

ELEMENT Domain 2 - Create Safe Conditions for Rigorous Mathematics Learning

2.4

Element 2.4 - Challenge students to achieve high standards with appropriate support

The following suggestions for practice are extracts from the 'Transforming Tasks' module on the Leading Learning resource:



Strategy

From Procedural to Problem Based

Technique

Providing insufficient information (at first): Give a perplexing problem and slowly provide information as needed.

Level	Before	After
Primary	<p>This bucket holds 10 litres when filled to the top. The dotted line shows the water level in the bucket.</p> <p>How much water do you think is in the bucket?</p> 	<p>Roughly how much water do you think was poured over this man?</p> <p>What information do you need in order to find out? What else?</p> 
Secondary	<p>The radius of the London Eye is 60m.</p> <p>Calculate:</p> <ol style="list-style-type: none"> The diameter of the wheel. The circumference of the wheel. The time taken for one revolution of the wheel if it travels at an average speed of 0.3m/s 	<p>In the year 2000 the London Eye became the world's tallest Ferris wheel.</p> <p>Approximately how long do you think a journey on the London Eye might take?</p> <p>Convince me/someone who thinks differently to you. What do you need to know to be sure of your accuracy?</p> 

How do you think the technique **Providing insufficient information (at first) might support *Element 2.4 - Challenge students to achieve high standards with appropriate support*?**

There are many ways to articulate this relationship. One response to this question has been provided on the next page.

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How does the technique **Providing insufficient information (at first)** support **Element 2.4 - Challenge students to achieve high standards with appropriate support**?

When teachers pose a maths problem and identify all the information necessary to solve the problem, they remove the opportunity to provide challenge, and for students to stop, think and consider which information they want/need to use. When students are given the necessary information, they are often led towards a particular way to calculate the solution. Leading students, supports them in that moment, but does not empower them to choose to use their mathematics in the long run. In contrast, when students identify the necessary information they are prompted to begin to plan the process they will use to solve the problem. Hence, when we challenge students to identify the necessary information for themselves, we challenge them to think about the mathematics that they are choosing to use. This is the basis of developing numerate students and in this way , providing insufficient information challenges students to achieve high standards.

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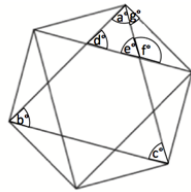



Strategy

From Procedural to Problem Based

Technique

Let students identify the steps: Provide multi-step problems and do not state all the steps.

Level	Before	After
Primary	<p>A movie ticket for one adult costs \$12. A movie ticket for one child is three quarters of the cost for an adult. a. What's the cost for one child? b. What's the cost for four children? c. What's the cost for a family of two adults and four children?</p>	<p>A movie ticket for 1 adult costs \$12. A movie ticket for a child is three quarters of the cost for an adult. What's the cost for a family of two adults and four children?</p> <p>This question is based on a NAPLAN question. Many NAPLAN questions are multi-step problems and do not state all the steps.</p>
Secondary	<p>This design is drawn inside a regular hexagon. Calculate the marked angles.</p> 	<p>This design is drawn inside a regular hexagon. What is the size of the angle marked a?</p>  <p>This question is from a NAPLAN paper. Many NAPLAN questions are multi-step problems and do not state all the steps.</p>

How do you think the technique **Let students identify the steps might support *Element 2.4 - Challenge students to achieve high standards with appropriate support*?**

There are many ways to articulate this relationship. One response to this question has been provided on the next page.



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How does the technique *Let students identify the steps* support *Element 2.4 - Challenge students to achieve high standards with appropriate support*?

When teachers provide students with all of the steps they ‘rescue’ students from the possibility of grappling with the problem and identifying the steps for themselves. Dan Meyer, in this TED talk, refers to providing all of the steps, as paving the way for students and “...congratulating them for stepping over the small cracks”. http://www.ted.com/talks/dan_meyer_math_curriculum_makeover?language=en

Having students identify the necessary steps challenges them to achieve high standards that will ultimately support them to be effective users of their mathematics understanding.

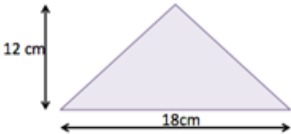
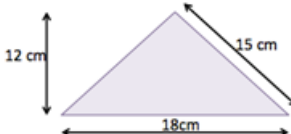
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The following suggestions for practice are extracts from the 'Transforming Tasks' module on the Leading Learning resource:



Strategy		From Procedural to Problem Based
Technique		Include some irrelevant information: Give additional information that is not required to do the task.
Level	Before	After
Primary	What is the value of $500 + 60 + 4$	Which of these is worth 564? Tick as many boxes as you need to. $5 + 6 + 4$ <input type="checkbox"/> $50 + 60 + 40$ <input type="checkbox"/> $500 + 40 + 6$ <input type="checkbox"/> $500 + 60 + 4$ <input type="checkbox"/>
Secondary	Calculate the area of the triangle. 	Calculate the area of the triangle. 

How do you think the technique **Include some irrelevant information** might support *Element 2.4 - Challenge students to achieve high standards with appropriate support*?

There are many ways to articulate this relationship. One response to this question has been provided on the next page.

**ELEMENT** Domain 2 - Create Safe Conditions for Rigorous Mathematics Learning**2.4** Element 2.4 - Challenge students to achieve high standards with appropriate support**How does the technique *Include some irrelevant information* support *Element 2.4 - Challenge students to achieve high standards with appropriate support*?**

When teachers provide students with only the relevant information and nothing more, they ‘rescue’ students from the possibility of grappling with identifying the useful information for themselves. Students can default to using the given information rather than being challenged to stop, think and consider which information is required. The challenge here is similar to asking students to identify which information is necessary to solve a problem, however, adding irrelevant information lends itself to different contexts, such as the place value context in the Primary Years example, for which it is not possible to have students identify the necessary information.

Some teachers of mathematics take the view that including irrelevant information is ‘tricking’ the students, rather than challenging them to achieve high standards. However, students are only tricked by irrelevant information when they do not have conceptual understanding. Hence, providing questions that include irrelevant information supports teachers to identify when students do/don’t have deep understanding. Knowing this is essential in challenging learners to achieve high standards.