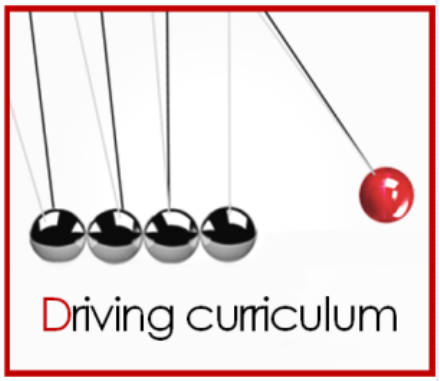
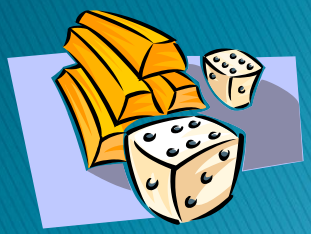
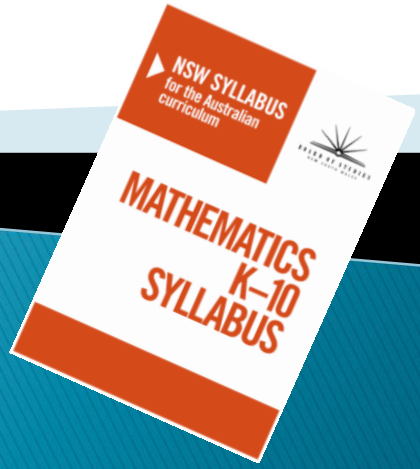


Using General Capabilities and Cross-Curriculum Priorities to Enhance Understanding in Maths

Presented by Zdena Pethers



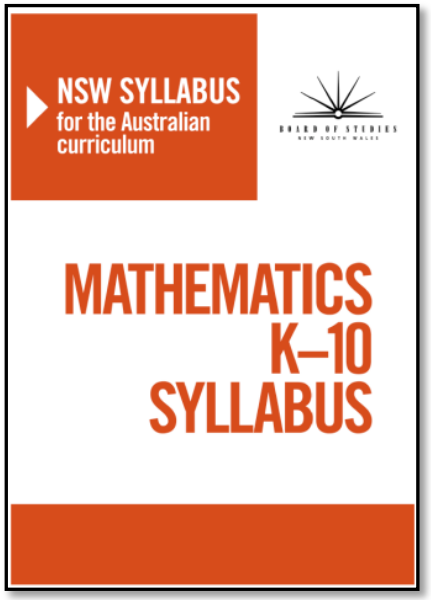


New syllabus – differences and implications:

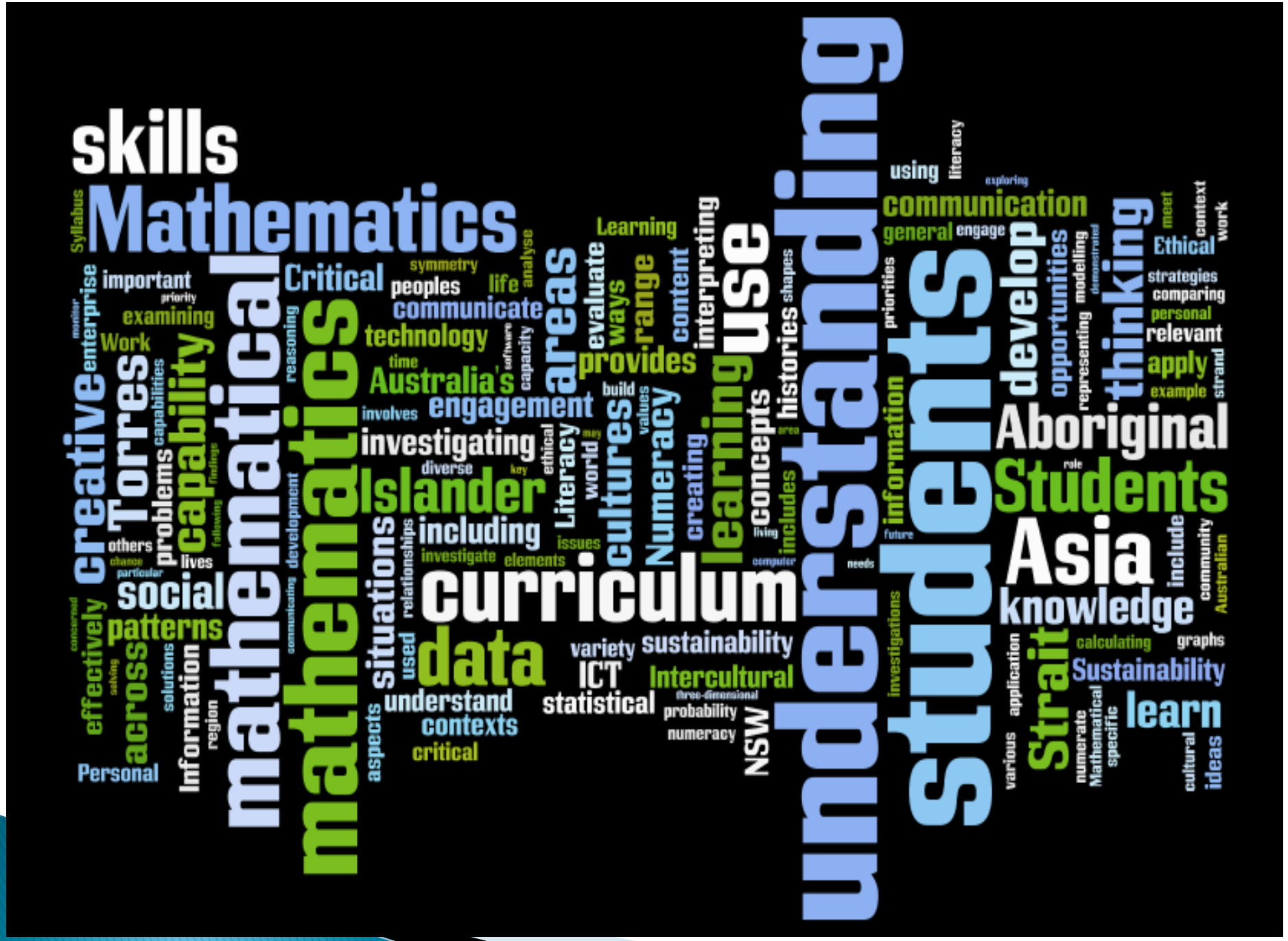
Teaching for engagement and understanding!

Learning across the curriculum

- Learning across the curriculum content, including the ***cross-curriculum priorities*** and ***general capabilities***, assists students to achieve the broad learning outcomes defined in the Board of Studies *K–10 Curriculum Framework* and *Statement of Equity Principles*, and in the *Melbourne Declaration on Educational Goals for Young Australians* (December 2008).
- Cross-curriculum priorities enable students to develop understanding about and address the contemporary issues they face.



NSW Board of Studies – Mathematics K–10 Syllabus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may
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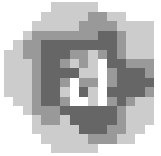
priority

1. What are the three cross-curriculum priorities?

2. What are the seven general capabilities?

3. What are the three additional learning areas added by the NSW BOSTES ?

Learning across the curriculum



Cross-curriculum priorities

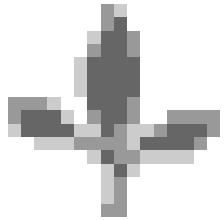
'Incorporation of the priorities will **encourage conversations** between learning areas and between students, teachers and the wider community.' www.acara.edu.au/currciulum/cross_curriculum_priorities

'…to develop understanding about and address the **contemporary issues** they face.'

Mathematics K-10 syllabus

The cross-curriculum priorities are:

1. Aboriginal and Torres Strait Islander histories and cultures
2. Asia and Australia's engagement with Asia
3. Sustainability



Learning across the curriculum

General capabilities encompass the knowledge, skills, attitudes and behaviours to assist students to live and work successfully in the 21st century.

The general capabilities are:

1. Critical and creative thinking
2. Ethical understanding
3. Information and communication technology
4. Intercultural understanding
5. Literacy
6. Numeracy
7. Personal and social capability

Learning across the curriculum

The Board's syllabuses include other areas identified as important learning for all students:

1. Civics and citizenship
2. Difference and diversity
3. Work and enterprise

} Not stated in the Mathematics Syllabus

Aboriginal and Torres Strait Islander histories and cultures

- ***Unique sense of identity*** - demonstrated through the interconnected aspects of Country and Place, People, and Culture.
- ***Rich understanding of mathematics*** - that includes a broad range of applications of mathematical concepts.
- ***Opportunities*** for students to investigate various aspects of number, measurement and geometry, including time and location and relevant interrelationships in Aboriginal and Torres Strait Islander contexts.
- ***Students can deepen and extend their understanding*** of the lives of Aboriginal and Torres Strait Islander peoples through the application and evaluation of statistical data.

Asia and Australia's engagement with Asia

- ***Regional context*** for learning in all areas of the curriculum.
- ***Fosters social inclusion*** in the Australian community and enables students to communicate and engage with the peoples of Asia so that the students can live, work and learn effectively in the region.
- Students can investigate the concept of chance using Asian games and can explore the way Asian societies apply other mathematical concepts, such as patterns and symmetry in art and architecture. Investigations involving data collection and representation can be used to examine issues pertinent to the Asia region.

Sustainability

- ***Education for sustainability*** develops the knowledge, skills, understanding, values and attitudes necessary for people to act in ways that contribute to more sustainable patterns of living.
- ***Mathematics provides a foundation*** for the exploration of issues of sustainability. It equips students with the skills to investigate data, evaluate and communicate findings, and make predictions. They can measure and evaluate sustainability changes over time and develop a deeper appreciation of the world through patterning, three-dimensional space, symmetry and tessellations.

Sustainability

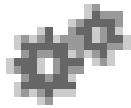
- ***Mathematical knowledge, skills and understanding*** are necessary to monitor and quantify both the impact of human activity on ecosystems and changes to conditions in the biosphere.
- Students gain skills and understanding to observe, record, organise and analyse data, and engage in investigations regarding sustainability - build connections with the natural world and their local community.
- In later stages, students can use mathematical and computer modelling, chance and probability, multiple data sets and statistical analysis to understand more complex concepts relevant to sustainability.

Critical and creative thinking

- ***Critical and creative thinking*** are key to the development of mathematical understanding. Students use critical and creative thinking as they learn to generate and evaluate knowledge, ideas and possibilities, and when seeking new pathways or solutions.
- ***Mathematical reasoning and logical thought*** are fundamental elements of critical and creative thinking. They are integral to mathematical problem solving

Thinking, Wade M (CC BY-SA 2.0)

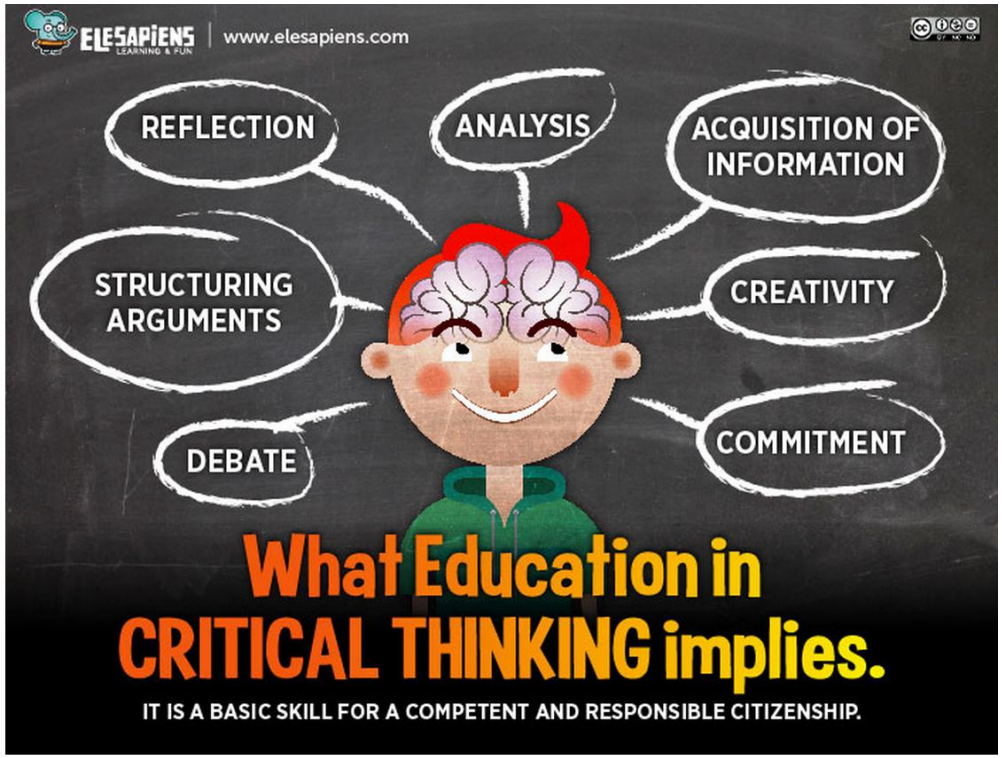
Critical and creative thinking



- Students use critical and creative thinking in such activities as exploring properties of shapes, setting up statistical investigations, comparing actual to expected results, approximating and estimating, interpreting data displays, examining misleading data, and interpolating and extrapolating.
- Critical and creative thinking are also of fundamental importance in such aspects of the Mathematics curriculum as posing problems, modelling situations, justifying choices and strategies used, and giving reasons to explain mathematical ideas.

Critical and creative thinkers…

- Pose questions- ask how? Why?
- Clarify ideas- inquire
- Organise information
- Imagine possibilities
- Connect ideas
- Consider alternatives
- Seek solutions
- Think about thinking
- Reflect
- Transfer knowledge
- Apply reasoning
- Draw conclusions
- Evaluate

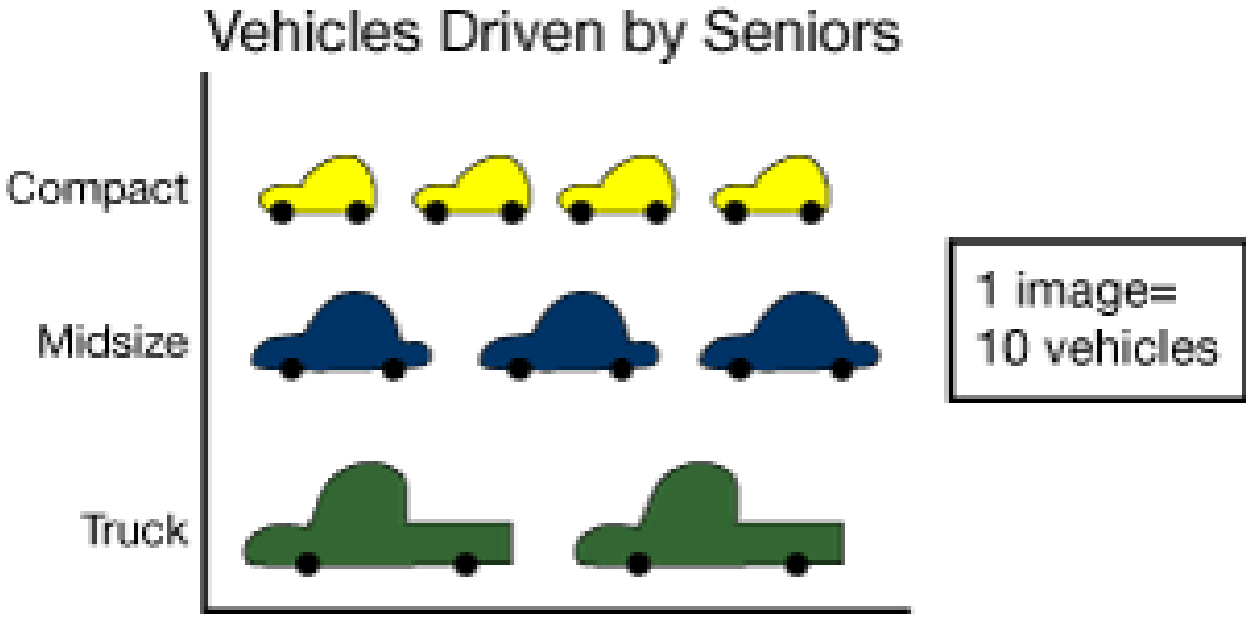


Ethical understanding

- Students develop ***ethical understanding*** as they learn about ethical principles, values, integrity and regard for others.
- Students to develop and apply ***ethical understanding*** when, for example, collecting and displaying data, interpreting misleading graphs and displays, examining selective use of data by individuals and organisations, and detecting and eliminating bias in the reporting of information.

3D Bar Graph Meeting, Scott Maxwell **(CC BY-SA 2.0)**

Misleading data



openstudy.com

Q. How is this graph misleading?

Q. What is the message they are trying to convey?

Information and communication technology capability

- Students use ICT effectively and appropriately when investigating, creating and communicating ideas and information, including in representing mathematics in a variety of ways to aid understanding, to solve problems and to perform previously onerous tasks more readily.
- In the ***Number and Algebra*** strand, students can use ICT in creating patterns, creating and interpreting graphs, investigating compound interest, and solving equations graphically.

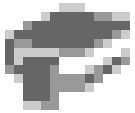
Information and communication technology capability

- In ***Measurement and Geometry*****,** students can use ICT in exploring angles and shapes; creating designs that involve shapes and transformations; representing, visualising and manipulating three-dimensional objects; investigating congruency and similarity; representing position and paths; making informal measures of length and area; and developing formulas for perimeter and area.
- In ***Statistics and Probability***, students can use ICT in recording and displaying data, comparing data sets, calculating measures of location and spread, modelling probability experiments, and using the internet to gather and analyse data presented by the media.

Intercultural understanding

- Students develop ***intercultural understanding*** as they learn to understand themselves in relation to others. This involves valuing their own cultures and beliefs and those of others, and engaging with people of diverse cultures in ways that recognise commonalities and differences, create connections and respect.
- ***Intercultural understanding*** is enhanced if students are exposed to a range of cultural traditions in mathematics, such as Aboriginal and Torres Strait Islander peoples' perceptions of time and weather patterns, and the networks embedded in family relationships, as well as in such activities as examining patterns in art and design, comparing currencies and learning about culturally specific calendar days.

Literacy



- Students become ***literate*** as they develop the skills to learn and communicate confidently (listening, reading and viewing, writing, speaking and creating print, visual and digital materials).
- ***Literacy is an important aspect of mathematics***. Students need to understand written problems and instructions, including the use of common words with a specific meaning in a mathematical context.
- Students have opportunities to learn mathematical vocabulary and the conventions for communicating mathematics. Mathematical literacy also extends to interpreting information from mathematical texts such as tables, graphs and other representations.

Numeracy

- Numeracy is embedded throughout the *Mathematics K–10 Syllabus*. It relates to a high proportion of the content across K–10.
- The key role that teachers of mathematics play in the development of numeracy includes teaching students specific skills and providing them with opportunities to select, use, evaluate and communicate mathematical ideas in a range of situations. Students' numeracy and underlying mathematical understanding will be enhanced through engagement with a variety of applications of mathematics to real-world situations and problems in other learning areas.

Personal and social capability

Students develop ***personal and social competence*** as they learn to understand and manage themselves, their relationships and their lives more effectively. This includes

- establishing positive relationships;
- making responsible decisions;
- working effectively in teams;
- handling challenging situations constructively.

Waugsberg, Take five.jpg

Personal and social capability

Relevant to mathematics - application of mathematical skills for personal purposes, such as:

- giving and following directions;
- visualisation and mapping skills;
- interpreting timetables and calendars;
- calculating with money and the GST, budgeting, price comparisons, evaluating discount offers, investigating payment on terms;
- conducting statistical investigations.

Work and enterprise

- ***Work-related knowledge, skills and understanding*** - includes constructing budgets, calculating wage and salary earnings, investigating and determining leave loadings, using deductions and 'pay-as-you-go' (PAYG) instalments to calculate a tax liability or refund, and investigating tax rebates and levies.
- ***Calculations*** involving discounts, and profit and loss, statistics to predict future earnings, monitor inventories, and analyse and interpret information gained from surveys.

Civics and citizenship

Civics and citizenship content involves knowledge and understanding of how our Australian society operates; consideration of how civic issues are represented in the public arena, the socially responsible construction and use of media.

Difference and diversity

Age, beliefs, gender, language and race are some of the factors that comprise difference and diversity. Students develop and express their sense of self, to connect with other people and communities and to understand the features of a fair and just society that values diversity.

Example Activity 1

Syllabus Outcome:
recognises and explains mathematical relationships using reasoning (MA4-3WM)

What CC areas have you accessed while working on this problem?

Agree or disagree, giving reasons:

HALF A CIRCLE IS A SEMICIRCLE

Learning across the curriculum

Where possible, using content that students are meeting in other subjects, helps students make links between different areas of study and therefore deepen their understanding of mathematical concepts.

For example:

- **History** teachers may provide advice on content being covered on Aboriginal history - this can then be further explored through statistics
- **English** teachers may provide advice on content being covered regarding the media – this can be further explored through the use of timetables, costs, visual numeracy, reading graphs and tables, and considering costs of newspaper advertisements (including areas and sizes of advertisements).

Learning across the curriculum

- **Science and HSIE** teachers may provide advice on content being covered on sustainability, farming, global warming and overpopulation - this can then be further explored through statistics, measurement and geometry.
- **PD/H/PE** teachers may provide advice on content being covered regarding sport and health – this can be further explored through the use of data, measurement, number and algebra (body mass index etc)
- **Creative arts** teachers may provide advice on content being covered on pottery and sculpture – this can be further explored through measurement (temperature of furnace, volume and mass of clay), geometry (shape of sculpture), number (costs involved).

Teaching strategies

Cross-curriculum priorities and general capabilities provide an excellent vehicle for a variety of teaching strategies and opportunities to enhance student engagement.

For example:

- Research projects;
- Hands-on, practical work including measurement
- Gathering first/second hand data and information
- Preparing reports, presentations and videos
- Working across subject areas

NSW SYLLABUSES for the Australian curriculum

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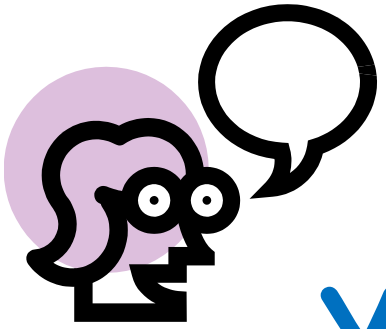
Syllabus	Stage	Learning across the curriculum		
Mathematics K–10	Stage 2	Sustainability	Clear Filters	Filter

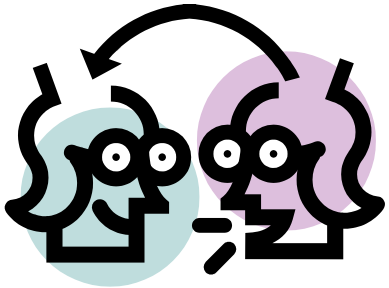
MATHEMATICS K–10 (3 results)

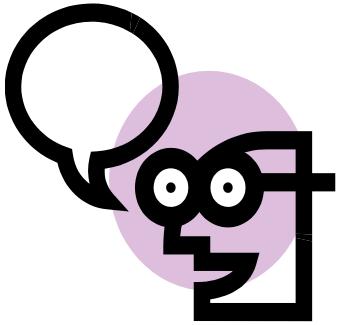
Stage 2 (3 results)

- use a thermometer to take and record daily temperature readings (Communicating)
  Preview in context Measurement and Geometry › Length 2
- use the millilitre as a unit to measure volume and capacity, using a device calibrated in millilitres, eg place a measuring cylinder under a dripping tap to measure the volume of water lost over a particular period of time
  Preview in context Measurement and Geometry › Volume and Capacity 2
- identify possible sources of data collected by others, eg newspapers, government data-collection agencies, sporting agencies, environmental groups
  Preview in context Statistics and Probability › Data 1

http://syllabus.bos.nsw.edu.au/filter/







Your comments & questions

Acknowledgement:

Peter Gould PhD
Asst. Dir. Literacy & Numeracy, Early Learning & Primary Ed

Katherin Cartwright
Primary Mathematics Australian Curriculum Advisor

Nagla Jebeile
Secondary Mathematics Australian Curriculum Advisor

Thank you!
All the best with your programming for 2015