ELEMENT 3.3

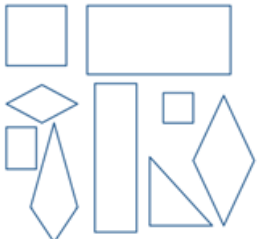
Domain 3 - Develop Expert Mathematics Learners

Element 3.3 - Explore the construction of knowledge

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

Strategy From Information to Understanding

Technique **Make connections and find relationships:** Have students make meaning by asking them to connect pieces of information.

Level	Before	After
Primary	Shapes worksheet. Colour the squares blue and the rectangles red. 	I'm thinking of a shape and it has 4 sides. What might it look like? Share your ideas. • What if it has 4 straight sides? Does that make you think differently about what you could have drawn before, or what the shape might be now? Share your ideas. • What if I it has four straight sides and it's a long thin shape. What do you think now? Could it be a square? This structure may help you to explain your thinking: • Because I know... I also know… • If … then...
Secondary	Scientific notation is a way of writing numbers when they are too big or too small to be written in decimal form. A number written in scientific notation is written as a number between 1 and 10 (inclusive) and multiplied by a power of 10. For example: • $700 = 7 \times 10^2$ • $530\,000\,000 = 5.3 \times 10^8$ **Copy and complete:** a. $73\,000 = \ldots \times 10^4$ b. $25\,300\,000 = 2.53 \times \ldots$ c. etc.	Use your smartphone calculator (or watch what happens on a shared device) when you calculate: 5,200,000 x 2,300,000. Now rotate your device. Can you see two different views? **Discuss** 1. What do you think is happening here? 2. What connections can you see? 3. What do you think ' e+13' might mean? Test out your ideas on some other values. 4. If 'Screen 2' was showing '530 000 000', What might 'Screen 1' show? 5. If 'Screen 1' was showing '2.53e+7', What might 'Screen 2' show? Find out about 'Scientific notation'.  Screen 1  Screen 2 A smartphone calculator has been used for these screenshots. (In screen 2 the device has been rotated)

How do you think the technique Make connections and find relationships might support *Element 3.3 - Explore the construction of knowledge?*

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 Make connections and find relationships support *Element 3.3 - Explore the construction of knowledge?*

Looking for and identifying connections can be, both a way to construct knowledge and evidence of knowledge. When teachers ask 'connections' questions, they can support students to identify something they know, or something they need to learn.

Teachers can support students to recognise that looking for connections and relationships impacts on their construction of knowledge. For example, in the Secondary Years 'after' task , the question exposes students to two representations of what must be the same value. The cognitive dissonance caused here leads to questions such as:

- How relaible is this information?
- Why are there two different representations?
- What is it that I don't know about this new form of representation/What do I know about it?
- What other information can I use to develop my understanding of this?

When students experience cognitive dissonance, we want them to develop a disposition towards resolving their dissonance through asking probing questions, such as those above.

In the Primary Years example, students are being asked to make connections between discrete pieces of imformation about a shape and a possible visual representation of the shape. The fact that the verbal description is incomplete facilitates students establshing a large number of connections initially. As further information is revealed, new connections are made and students rule out some of their initial ideas and perhaps introduce some new ideas.

To support students to appreciate the way in which they are constructing their knowledge teachers can draw students attention to the way in which their thinking changes as the information they have increases. In this example students are able to say that the shape cannot be a square, even though they have not been told directly that the shapea is not a sqaure. It is important for students to realise they worked this out, without being told the information directly.