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Numeracy Beyond Mathematics

An Exploration of Three Effective Numeracy Practices

Te Tāhuhu o te Mātauranga
Ministry of Education

Kaupapa o te rā

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This learning experience is designed to:

1. Help you reflect and build on what you are currently doing to support numeracy
2. Unpack 3 effective practices that support numeracy and identify how they can be implemented in your subject area
3. Introduce resources to support your next steps

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Your current practice

What are 3 things that you have done to support numeracy in your classroom this week?

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Numeracy	
1.	?
2.	?
3.	?

5 minutes

What is Numeracy?

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"Numeracy is a foundational skill that enables access to further learning, develops important life skills, and allows people to fully engage in work and in their communities"
- NCEA.ed

"Numeracy includes knowledge, skills and behaviours that are needed to be able use mathematics and statistics **purposefully** in a wide range of situations including real-life contexts. Learners become numerate as they develop their ability to **apply** mathematical and statistical knowledge and skills purposefully **across all learning areas** and in their lives to achieve their goals"
- Literacy Communication and Maths strategy

Milk bottle activity

Discuss:
Which bottle would you buy? Why?

5 minutes

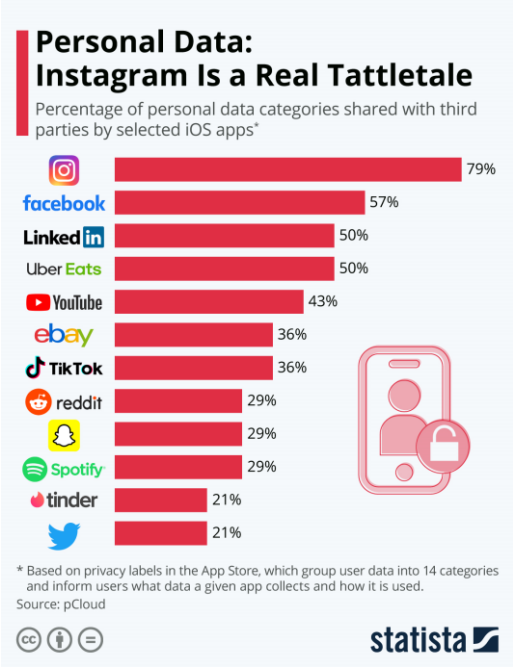
Milk bottle activity

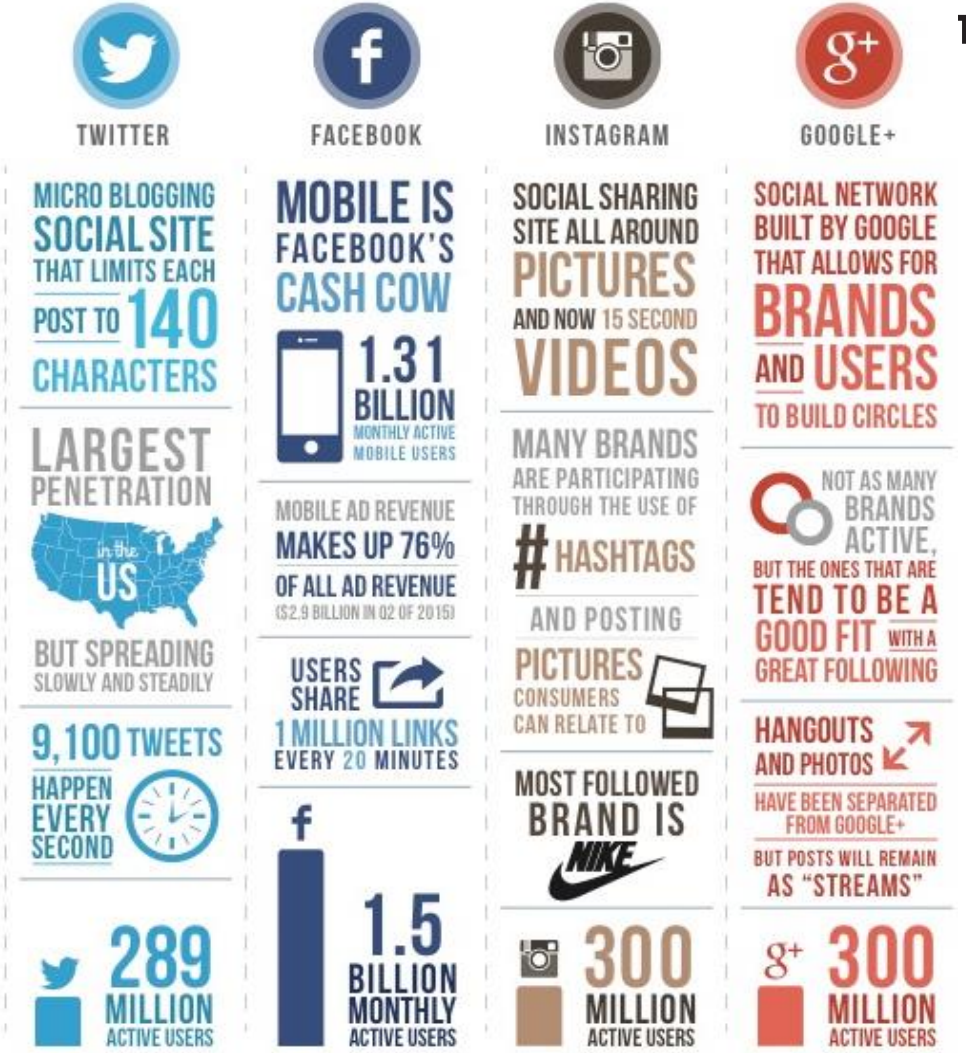
Discuss:
Where numeracy occurs in your subject?

5 minutes

Infographic activity

These are examples of infographics we often find around us

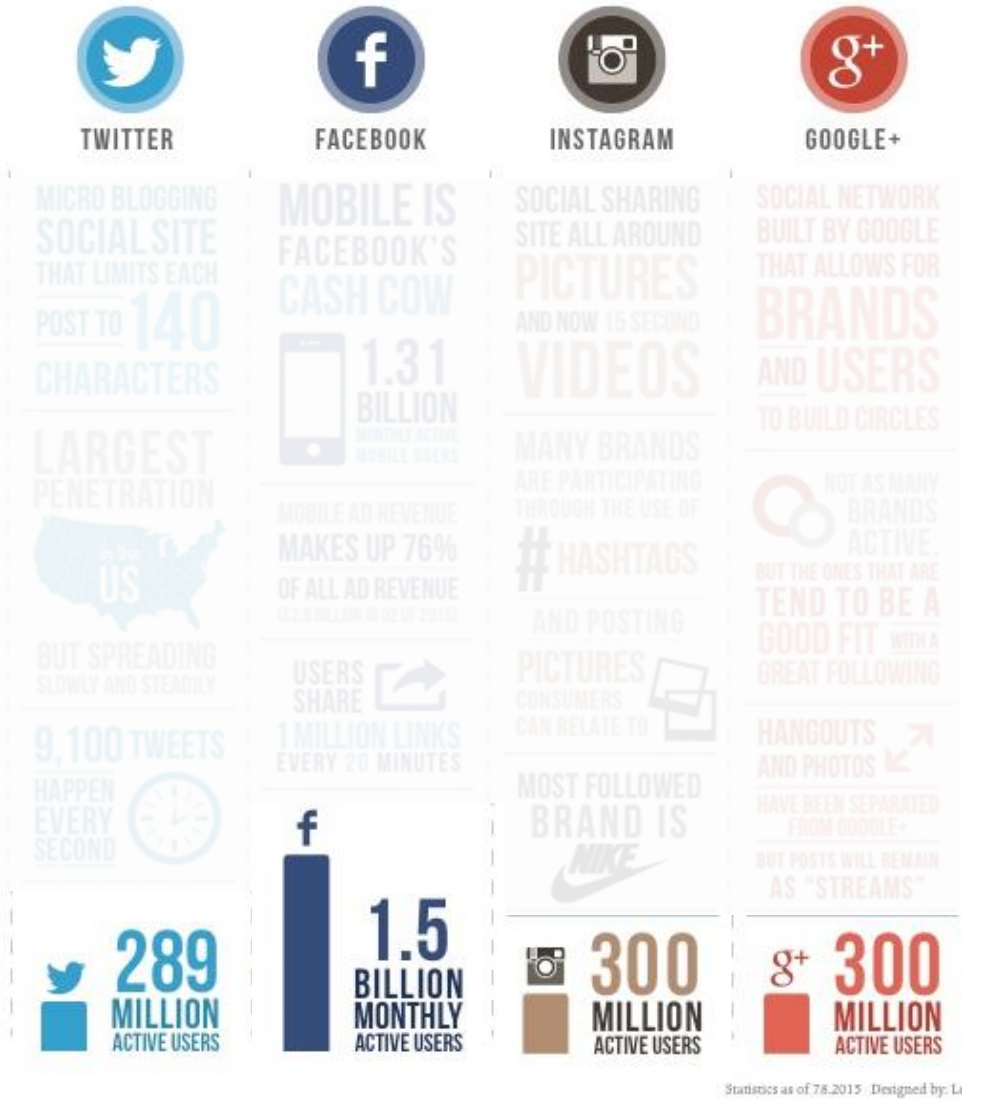




5 minutes

Infographic activity

Discuss:
Which social media site is the most popular?
Why?



5 minutes

Infographic activity

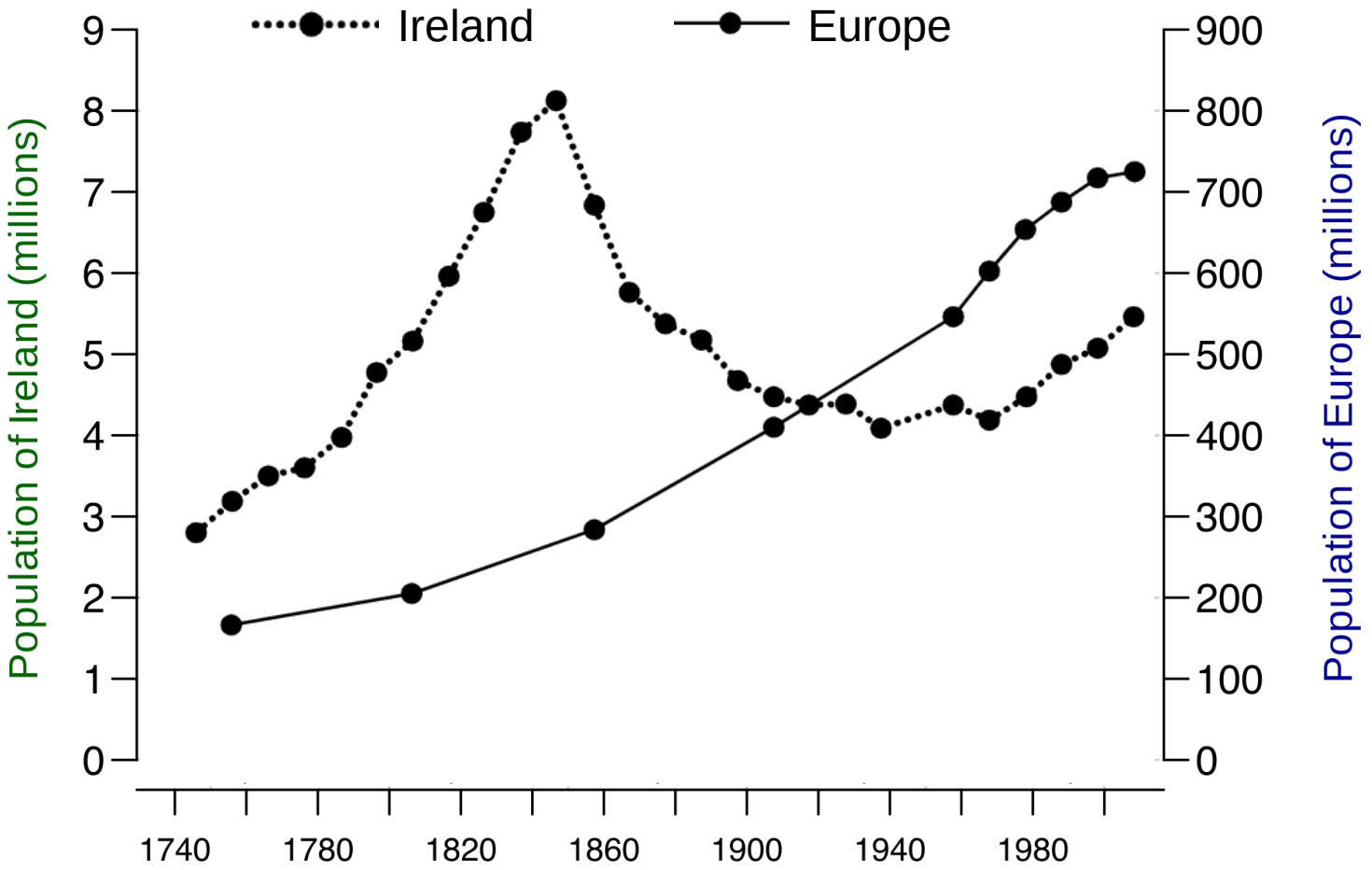
Reflect:
When do you have to find the 'relevant' information in a larger amount in your subject?

When do you use very large, or very small numbers in your subject?

5 minutes

Statistics activity

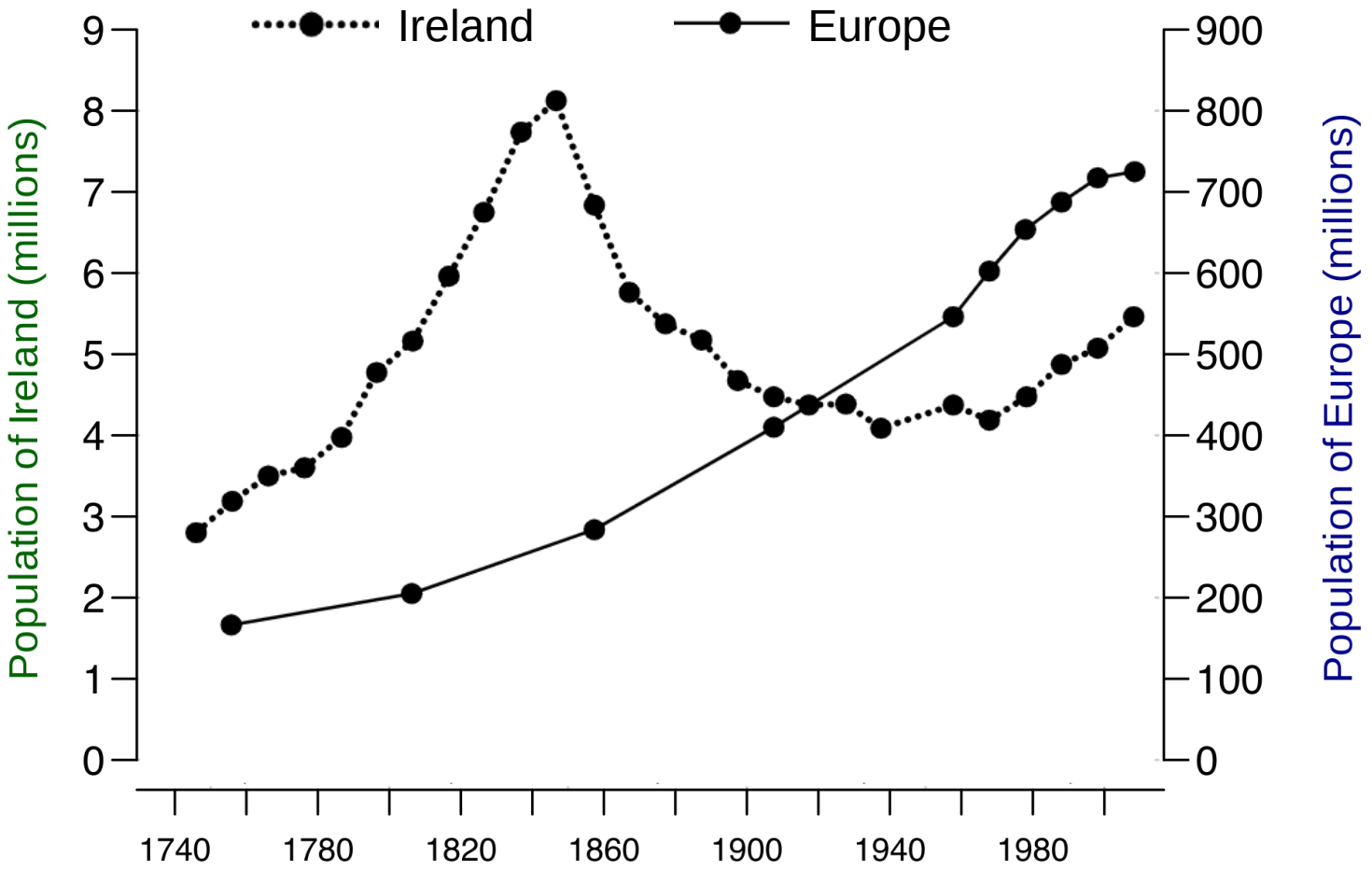
Discuss: What does this graph make you wonder?



5 minutes

Statistics activity

Reflect: Where do you use graphs or data in your subject?



5 minutes

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Effective Practices that Support Numeracy

Effective practices that support Numeracy

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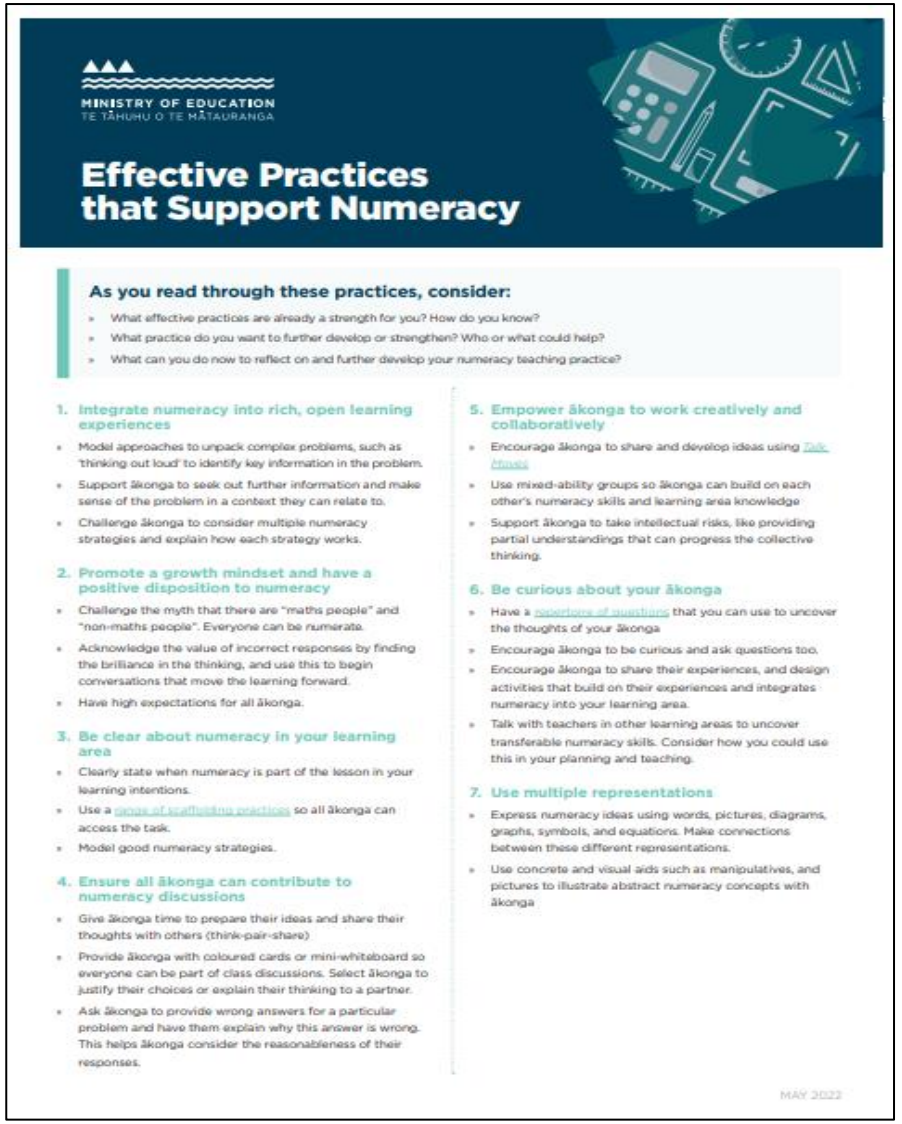
1. Integrate numeracy into rich, open learning experiences
2. Promote a growth mindset and have a positive disposition to numeracy
3. Be clear about numeracy in your learning area
4. Ensure all ākonga can contribute to numeracy discussions
5. Empower ākonga to work creatively and collaboratively
6. Be curious about your ākonga
7. Use multiple representations

Effective Numeracy Practices



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Effective Practices that Support Numeracy

As you read through these practices, consider:

- What effective practices are already a strength for you? How do you know?
- What practice do you want to further develop or strengthen? Who or what could help?
- What can you do now to reflect on and further develop your numeracy teaching practice?

1. Integrate numeracy into rich, open learning experiences

- Model approaches to unpack complex problems, such as 'thinking out loud' to identify key information in the problem.
- Support ākonga to seek out further information and make sense of the problem in a context they can relate to.
- Challenge ākonga to consider multiple numeracy strategies and explain how each strategy works.

2. Promote a growth mindset and have a positive disposition to numeracy

- Challenge the myth that there are "maths people" and "non-maths people". Everyone can be numerate.
- Acknowledge the value of incorrect responses by finding the brilliance in the thinking, and use this to begin conversations that move the learning forward.
- Have high expectations for all ākonga.

3. Be clear about numeracy in your learning area

- Clearly state when numeracy is part of the lesson in your learning intentions.
- Use a range of scaffolding practices so all ākonga can access the task.
- Model good numeracy strategies.

4. Ensure all ākonga can contribute to numeracy discussions

- Give ākonga time to prepare their ideas and share their thoughts with others (think-pair-share)
- Provide ākonga with coloured cards or mini-whiteboard so everyone can be part of class discussions. Select ākonga to justify their choices or explain their thinking to a partner.
- Ask ākonga to provide wrong answers for a particular problem and have them explain why this answer is wrong. This helps ākonga consider the reasonableness of their responses.

5. Empower ākonga to work creatively and collaboratively

- Encourage ākonga to share and develop ideas using Talk Moves
- Use mixed-ability groups so ākonga can build on each other's numeracy skills and learning area knowledge
- Support ākonga to take intellectual risks, like providing partial understandings that can progress the collective thinking.

6. Be curious about your ākonga

- Have a repertoire of questions that you can use to uncover the thoughts of your ākonga
- Encourage ākonga to be curious and ask questions too.
- Encourage ākonga to share their experiences, and design activities that build on their experiences and integrates numeracy into your learning area.
- Talk with teachers in other learning areas to uncover transferable numeracy skills. Consider how you could use this in your planning and teaching.

7. Use multiple representations

- Express numeracy ideas using words, pictures, diagrams, graphs, symbols, and equations. Make connections between these different representations.
- Use concrete and visual aids such as manipulatives, and pictures to illustrate abstract numeracy concepts with ākonga

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Effective practices that support Numeracy

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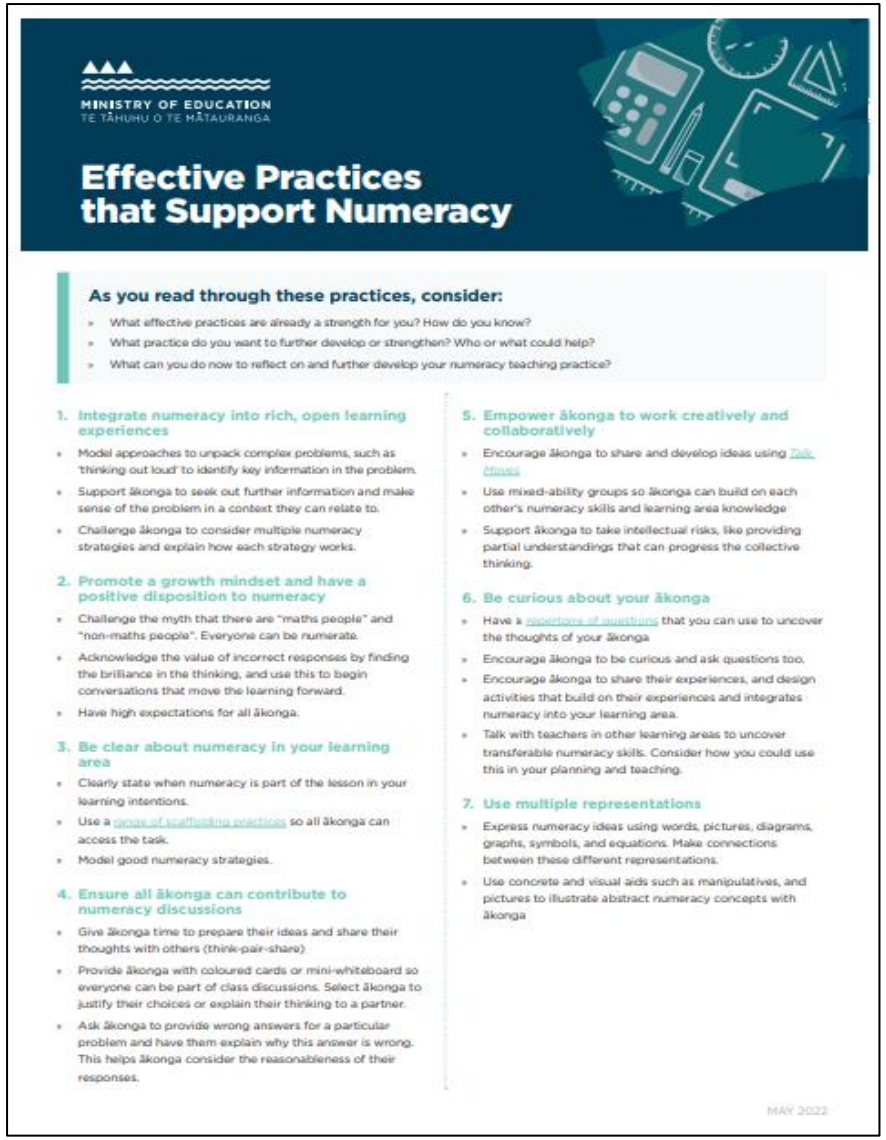

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Promote a growth mindset and have a positive disposition to numeracy

Practice 2: Promote a growth mindset and have a positive disposition to numeracy

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Activity: In pairs or departments.

Think of an upcoming unit of work and consider these questions:

How can you **plan** to promote a growth mindset where:

- Students are encouraged to persevere through challenges?
- Students are allowed to make mistakes and understand this is part of the process?
- Students are free to try different strategies?

7 minutes

Practice 2: Promote a growth mindset and have a positive disposition to numeracy

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Activity: In pairs or departments.

Think of an upcoming unit of work and consider these questions:

How can you **plan** to promote a positive disposition to Numeracy?:

- How can you actively plan to make sure that expectations are high for all learners?
- How can you build in supports for students so that they have several strategies to progress?

7 minutes

Rauemi | Resources to support Practice 2

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youcubed at Stanford University
Advice for Parents, from Professor Jo Boaler

[Advice for Parents and teachers]

Ensuring high expectations for all learners

The statements below, about high expectations for learners in New Zealand schools, are supported by educational research (including the research referred to in this Update). The guiding questions are prompts to help schools consider what each statement implies for their particular context.

[Ensuring high expectations for all learners]

youcubed®

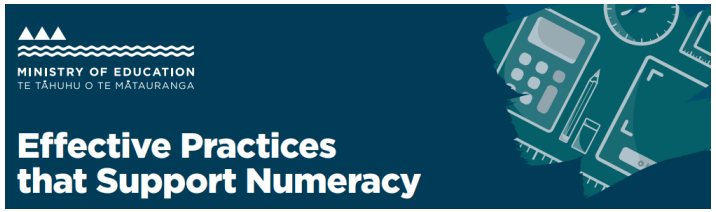
How Students Should be Taught Mathematics: Reflections from Research and Practice

[How students should be taught mathematics]

HIGH IMPACT TEACHING / OVERVIEW

How to develop high expectations teaching

[How to develop High Expectations Teaching]



[Effective Numeracy Practices]

NCEA Literacy and Numeracy Case Studies
Niue High School (Mata Ki Luga)

[Niue Case Study]

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Empower ākonga to work creatively and collaboratively

Empower ākonga to work creatively and collaboratively

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Activity: In pairs or departments.

Think of an upcoming unit of work and consider these questions:

How can you **plan** to promote ākonga working together?

- Students are collaborating and communicating with each other?
- Students work in mixed ability groups to build on each other's skills and strengths?

7 minutes

Empower ākonga to work creatively and collaboratively

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Activity: In pairs or departments.

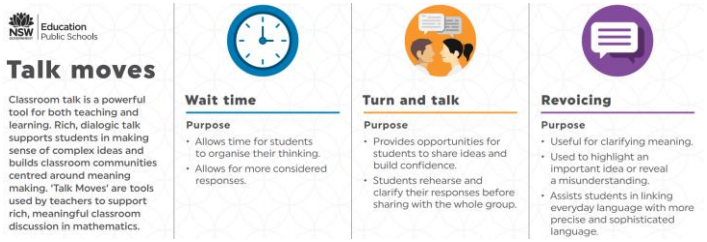
Think of an upcoming unit of work and consider these questions:

How can you **plan** to promote ākonga working together?

- Are students explaining and justifying the reasonableness of their responses?
- Are students taking intellectual risks by asking questions that clarify and deepen everyone's understanding

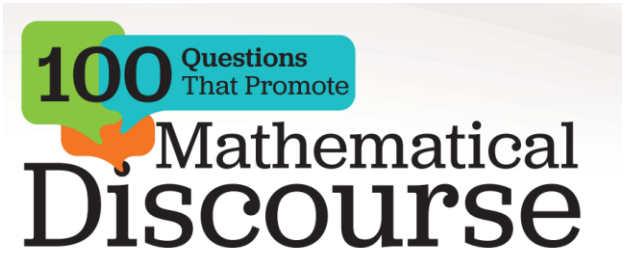
7 minutes

Rauemi | Resources



Talk Moves

Sentence Starters

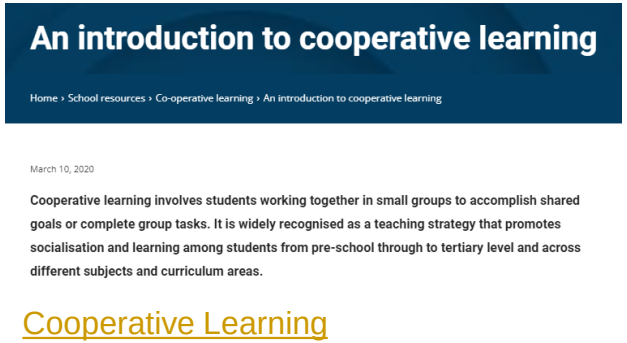


Questions that promote mathematical discourse

Grouping students in mathematics... more than just mixed ability

Groping students in mixed ability groups

The plan for remove streaming in our schools



Cooperative Learning

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Use Multiple Representations

Use multiple representations

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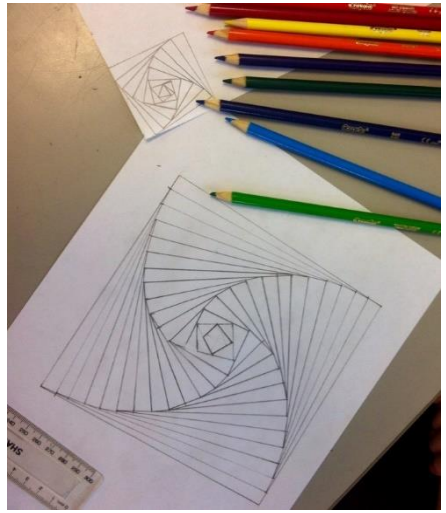
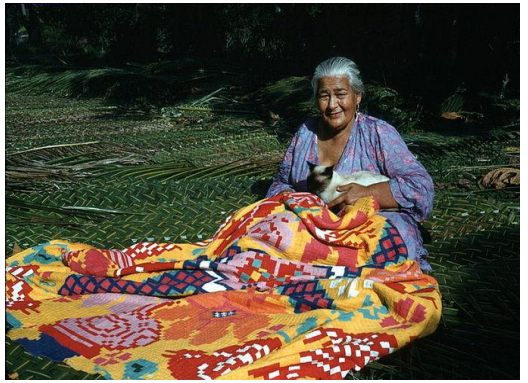
Reflect:
Pick an upcoming unit of work.

Numeracy can be expressed using abstract representations (diagrams, graphs, symbols, and equations) as well as concrete representations (materials, visuals, drawings, experiments)

- How can you incorporate these ideas into your planning?





7 minutes

Use multiple representations

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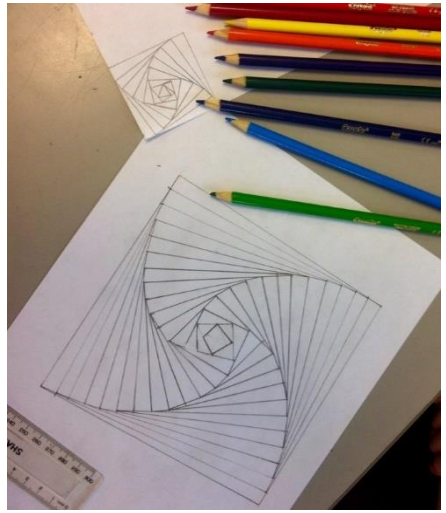
Reflect:
Pick an upcoming unit of work.

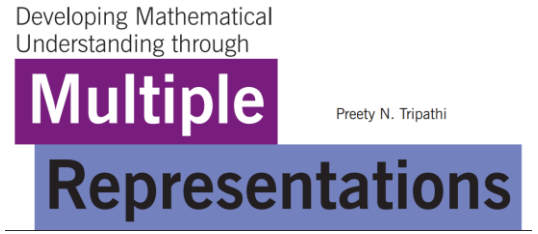
By using multiple representations, Numeracy can be **supported across the curriculum,** as mathematical understanding can be developed in diverse ways.

- How can you use multiple representations to support this numeracy learning in your Learning Area?

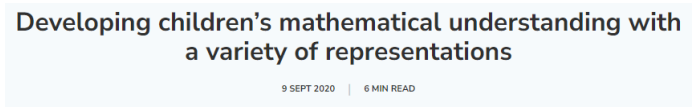


7 minutes

Rauemi | Resources

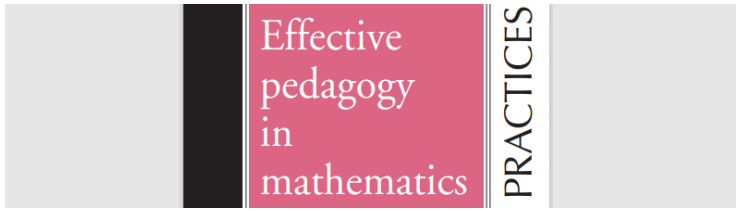


Developing mathematical understanding through multiple representations



Variety of representations

Multiple representations in teaching maths



Effective pedagogies in mathematics

Multiple representations

Conceptual Variation- Multiple Representations

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Reflections

Reflection on today's session

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Reflect:

- Write down the key words and ideas from today's session (2 minutes)
- Select one practice (or part of a practice) to focus on
- Discuss in a pair what you will explore and trial and why?

6 minutes

References

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The material below guided the development of this resource:

- Anthony, G & Hunter, R (2013) *Expansive learning: Lessons from a teacher's learning journey* retrieved from Expansive learning: Lessons from one teacher's learning journey (researchgate.net)
- Averill, R & Ingram, N (2023) *Engaging and effective teaching and learning in secondary school mathematics and statistics*. Article published on the Education Hub. Source: Engaging and effective teaching and learning in secondary school mathematics and statistics - THE EDUCATION HUB
- NCEA case studies Case Studies | NCEA (education.govt.nz)
- Rubie-Davies, C. (2014). *Becoming a high expectation teacher: Raising the bar*. Hoboken: Routledge.

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Te Mahau

We **shape** an **education** system that delivers **equitable** and **excellent outcomes**

He mea **tārai** e mātou te **mātauranga** kia **rangatira** ai, kia **mana taurite** ai ōna **huanga**

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