACTDEK031)	Change to an object's motion is caused by unbalanced forces acting on the object (ACSSU117) Energy appears in different forms including movement (kinetic energy), heat and potential energy, and causes change within systems (ACSSU155)
Investigate and make judgments on how the characteristics and properties of materials are combined with force, motion and energy to create engineered solutions (ACTDEK043	The motion of objects can be described and predicted using the laws of physics (ACSSU229

Critical and creative thinking

Learning continuum

Generating ideas, possibilities and actions

Level 3

Typically by the end of Year 4, students:

Imagine possibilities and connect ideas

expand on known ideas to create new and imaginative combinations

Show examples ›

Consider alternatives

explore situations using creative thinking strategies to propose a range of alternatives

Show examples ›

Seek solutions and put ideas into action

experiment with a range of options when seeking solutions and putting ideas into action

Show examples ›

Level 4

Typically by the end of Year 6, students:

Imagine possibilities and connect ideas

combine ideas in a variety of ways and from a range of sources to create new possibilities

Show examples ›

Consider alternatives

identify situations where current approaches do not work, challenge existing ideas and generate alternative solutions

Show examples ›

Seek solutions and put ideas into action

assess and test options to identify the most effective solution and to put ideas into action

Show examples ›

Level 5

Typically by the end of Year 8, students:

Imagine possibilities and connect ideas

draw parallels between known and new ideas to create new ways of achieving goals

Show examples ›

Consider alternatives

generate alternatives and innovative solutions, and adapt ideas, including when information is limited or conflicting

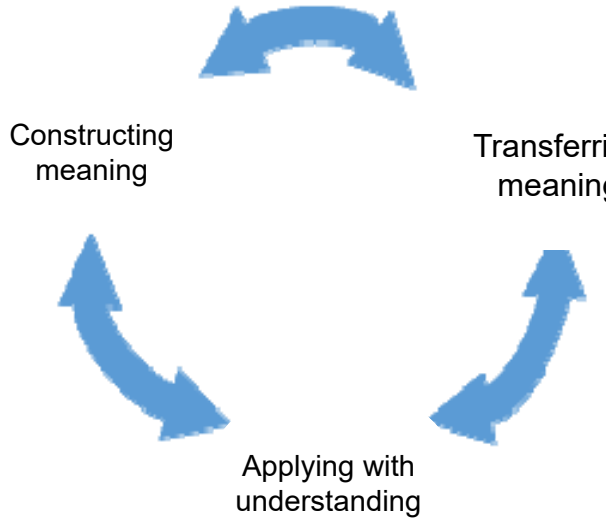
Show examples ›

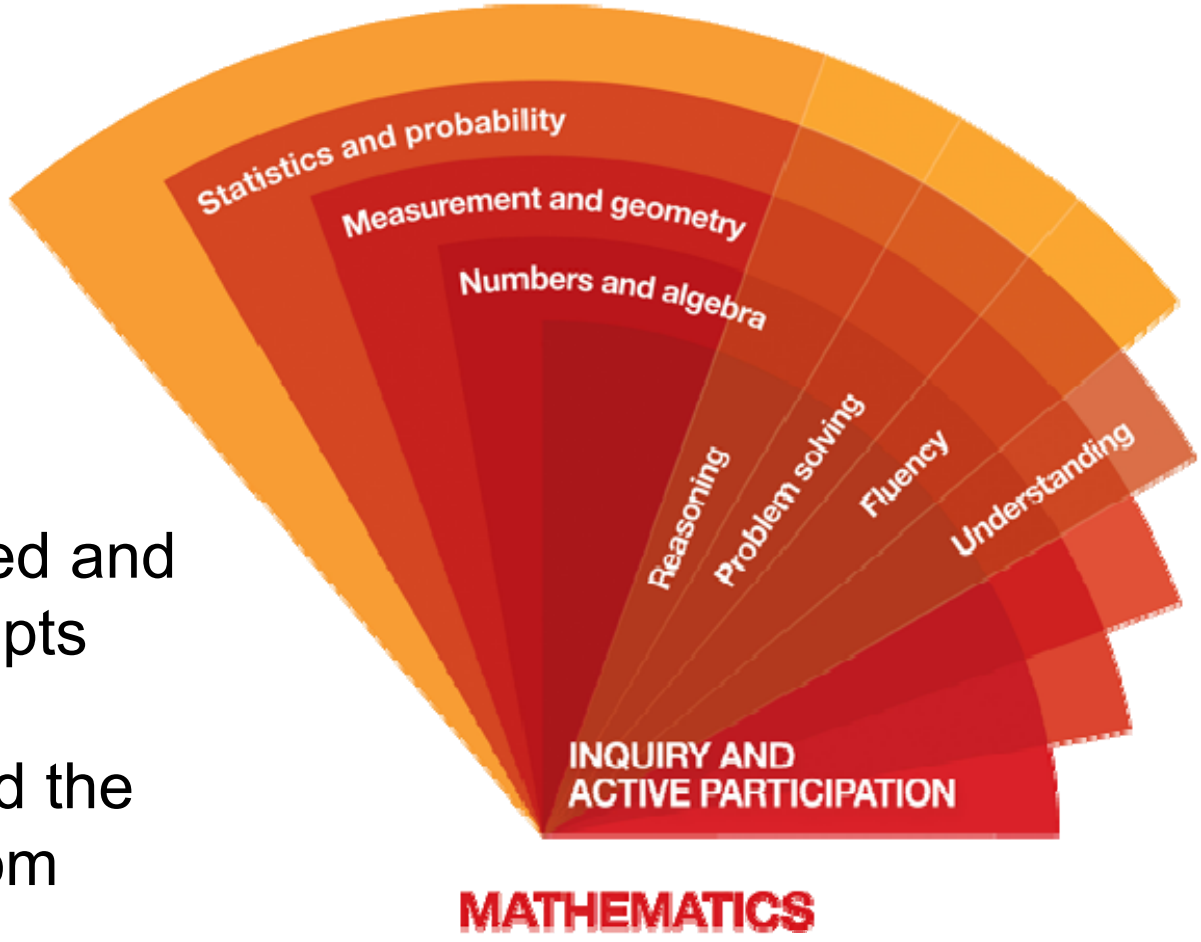
Seek solutions and put ideas into action

predict possibilities, and identify and test consequences when seeking solutions and putting ideas into action

Show examples ›

Australian Curriculum: Mathematics





Multiple but interrelated and interdependent concepts and systems which students apply beyond the mathematics classroom

A significant common feature

Systems

- mathematics: consists of multiple interrelated and interdependent concepts and systems
- science: systems as an overarching idea
- technologies: systems thinking and engineering principles and systems

STEM Connections project

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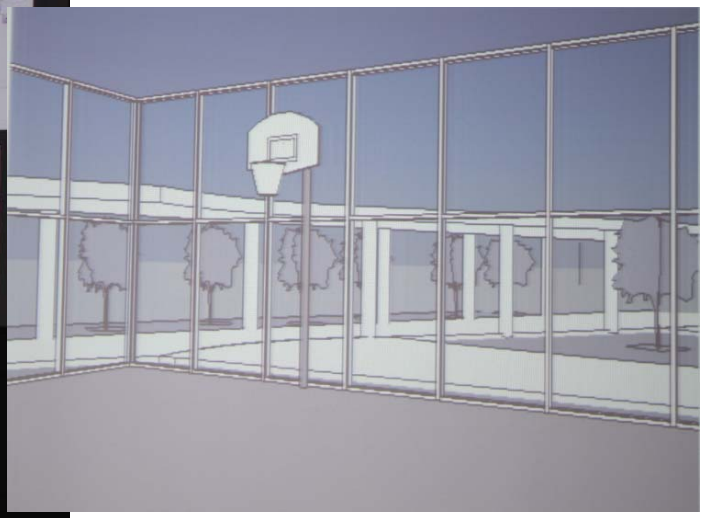
STEM Connections

- ACARA coordinated the STEM Connections project in partnership with the Australian Association of Mathematics Teachers (AAMT).
- Thirteen schools from across the country implemented integrated STEM projects with Year 9/10 students featuring high levels of collaboration between Science, Technologies and Mathematics teachers, industry support and an integrated STEM project.
- Final presentations were shared with participants on 29-30 July 2015.
- STEM report, illustrations of practice and work samples published.


Australian CURRICULUM
HOME | WORK SAMPLES | MATHEMATICS PROFICIENCIES | STEM
Australian Curriculum: Resources
This portal houses a range of resources that can be used to support teachers as they implement the Australian Curriculum. The resources have been developed by ACARA after intensive work with a range of schools and teachers. The resources consist of illustrations of practice, work samples and links to reports and relevant research.
The Mathematics proficiency strands describe
the Australian Curriculum: Mathematics. This pr
used for professional learning as teachers impler
Work samples are only annotated to indicate how
The STEM Connections project investigates a
practice demonstrate strategies used by five pro
to teachers who wish to develop their own integr
Work samples are only annotated to indicate how
Illustrations of practice are short videos that de
Work Samples
Search
Resource Type
Resource Type
Australian CURRICULUM
HOME | WORK SAMPLES | MATHEMATICS PROFICIENCIES | STEM
Home / STEM
STEM
STEM (Science, Technology, Engineering and Mathematics) education has become the focus of considerable political, industry and media commentary. Widespread concern about Australia's performance in STEM disciplines, the take-up of STEM careers and the likely impact on Australia's international competitiveness has resulted in the development and publication of the Education Council's National STEM School Education Strategy (2015). The strategy describes STEM as either the teaching of the disciplines within its umbrella or a cross-disciplinary approach to teaching that increases student interest in STEM-related fields and improves students' problem-solving and critical analysis skills. It sets two goals for STEM education in Australia and five key areas for national action.
ACARA's STEM Connections project aimed at investigating a cross-disciplinary approach to the teaching
collaboration with the Australian Association of Mathematics teachers, ACARA supported 13 schools from
develop an integrated STEM project that had its basis in the real world and incorporated the Australian Cu
of Mathematics, Science and Technologies. While the project was implemented before the publication
School Education Strategy, it addressed the strategy's first goal and, in part, each of the strategy's five
action.
The STEM Connections report, illustrations of practice and work samples available on this page are produ
illustrations of practice explore the experiences of five of the participating schools and the work sample
integrated STEM tasks.
The interdisciplinary nature of STEM in these projects is evident. While…
STEM SUSTAINABILITY
STEM ENVIRONMENT
STEM PRODUCT
School Stories
Simonds Catholic Co…
Heathfield High School
Henley High School
Home / STEM / Environment / Design project: The top playground
Environment
Year 9
Design project: The top playground
Sample summary
This task is the culmination of an extended unit of work that aimed to make connections for students between STEM disciplines in a project that targeted an identified need in the school. Students collaborated in small groups to investigate the effect of overpopulation on the school's top playground. They were asked to design a potential solution to address the identified problems, using their knowledge of the design process and mathematical, technological and scientific tools.
Link to other portfolios
Achievement Standards
Achievement Standard targeted: Science
Technologies
Mathematics
By the end of Year 9, students explain chemical processes and natural radioactivity in terms of atoms and energy transfers and describe examples of important chemical reactions. They describe models of energy transfer and apply these to explain phenomena. They explain global features and events in terms of geological processes and timescales. They analyse how biological systems function and respond to external changes with reference to interdependencies, energy transfers and flows of matter. They describe social and technological factors that have influenced scientific developments and predict how future applications of science and technology may affect people's lives.
Students design questions that can be investigated using a range of inquiry skills. They design methods that include the control and accurate measurement of variables and systematic collection of data and describe how they considered ethics and safety. They analyse trends in data, identify relationships between variables and reveal inconsistencies in results. They analyse their methods and the quality of their data, and explain specific actions to improve the quality of their evidence. They evaluate others' methods and explanations from a scientific perspective and use appropriate language and representations when communicating their findings and ideas to specific audiences.
Project folio
Scientific report
3D walkthrough
Zoom
Annotations
Show all:
Research Plan
shelltered paths
Shortcuts
Pathways
mounds
piping
RESEARCH PLAN
Sustainable greens
Drainage System
how to prevent soil degradation
sustaining grass
rain flow
created using bubbl.us
Technologies
Outlines research plan for the project
School Story
Cherrybrook Technology High School

Cherrybrook Technology High School



The process

Criteria for success

- STEM connections are authentic and meaningful for the cohort of students
- The integrity of subjects is maintained
- The unit of work reflects the Australian Curriculum
- The student activities enhance transfer
- The assessment tasks reflect aspects of the Australian Curriculum achievement standards
- The action research benefits teachers and the school

Purpose

Determine the school identified purpose

- What is your school hoping to achieve by undertaking a STEM connection approach?
- What does the data tell you about this cohort of students?

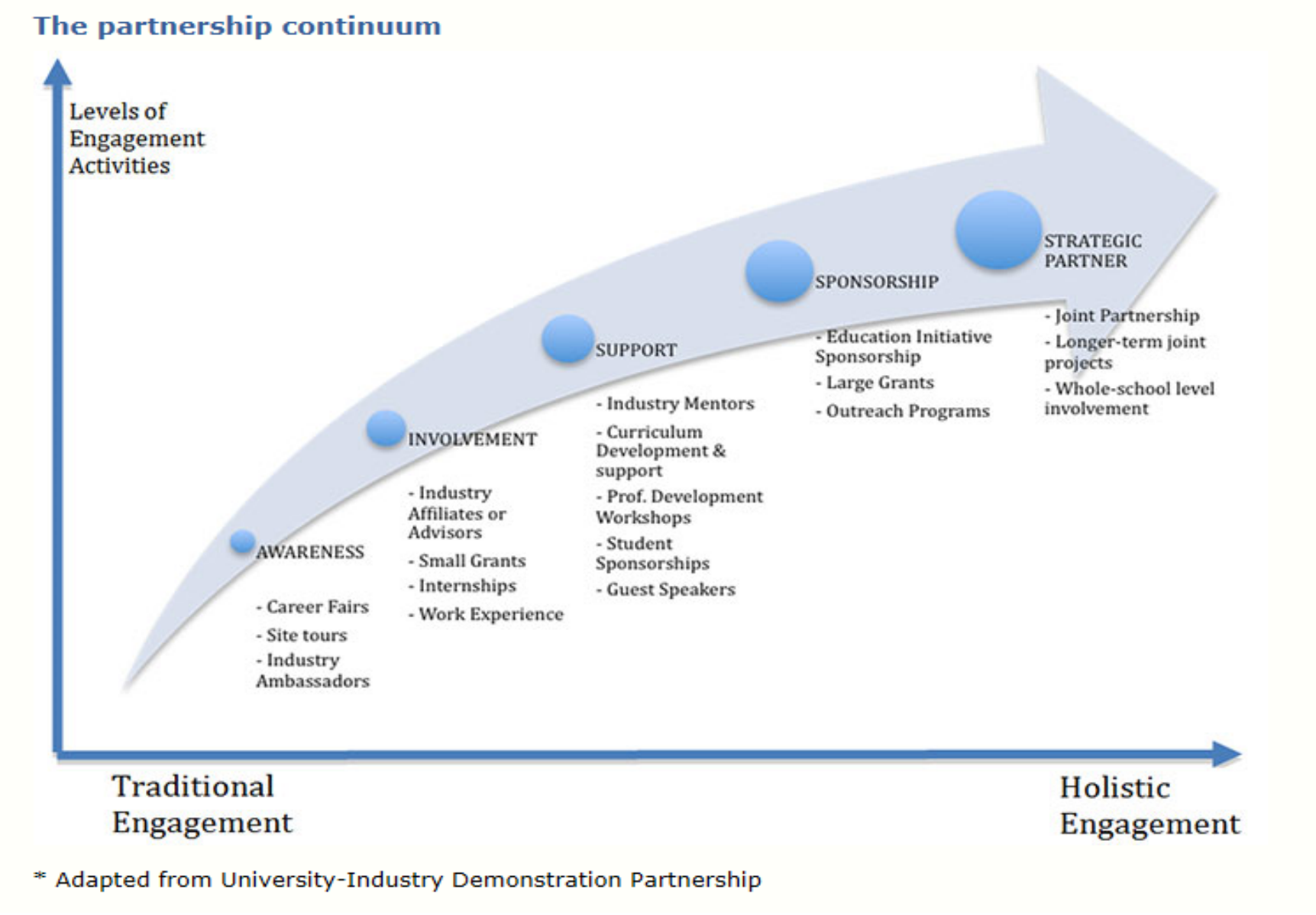
- The school identifies an **authentic need** – *what do you want your students to learn?*
- Teachers design a unit of work for approximately one term, for a chosen group of students based on the identified need.
- A **connecting idea** links the different subjects together.
- Students are given a **common task** to complete over the term.
- The task encourages students to make deep connections within and between subjects.
- Teachers **collaboratively plan** learning experiences to allow students to achieve the task.
- Teachers **select and assess outcomes from their own curriculum** which are appropriate to the connecting idea.
- Teachers program individual subject content and assessment.

Guiding principles

Partnerships between students, parents, carers and families, the broader community, business, schools and other education and training providers bring mutual benefits and maximise student engagement and achievement.

Partnerships engender support for the development and wellbeing of young people and their families and can provide opportunities for young Australians to connect with their communities.
(Melbourne Declaration, 2008)

Types of partnerships



* Adapted from University-Industry Demonstration Partnership

Choose the connecting idea

- What concept, theme, or idea will link the different subjects together?
- What knowledge and skills do you want the students to be left with once the unit has been completed?
- What do you normally teach Year 9 or 10 during this timeframe?
- Does the learning connect to the students' world? Does it form a basis for future learning?
- Why teach this connecting idea? Why does it matter for students to gain a deep understanding of this connected concept?

Activity – Integration activity

- Select a year
- Identify an aspect of mathematics, science or technologies from the curriculum to address
- Identify the content descriptions from other curriculum that relate/support
- Generate ideas for integrated tasks that reflect your connecting idea

Implementation support

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Australian CURRICULUM
HOME | WORK SAMPLES | MATHEMATICS PROFICIENCIES
Home / Work Samples
Work Samples
The Australian Curriculum sets the expectations for what all Australian students
regardless of where they live or their background. For Foundation – Year 10, it
have access to the same content and their achievement can be judged against
standards.
Annotated work sample portfolios for each learning area or subject support teac
balance judgements about the quality of their students' achievement and help to
across the country.
Any subjects published prior to 2016 will not be found in this resource. Engli
work samples can be found as PDF documents below the year level achieveme
About work sample portfolios
Each portfolio demonstrates student learning in relation to the achievement
learning areas, three portfolios will be available for each achievement standa
below satisfactory student achievement. The interactive format allows teache
achievement to assist them make their judgements.
Each portfolio comprises a collection of students' work drawn from a range
number of student work samples in a portfolio, nor are they sequenced in any
may vary in terms of how much student time...
Search
Resource Type
Resource Type
Year / Band Level
Year / Band Level
Australian CURRICULUM
Digital Tec
Home / Digital Technologie
Portfolio sum
This portfolio of student work
and how digital systems are
representing a variety of data
The student can define prol
problems (WS1, WS2). The
digital solutions (WS1, WS2),
sustainability (WS1). Student
and agreed protocols (WS1,
Work sample
Digital project: Lear
Work sample
Worksheet: Whole
Curriculum version: 8.1
Home / Digital Technologies - Satisfactory - Years 5 and 6 / Digital project: Scratch game
Work sample 2
Digital project: Scratch game
Work sample summary
Students designed a game for a buddy using Scratch visual programming language. They selected a challenge from three options and defined the problem. They designed and implemented the digital solution and recorded their development process.
Years 5 and 6 subject achievement standard
View learning area achievement standard
The parts of the achievement standard targeted in the assessment task are highlighted.
By the end of Year 6, students explain the fundamentals of digital system components (hardware, software and networks) and how digital systems are connected to form networks. They explain how digital systems use whole numbers as a basis for representing a variety of data types.
Students define problems in terms of data and functional requirements and design solutions by developing algorithms to address the problems. They incorporate decision-making, repetition and user interface design into their designs and implement their digital solutions, including a visual program. They explain how information systems and their solutions meet needs and consider sustainability. Students manage the creation and communication of ideas and information in collaborative digital projects using validated data and agreed protocols.
hide full description
Game development
Scratch game
Zoom
Annotations
Annotation 1
Defines the problem to be solved in the game
Annotation 2
Identifies a list of functional requirements
Annotation 3
Writes a basic algorithm (step-by-step instructions), including input and output
Similar Work Samples:
Below satisfactory
Digital project: Scratch game
Above satisfactory
Digital project: Scratch game
Compare
View
Compare
View
This portfolio
Work Sample 1
Digital project: Learning tool
Work Sample 3
Presentation: School system
Work Sample 4
Worksheet: Whole numbers
Curriculum version: 8.1
Work samples home page
Years 5 and 6
Satisfactory
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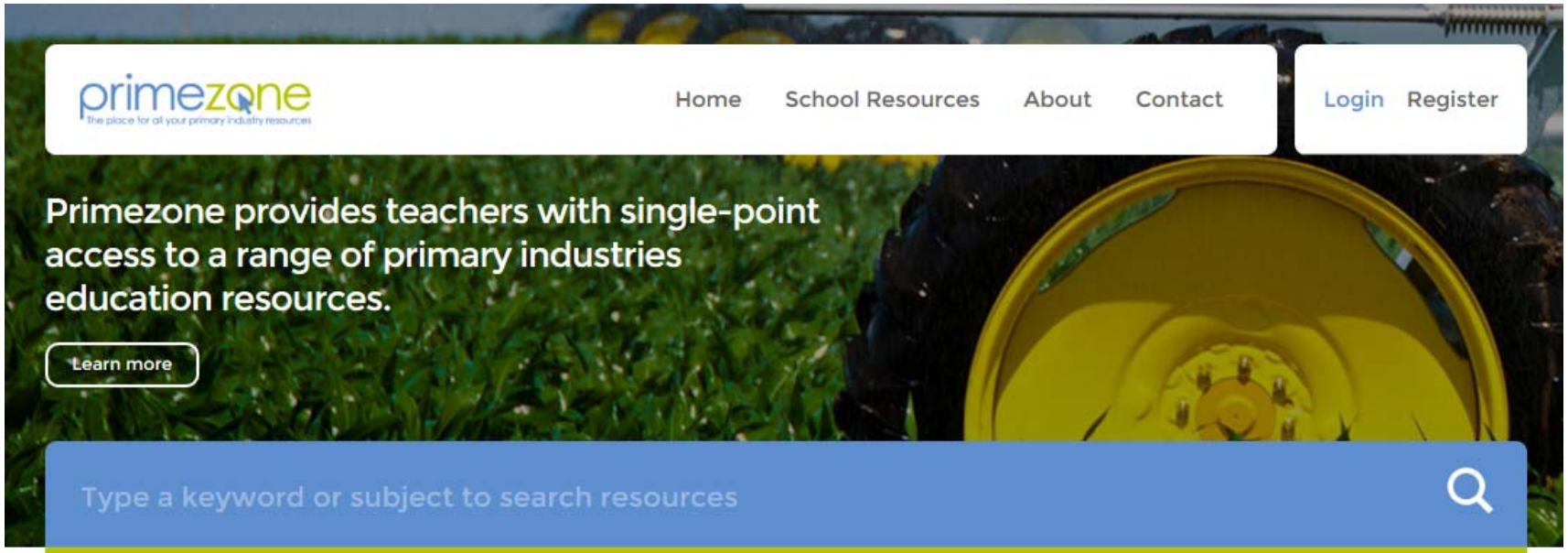
portfolios:
MULTIPLICATION
Division
and 6
satisfactory
AECI GAME :D
and 6
satisfactory



Trending Resources

Investigating technologies in agriculture

This unit consists of a pdf resource and two supporting videos. It has five inquiry teaching sequences about some of the...

Learn more

George the Farmer

George the Farmer is an App that teaches 0-8 year old children about farming practices and food and fibre production in a...

Learn more

Featured PIEFA Resources

Navigating primary industries in to the 21st Century

This is a unit developed with a learning sequence about the environmental, economic and technological factors that influence...

Learn more

Investigating technologies in agriculture

This unit consists of a pdf resource and two supporting videos. It has five inquiry teaching sequences about some of the...

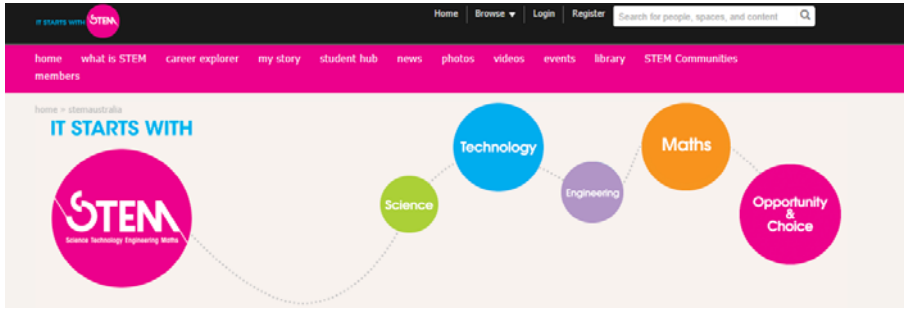
Learn more

Resources

CREativity in Science and Technology (CREST) crest@csiro.au

SMiS

www.csiro.au/en/Education/Programs/SMiS



http://stemaustralia.org.au/about/stemaustralia

https://www.sciencebydoing.edu.au/

http://itunes.com/onebestthing

AMSI
AUSTRALIAN MATHEMATICAL SCIENCES INSTITUTE

http://amsi.org.au/

Intel free course

http://www.intel.com/content/www/us/en/education/k12/design-and-discovery/overview.html

Digital Technologies hub

https://www.digitaltechnologieshub.edu.au/

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