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Making mathematical connections

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Warm up

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- Race to …

Making mathematical connections

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Making connections between different ideas in mathematics is a feature of a highly efficient maths teachers (Askew, M. 2008).

- What does this mean?
- How can teachers use this information to assist planning?
- How will making connections support students to learn?
- This workshop is a brief introduction to the big ideas thinking along with practical ways teachers can use each of these approaches in their planning to further enhance student learning.

‘Big ideas’

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Liping Ma described a profound understanding of mathematics:

- ‘… not in terms of knowledge of facts, skills and procedures, but rather in terms of four key features: *connectedness, multiple perspectives, recurring basic ideas, and longitudinal coherence*’. (Ma, 2003)

Askew et al, (1997)

- '*having a rich network of connections between different mathematical ideas*.’

Deans for Impact

- https://deansforimpact.org/wp-content/uploads/2016/12/The_Science_of_Learning.pdf

‘Big ideas’ and the Australian Curriculum

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A similar view is expressed in the rationale for the *Australian Curriculum: Mathematics*:

- “Mathematics is composed *of multiple but interrelated* and interdependent concepts and *systems* which students apply beyond the mathematics classroom”.

- The intent is to maintain attention on “developing increasingly sophisticated and refined mathematical *understanding, fluency, reasoning, and problem-solving* skills”.

- ‘... students of this age also need an understanding of the *connections* between mathematical concepts and their application in their world as a motivation to learn. This means using contexts directly related to topics of *relevance and interest* to this age group.’

Rocks, pebbles and sand

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https://www.youtube.com/watch?v=gXdsF4xk2f8

Top approaches

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- Top down
- Bottom up

Top down

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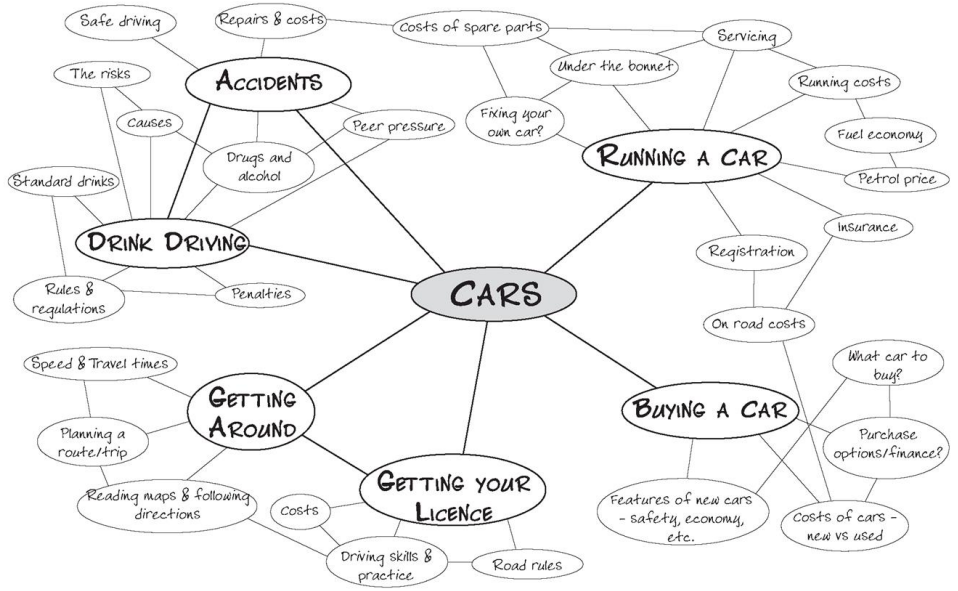
- Thinking in of an issue, object, theme using real world perspective
- Brainstorm all of the possibilities.
- An inquiry model could be used
- Create connections
- Reduce!



From: Tout & Motteram, Foundation Numeracy in Context, ACER Press, 2006

Building a playground

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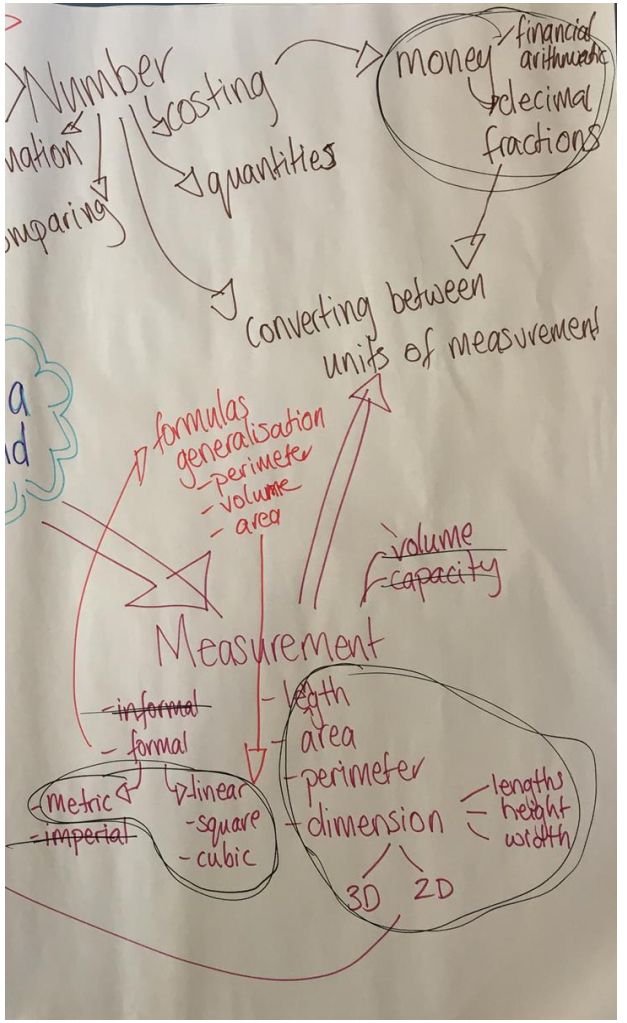

Bottoms up

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- Connect the dots to form bigger ideas.

Compare and order snippets in the Victorian Curriculum

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- Number & Algebra Level 4: Recognise, represent and *order* numbers to at least tens of thousands
- Measurement & Geometry Level 4: Use scaled instruments to measure and *compare* lengths, masses, capacities and temperatures
- Measurement & Geometry Level 5: *Compare* 12- and 24-hour time systems and convert between them
- Statistics &Probability Level 4: Describe possible everyday events and *order* their chances of occurring
- Statistics & Probability Level 6: *Compare* observed frequencies across experiments with expected frequencies

Why make connections

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- Research (Tout, D., et al 2015) indicates that students learn best when they make connections with ideas and transfer these ideas into long term memory

PISA

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PISA

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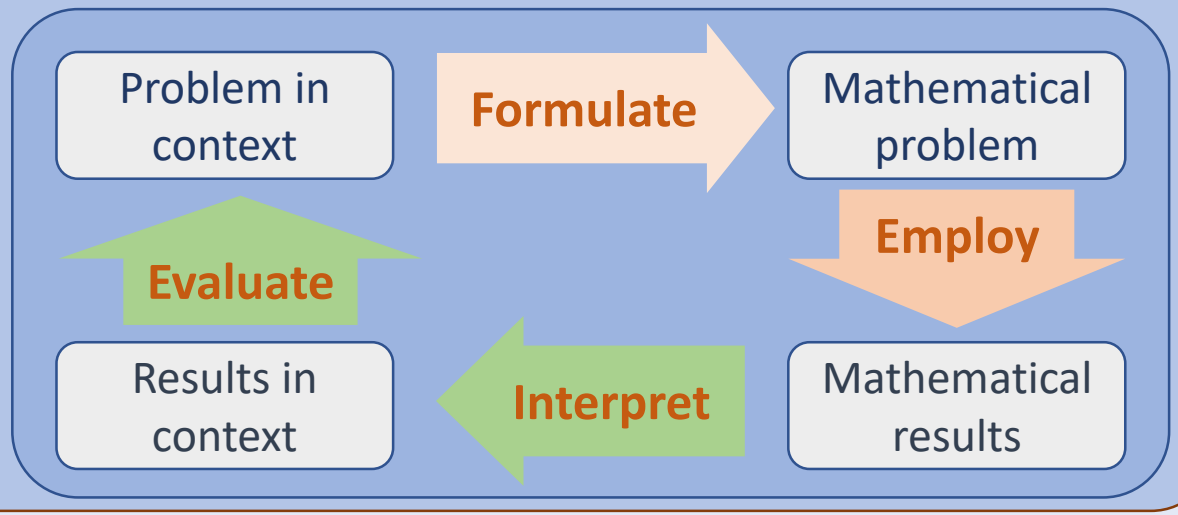
Looking for Connections – a top-down view from a real-world perspective

Challenge in real world context

Mathematical content categories: Quantity; Uncertainty & data; Change & relationships; Space & shape
Real world context categories: Personal; Societal; Occupational; Scientific

Mathematical thought and action

Mathematical concepts, knowledge and skills
Fundamental mathematical capabilities: Communication; Representation; Devising strategies; Mathematisation; Reasoning and argument; Using symbolic, formal and technical language and operations; Using mathematical tools
Processes : Formulate, Employ, Interpret/Evaluate



PISA sample

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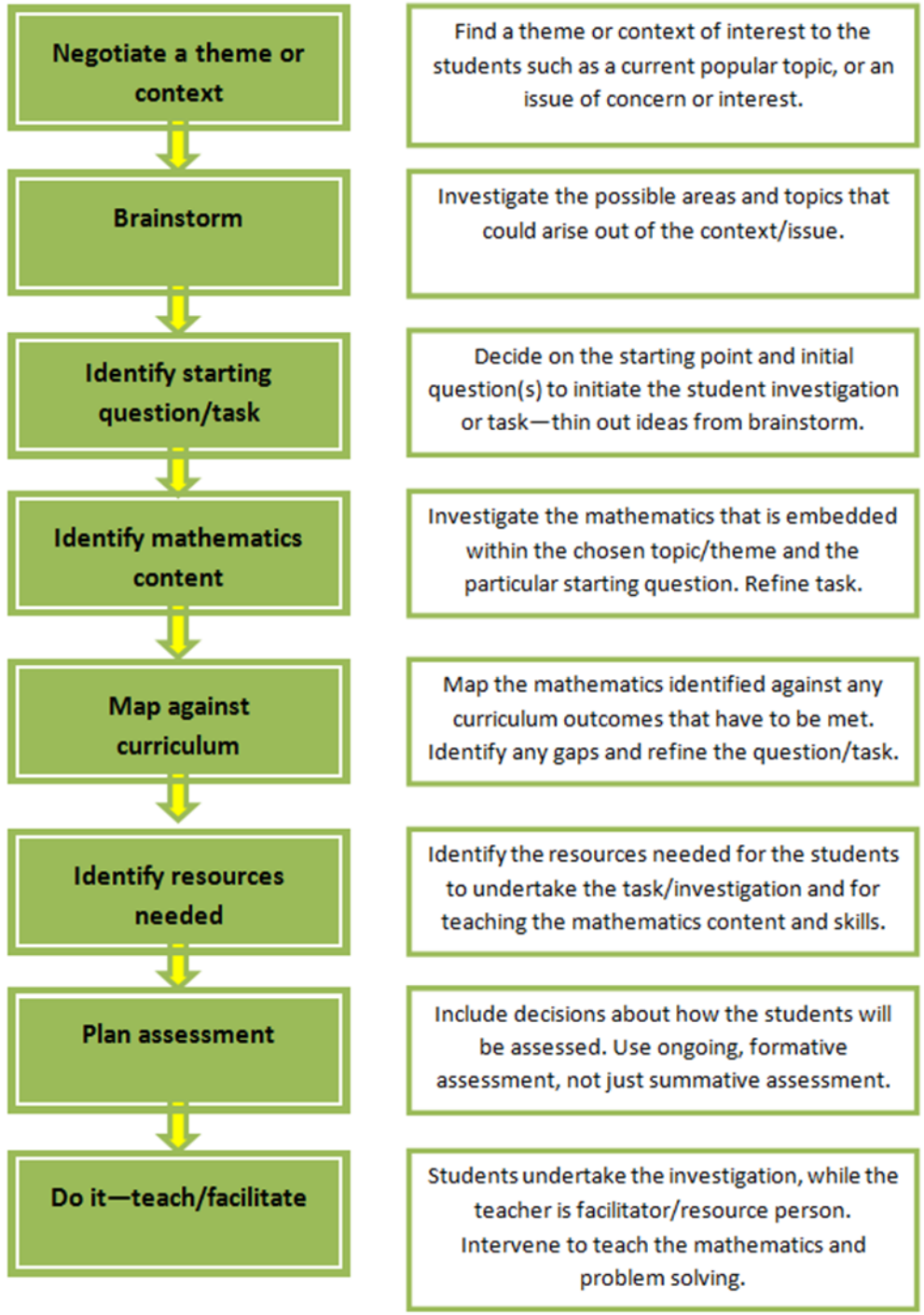
The Gotemba walking trail up Mount Fuji is about 9 kilometres (km) long.

Walkers need to return from the 18 km walk by 8 pm.

Toshi estimates that he can walk up the mountain at 1.5 kilometres per hour on average, and down at twice that speed. These speeds take into account meal breaks and rest times.

Using Toshi's estimated speeds, what is the latest time he can begin his walk so that he can return by 8 pm?

Tout planning model



Questions

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