

MATHEMATICS TEACHING

**toolkit**

ISSUES IN THE TEACHING  
OF MATHEMATICS

# Critical Connections Between Numeracy and Mathematics

SUPPLEMENTARY MATERIALS

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Education  
and Training

# ENGAGEMENT ACTIVITY 1:

## Numeracy in the 21<sup>ST</sup> century

Targeted at all teachers/whole school

### STIMULUS

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Read this monograph and one or two of the articles/papers about the demands for numeracy in the 21st century. The following two are available free:

- Gravemeijer et al (2017). What Mathematics Education May Prepare Students for the Society of the Future? Access from: <https://link.springer.com/article/10.1007%2Fs10763-017-9814-6>
- Australian Association of Mathematics Teachers (AAMT) & Australian Industry Group (AiGroup), (2014). Tackling the School–Industry Mathematics Divide, Commonwealth of Australia. Available from the AAMT: <https://www.aamt.edu.au/Library/Projects/Workplace-maths-skills>
- Or get access to other readings in the reference list that are of interest.

### GROUP ACTIVITY: APPROXIMATELY 45 MINUTES

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Based on the readings, have a small group discussion about the issue of numeracy in the 21st century. You could use the following questions as prompts:

- How important do you think numeracy and maths skills are in the 21st century?
- Do you think maths and numeracy are more important, or is now less important, in the 21st century, and if so, why do you think this is so? Do you think citizens and workers need higher levels of maths/ numeracy skills in the 21st century than previously? Or has technology meant they need less maths?
- Do you feel that your school addresses numeracy well across the whole school and supports learners with their numeracy needs? Do you think they leave your school well prepared for the road(s) ahead in relation to the potential numeracy demands they will face?
- How can you do this better? Are there challenges?
- How do you and other teachers feel about addressing numeracy?
- How do you think you could directly engage with parents and students about the value and importance of numeracy and improving the numeracy outcomes of all students?

# ENGAGEMENT ACTIVITY 2:

## Numeracy across the curriculum

Targeted at all teachers/whole school

### STIMULUS

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View some of the videos about Numeracy across the curriculum developed for the Queensland College of Teachers (QCT). They are available from here:

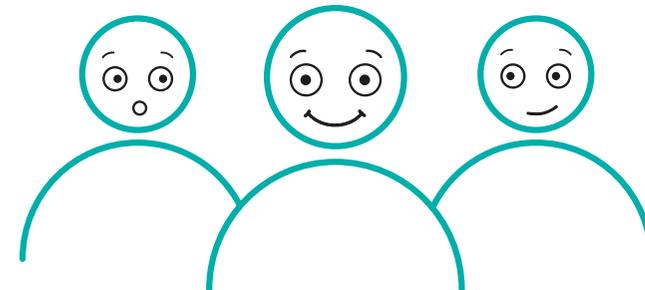
<https://www.filmpond.com/ponds/qct-the-university-of-queensland/films/numeracy-across-the-curriculum-resources-for-teachers>

### GROUP ACTIVITY: APPROXIMATELY 45 MINUTES

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Based on the videos, have a small group discussion about the issue of numeracy across the curriculum and how you address this at your school. You could use the following questions as prompts:

- Do you and your fellow teachers of non-maths subjects take responsibility for developing your students' subject specific numeracies? If yes, in what ways? Which ways are the most effective? Share some success stories.
- If no, why not? What is stopping you? What are the barriers? What support do you need?
- Evidence shows that a whole-school approach to understanding and operationalising the ways in which mathematics enhances learning in other disciplines can be critical? How do you think your school could do this?



# ENGAGEMENT ACTIVITY 3:

## The challenge of word problems

Targeted at teachers of maths

### STIMULUS

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This activity is to have a small group discussion about the use of word problems in teaching mathematics. Ask a couple of maths teachers to find some examples from their text books or other sources to share. There is a maths word problem [e-card](#) you could use to prompt some of the discussions.

### GROUP ACTIVITY: APPROXIMATELY 45 MINUTES

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Based on the maths word problems you have found, have a small group discussion about the use and relevance of such word problems. You could use the following questions as prompts:

- Do you and your fellow teachers of maths use traditional school-type mathematics word problems in your teaching or are they in the text books you use?
- What do you think about their use? Have you ever questioned whether they are realistic or authentic? Do you think that matters?
- With the ones you are reviewing are any of them actually authentic – or are they contrived? Would anyone ever actually meet that situation or want to solve that problem? Or does it only fit within a maths classroom or maths text book?
- What do your students think about them?

If you wish to use more authentic “word problems” you can download the publicly released PISA items from: <http://www.oecd.org/pisa/pisaproducts/pisa2012-2006-rel-items-maths-ENG.pdf>.

Most of these have been developed based on authentic situations (and then often simplified for use in the international testing situation across different languages and cultures). Use these as models for developing similar classroom questions you can use – try to find real world instances of maths as a starting point. Use brochures, info sheets, pamphlets, news items/articles, instructions, plans, etc.

# ENGAGEMENT ACTIVITY 4:

## Connecting to the real world – how to do it?

Targeted at teachers of maths

### STIMULUS

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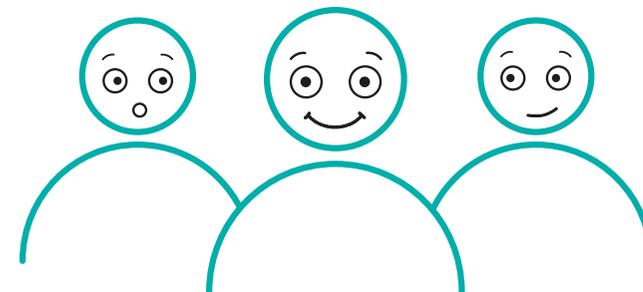
Use the series of 10 short online articles written for ACER about teaching maths in context: <https://www.teachermagazine.com.au/authors/dave-tout>

### GROUP ACTIVITY / INDIVIDUAL: APPROXIMATELY 45 MINUTES

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Based on the series of articles, think about or discuss the ideas and suggestions for teaching maths in context. You could use the following questions as prompts:

- As a teacher, how are you connecting maths and the real world in your classroom?
- Do you use activities that reflect the real-life situations that your students are likely to face beyond the school gates?
- What strategies and processes do you use for planning how to use a problem solving approach in your classroom?
- What processes do you use for the formulation aspect of solving a numeracy problem?
- What are some topics that you think different groups of your students might be interested in? When choosing a topic, how will you involve students in the decision making process?
- What challenges do you see in teaching maths in this way?



# ENGAGEMENT ACTIVITY 5:

## The challenge of word problems

Targeted at (secondary school) teachers of maths

### STIMULUS

Find some workplace materials that incorporate elements of maths. Here are some possible links to follow to see some examples:

- An example of an agricultural context where the sophistication, complexity and embedded nature of the maths makes it a good, and common, example of how maths is used in the workplace, including a lot of algebra/formulae is available from [here](#).
- Visit <https://oggiconsulting.com/our-work/> and download the set of numeracy materials called "Numeracy By Measure."
- Or download the materials referred to earlier about the research into numeracy at work undertaken by the AAMT. This includes a mapping of the different maths skills that were identified.: <https://www.aamt.edu.au/Library/Projects/Workplace-maths-skills>

### GROUP ACTIVITY / INDIVIDUAL: APPROXIMATELY 45 MINUTES

Based on materials you find and read, think about or discuss how the maths is embedded within the workplace context, and look at the range of maths skills incorporated. And consider what other skills are required in order to understand what to do? You could use the following questions as prompts:

- What maths did you discover was used in the workplaces or needed in the materials you found?
- Do people need an understanding of algebraic thinking and how to use formulae?

- How difficult is it to access and excavate the maths from the context?
- What is the level of literacy required? How simple or complex is the language that is used?

# AUSTRALIAN PROFESSIONAL STANDARDS FOR TEACHERS

The engagement activities explicitly address a number of the Australian Professional Standards for Teachers.

The main domains of teaching and related Standards and focus areas covered are shown below.

| Domain of teaching            | Standard   | Focus area  |
|-------------------------------|--|---|
| <b>Professional Knowledge</b> | <b>1.</b> Know students and how they learn                       | 1.1 Physical, social and intellectual development and characteristics of students                             |
|                               |  | 1.2 Understand how students learn   |
|                               |  | 1.3 Differentiate teaching to meet the specific learning needs of students across the full range of abilities |
|                               | <b>2.</b> Know the content and how to teach it                   | 2.1 Content and teaching strategies of the teaching area  |
|                               |  | 2.2 Content selection and organisation  |
|                               |  | 2.3 Curriculum, assessment and reporting  |
|                               |  | 2.4 Literacy and numeracy strategies  |
| <b>Professional Practice</b>  | <b>3.</b> Plan for and implement effective teaching and learning | 3.1 Establish challenging learning goals  |
|                               |  | 3.2 Plan, structure and sequence learning programs  |
|                               |  | 3.3 Use teaching strategies   |
|                               |  | 3.4 Select and use resources  |
|                               |  | 3.5 Use effective classroom communication   |

# REFERENCES

Listed below are some supplementary references, materials and resources related to the issue of the connections between numeracy and mathematics. As a starting point, the Department of Education and Training's comprehensive numeracy pages contain many useful ideas, materials and references, many of which are referenced in this monograph. Please revisit and read these materials and resources:

<https://numeracyguidedet.global2.vic.edu.au>

<https://numeracyguidedet.global2.vic.edu.au/evidence-base/#Defining%20numeracy>

## KEY RESOURCES

### Numeracy across the curriculum – QCT resources

A set of online resources for teachers comprising six videos illustrating how teachers are embedding numeracy in the subjects they teach.

<https://www.filmpond.com/ponds/qct-the-university-of-queensland/films/numeracy-across-the-curriculum-resources-for-teachers>

### Connecting to the real world – how to do it?

A series of papers written about how to plan for and implement teaching maths in context – numeracy.

<https://www.teachermagazine.com.au/authors/dave-tout>

### Publicly released PISA items

Download the publicly released PISA items. Use these as models for developing similar classroom questions you can use with your learners. Try to find real world instances of maths and adapt them.

<https://www.oecd.org/pisa/pisaproducts/pisa2012-2006-rel-items-maths-ENG.pdf>

### reSolve: Maths by Inquiry

The reSolve: Maths by Inquiry is a national program that promotes relevant and engaging mathematics teaching and learning from Foundation to Year 10. It is a collaboration of the Australian Academy of Science and the Australian Association of Mathematics Teachers.

<https://resolve.edu.au/>

### The International Mathematical Modeling Challenge (IM<sup>2</sup>C)

A team competition for secondary school students that aims to promote mathematical modelling to solve problems of real-world importance.

<https://www.immchallenge.org.au/>

### Maths Inside

The 'Maths Inside' project has been developing resources to help teachers bring maths to life for high school students. It is a collaboration between UTS, CSIRO and the AAMT.

<https://www.uts.edu.au/research-and-teaching/our-research/maths-inside>

### Having Maths Eyes

This Irish website, Having Maths Eyes, supports learners to change their view of mathematics as being simply something everyone just does in school. With maths eyes people see the mathematics they do every day so mathematics becomes real and meaningful.

<http://www.haveyougotmathseyes.com/>

## KEY ARTICLES AND PAPERS

### Below is a listing of the papers referenced in this monograph.

Australian Association of Mathematics Teachers (AAMT) & Australian Industry Group (AiGroup), (2014). Tackling the School–Industry Mathematics Divide, Commonwealth of Australia. Available from the AAMT [here](#).

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