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Moving towards **more** open and challenging tasks

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Notes and contact

- I am more than happy to email the notes and will share them with MAV to be uploaded on the website
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What are open and challenging tasks?



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- Open tasks are activities that have more than one possible solution or can be solved in more than one way.
- Challenging tasks are open and require students to make connections.
- For a task to be challenging the student can not know how to answer the question initially.
- Challenging tasks are supported by an enabling prompt, to support students to enter the initial task, and an extending prompt, for students to progress to if they successfully complete the initial task.

What are open and challenging tasks?



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Nine Colours



You have 27 small cubes, 3 each of nine colours.

Can you use all the small cubes to make a 3 by 3 by 3 cube so that each face of the bigger cube contains one of each colour?

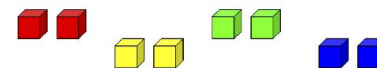
nrich.maths.org/roadshow

Four Colours

You need:

8 multilink cubes - two red ones, two yellow, two green and two blue.

(Two each of any four different colours will do.)



What you have to do:

Fit them together to make a cube so that each colour shows on each face just once?



Is there more than one way to do it?

If you can do this, you might like to try 'Creating Cubes' and 'Nine Colours'.

nrich.maths.org/roadshow

What are open and challenging tasks?



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- I added the numbers 18 and 7 in my head, how could I have solved it?
- Can you find something in the classroom that is between 3 hands and 5 hands long?
- Can you draw five different triangles?
- I surveyed 30 people about their favourite sport, soccer was most popular. What could the results from my survey be?

Why use open and challenging tasks?

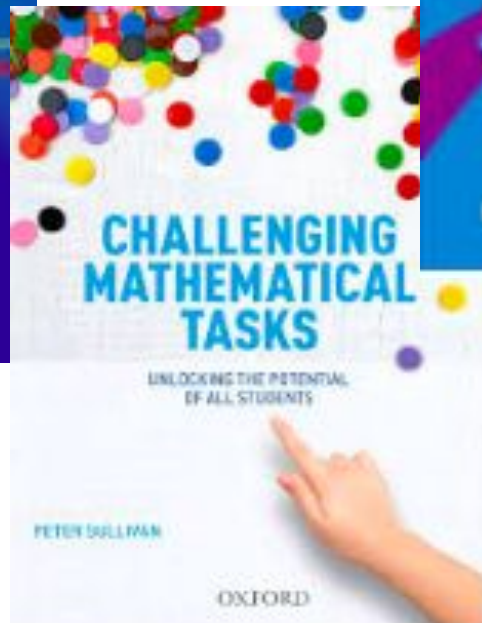
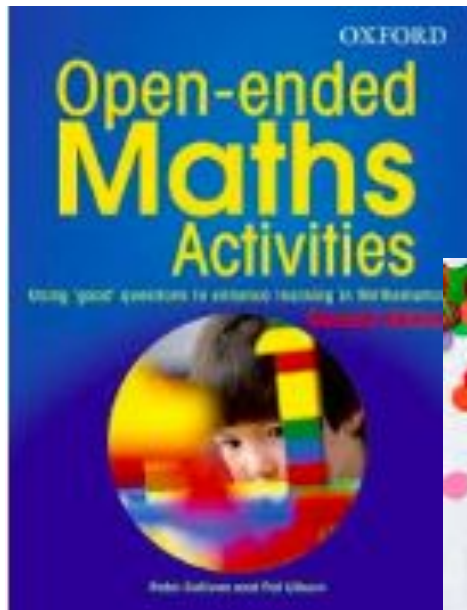


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- There are many advantages to using open and challenging tasks
 - Challenging tasks provide students the opportunity to build on their own understanding and strategy use
 - They support deep learning and provide the potential for 'AHA moments'
 - Challenging tasks encourage students to make connections between mathematical ideas
 - It allows all students to engage, discuss and reflect on the same task
 - Prepares students for the kind of problems they will confront in their lives
 - Working through challenging, open and problem based tasks increase student retention.

How do we find these tasks?

- Teacher Books



How do we find these tasks?



- Websites



How do we find these tasks?



- Relying on websites and teacher resources is not a perfect system
- Many of the websites are hard to navigate and do not have tasks listed under content areas
- We can become focused on the task we have found and not the mathematical focus we need to develop
- Searching for a task that is open, challenging and fits our learning focus and grade level can be time consuming
- Some of these tasks are mathematically complex and some teachers are uncomfortable teaching them
- As a result an important part of the process is being able to make the teaching you are already doing **more** open and challenging.

Creating open and challenging tasks.



- Peter Sullivan suggests three different ways that you can adjust an activity to make it more open.
- Start with the answer and reword the question
 - Instead of $15 + 9 =$, you might ask 'I added two number together and got an answer of 24, what could the numbers I added together be?'
 - Ben left school at 3:30 p.m. and it takes him 25 minutes to get home. What time does he get home? This question could be Ben gets home from school at 3:55 p.m. What time might school finish? How long does it take him to get home?
 - Instead of what colour is most likely to be spun on this spinner, I created a spinner which blue was most likely to be spun on, what could my spinner look like?

Creating open and challenging tasks.



- Add an additional idea or concept to the question.
 - Add a component about fractions or angles to a time question, eg. The hands on an analogue clock made a right angle, what time is it?
 - Include transformation into work on shape, eg. Can you find all of the nets of a cube (make sure they are not the same net that has been turned)
- Delete parts or certain information from the question
 - Removing numbers from an equation, eg. $4_2 + _3_ = 611$.
 - Providing students a graph that has no heading, subheading or increments and students need to fill that in or graph data from an incomplete table.
 - Instead of what is at B3 on the map, I found something that had the first coordinate B, what could it have been.

The Importance of Pedagogy



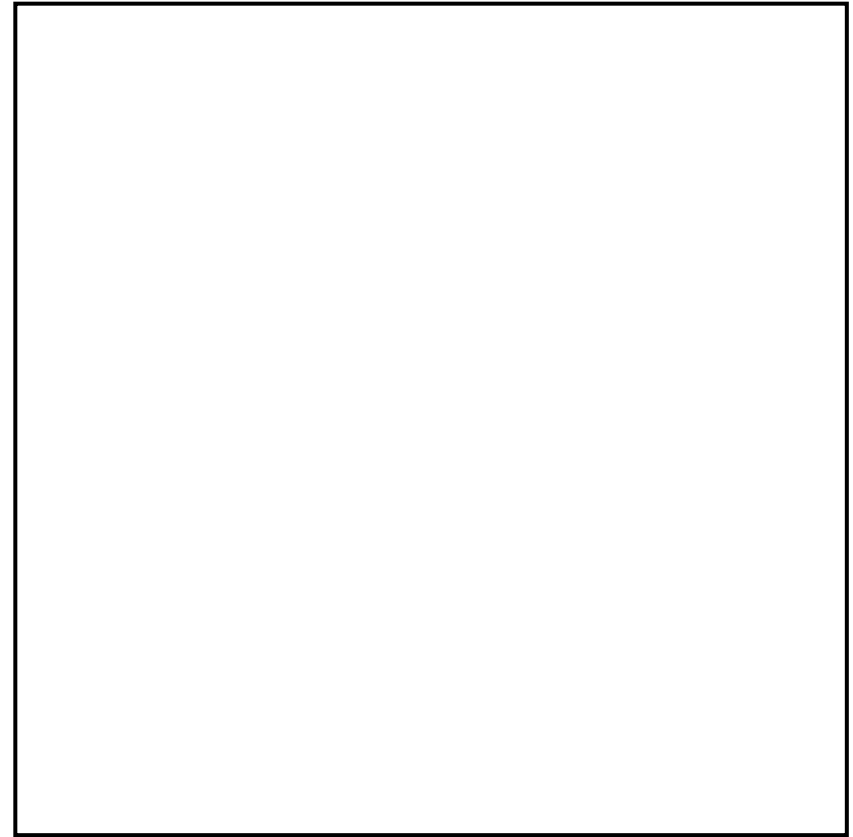
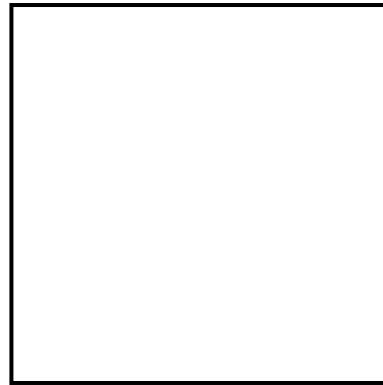
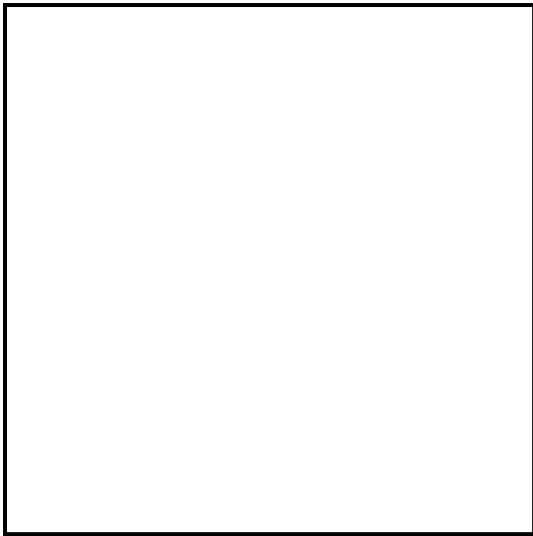
- The pedagogy associated with open and challenging tasks is extremely important, arguably more important than the task chosen
- Students need to record their steps, explain their strategies and justify their thinking. The teacher needs to establish these as expectations and value them in their pedagogy
- Encouraging persistence is a key component of challenging tasks as students should not know how to answer the question straight away.
- This does not sit comfortably with some teachers and they adjust their pedagogy to reduce the challenge and persistence required.
- There are many pedagogy structures to support these kinds of tasks, one is launch, explore and summarise.

Pedagogy – Launch

- When introducing the task the teacher needs to -
 - Arouse student curiosity
 - Make sure every student has an entry point into the learning
 - Introduce new concepts or review old concepts
 - Carefully consider the learning intentions and success criteria
- When introducing the task the teacher should not -
 - Deliver a long and detailed explanation of how the task should be completed
 - Model how to do the problem (however on occasions an example may be helpful to model the format, however make sure that you maintain the challenge).

Pedagogy – An example

- How many ways can you show a quarter of a square?



Pedagogy – Explore



- While the students are working on the task the teacher needs to -
 - Ensure all students have entered the task and monitor their progress
 - Ask questions to prompt, redirect and extend students
 - Utilise the enabling and extending prompts as needed
 - Identify possible examples to share with the class either during the session, these students might need advanced warning they are presenting
- While the students are working the teacher should avoid -
 - Focusing the majority of their time and energy on a small number of students
 - Removing or withdrawing students from the learning task, such as for a teacher group, explicit teaching or to work on a different task.

Pedagogy – Summarise

- At the conclusion of the session the teacher needs to -
 - Carefully select some students to present
 - Encourage students to explain their learning and other students to ask questions
 - Focus the discourse on the intended focus of the lesson and ensure connections between ideas and strategies are made
 - Provide a brief teacher reflection to make the key learning explicit.
- At the end of the session the teacher should avoid -
 - Dominating the conversation
 - Telling students the 'right way' the task should have been completed

The Importance of Pedagogy



- Moving towards these kinds of tasks has been a long, slow and gradual process and we have made many changes to our pedagogy.
- Shortening the whole class introduction / launch
 - Initially teachers spent nearly half the session introducing the task
 - Focusing on the idea of 'explore then explain' and a mini share was very important.
- Teacher groups and rotations
 - Teacher groups provided opportunity for explicit teaching and ongoing assessment
 - Teacher groups still occur but in relation to data or anecdotal observations from a previous session
 - Rotations provided structure to support teacher groups.

The Importance of Pedagogy



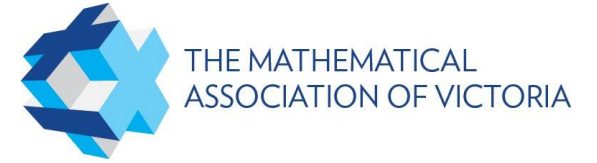
- Assessment

- We developed an expectation of written observation on each student at least once a week
- We are trialing different strategies, exit tests and annotated class lists are most widely used.

- Learning Intentions and Success Criteria

- As a visible learning school we use LI and SC, however at times these were reducing the challenge of the task
- We make our learning intentions now more general, we are learning about...
- We try not to make the Success Criteria a checklist of what to do and they are sometimes withheld as students explore ideas for the first time.

The Importance of Pedagogy



- Other considerations...
- Group work and partners
- The zone of confusion
- Speed and competition
- Consolidating tasks
- Project based learning

Creating open and challenging tasks.



- Some lesson ideas are fantastic and easily transferable to other areas of maths.
 - Which is the odd one out (shape, fractions, number, patterns, etc.)
 - Help Burt Divide (all operations, measurement, directions, mapping, graphing, etc.)
 - Will it always work (area formulas, shape, fractions, number patterns, symmetry, transformation, etc.)
 - How many ways can you... (make a quarter, show this data, make a cube net, draw a triangle, show or make a number, etc.)

Creating open and challenging tasks.



- Easy or hard.
- Students work together to decide if a question is easy or hard. Students solve the easy questions.
- Can be used with all operations and problem solving.

DIVISION





Below is a set of division equations. For each question decide with your partner if you think the question is easy or hard.

Solve each easy sum and record the strategy that you used to solve it.

$68 \div 17 =$	$144 \div 36 =$	$37 \div 4 =$
$6000 \div 6 =$	$97 \div 7 =$	$636 \div 3 =$
$112 \div 2 =$	$3 \div 12 =$	$48 \div 24 =$

Creating open and challenging tasks.

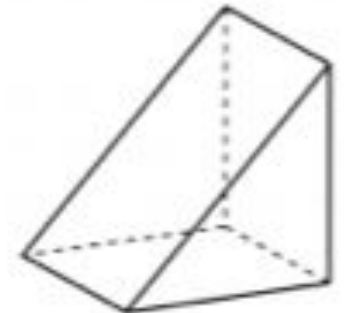
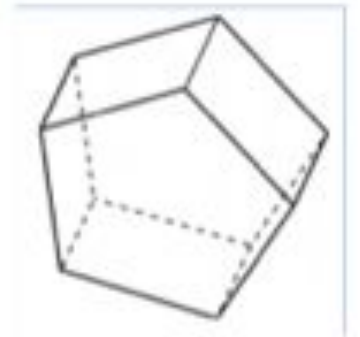
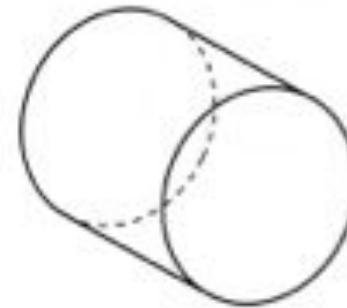
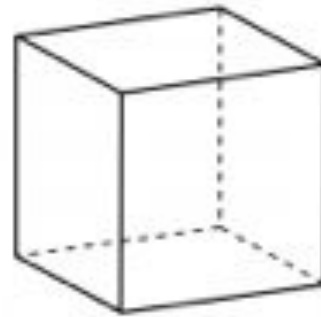
- Matching cards.
- Students connect the different representations of the same time together.
- Can be used for shape, number triad, fractions, partitioning numbers, graphing, etc.

ANALOGUE TIME	DIGITAL TIME	TIME IN WORDS
	6:15	Quarter to one
	12:45	Quarter past twelve
	7:45	Quarter past six
	12:15	Quarter to

Creating open and challenging tasks.

- Sorting collections.
- Students sort a collection of shapes into two groups.
- Students can sort shapes, vocabulary, equations by strategy they would use to solve them, etc.
- In fact students can sort any kind of collection with a mathematical focus.

How many different ways could you sort these objects into 2 different groups?

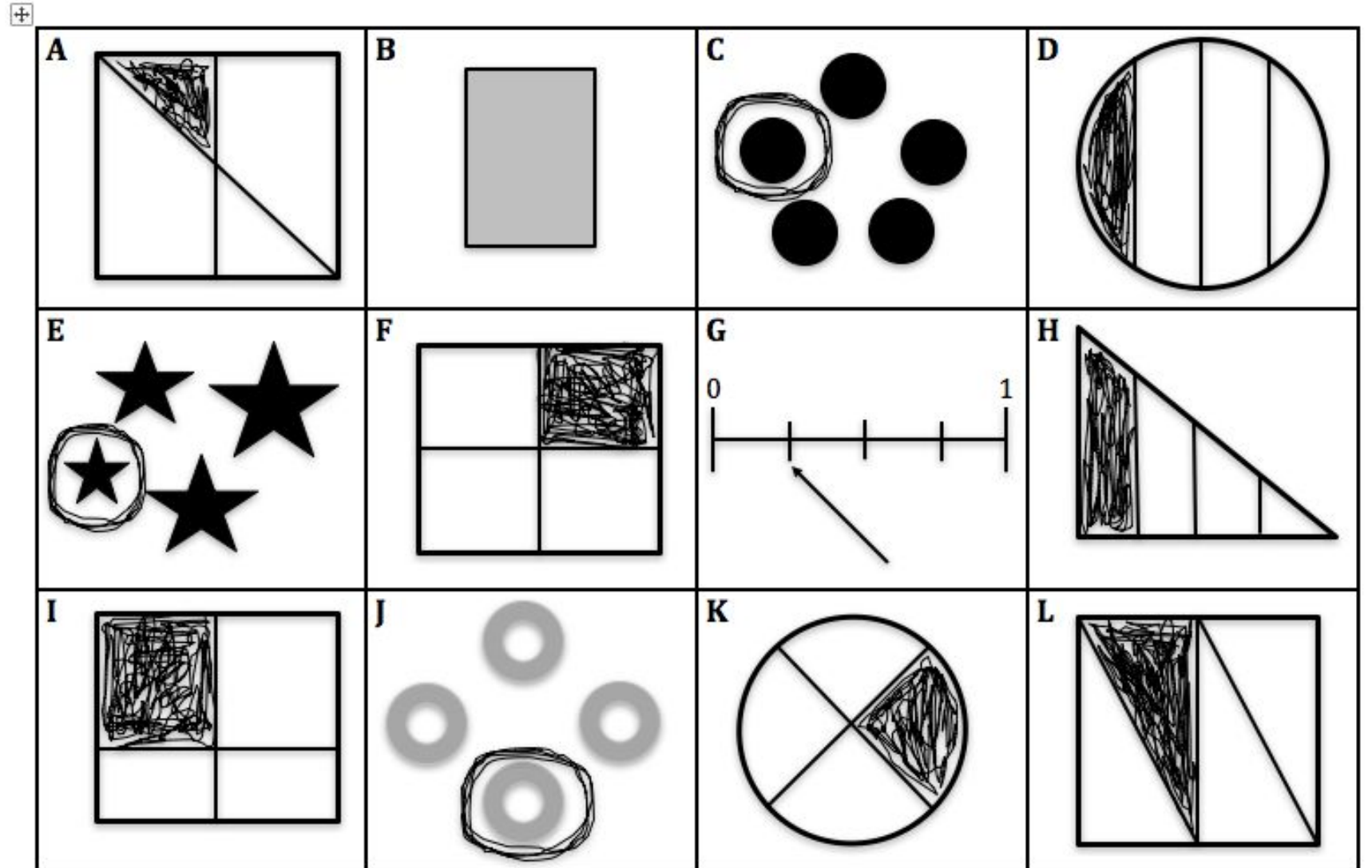


Creating open and challenging tasks.



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- Sorting examples and non-examples.
- Which of these are a quarter?
- This can also be used for shapes, numbers, etc.

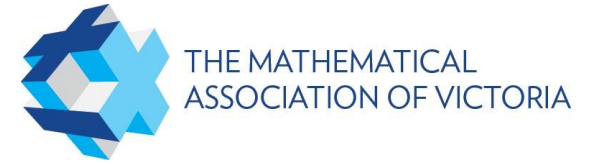


Transforming Tasks

- Product of a South Australian project.
- Includes supporting website and a range of resources.



Thank you!



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