ELEMENT 2.2

Domain 2 - Create Safe Conditions for Rigorous Mathematics Learning

Element 2.2 - Build a community of learners

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

Strategy From Closed to Open

Technique **Different perspectives:** Have students explore different points of view.

Level	Before	After
Primary	Answer these questions: 4 x 3, 7 x 3, 9 x 3 etc up to 12 x 3	Think about how you would sort the following multiplication questions into three levels of difficulty: Harder, medium, easier:1 x 3, 2 x 3, 3 x 3 etc up to 12 x 3  • Deal out the x3 cards and work in a group to place each card in the place that best describes its difficulty for you. Do you all agree? • Take turns to move a card to a different section if you think it has a different level of difficulty for you. Explain why you find it hard/easy. Did anyone find their opinion changed when listening to the ideas and reasoning of others?
Secondary	Answer these questions: Half of 32 0.25 x 68 ¼ of 48 ¼ of 32 32 x 0.5 ½ of 32 68 divided by 4 48 x 0.25	Individually, sort the following questions into at least two groups of your own choosing. Half of 32 0.25 x 68 ¼ of 48 ¼ of 32 32 x 0.5 ½ of 32 48 x 0.25 68 divided by 4 In pairs, share your individual thinking and try to find at least one more way to sort this collection of questions. Share your thinking with another pair. Share your thinking with the class. • Did anyone else sort the questions in the same ways as you? • Did anyone else sort the questions differently from you? • Why might they have sorted their questions like this? Check with the students who presented that grouping. Summarise the connections that have been made.

How do you think the technique Different perspectives might support *Element 2.2 - Build a community of learners?*

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

ELEMENT 2.2

Domain 2 - Create Safe Conditions for Rigorous Mathematics Learning

Element 2.2 - Build a community of learners

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

How does the technique Different perspectives support *Element 2.2 - Build a community of learners*?

When teachers use this transformation technique to design learning in which students share different perspectives they provide opportunities for students to become aware of the range of ways in which individuals think and process information. Teachers can support students to notice the effect that hearing their peer's perspective has on their thinking. For example, in relation to the Primary Years times table example, it is relatively common for students who initially identify 9 x 3 as a difficult question, to later decide that it can be thought of as a medium or easy question. They usually experience this change in thinking through listening to a peer explain that they see 9 x 3 as, 3 less than ten-threes (3 less than 30). When teachers support students to share their perspectives about mathematical procedures or connections, they create the conditions for students to become a community of learners, in which there are many teachers and many learners.

ELEMENT 2.2

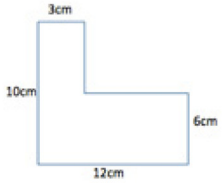
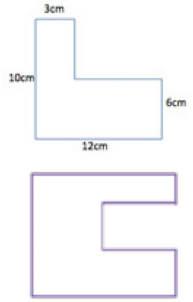
Domain 2 - Create Safe Conditions for Rigorous Mathematics Learning

Element 2.2 - Build a community of learners

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

Strategy From Closed to Open

Technique **Many pathways:** Ask for one problem to be solved in **multiple ways**, rather than multiple problems in **one way**.

Level	Before	After
Primary	Calculate: 39 + 43	Find at least two different ways to do the calculation 39 + 43 Share your methods with another student. Together, try to identify at least three different methods. • Identify which method is the most efficient for this calculation. • Identify which methods are best for mental calculation? • Identify if some methods would be better than others for addition sums with larger values.
Secondary	**Calculate the area of this shape:** 	Calculate the area of this shape in at least two different ways. • Share your methods with another pair of students. Work together to try to identify at least three different methods. • Do you they think that one method was easier or more effective than another method? Why? • Would one of your methods be more efficient than another if the shape was like this one? Why/why not? 

How do you think the technique Many pathways might support *Element 2.2 - Build a community of learners?*

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

ELEMENT 2.2

Domain 2 - Create Safe Conditions for Rigorous Mathematics Learning

Element 2.2 - Build a community of learners

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

How does the technique Many pathways support *Element 2.2 - Build a community of learners?*

The emphasis of this transformation technique is to challenge individual students to explore many pathways for themselves, before expanding their repertoire through sharing ideas with peers. Once students are ready to share their 'pathways', teachers can support the development of a community of learners through using a range of processes for sharing. Processes, which can be agreed upon and established as a group, could include:

- random selection of a sharing partner (using named pop-sticks or a digital generator of random pairs)
- partnering or grouping of students who identify as confident with this learning with those seeking a peer tutor for the learning.

ELEMENT **2.2**

Domain 2 - Create Safe Conditions for Rigorous Mathematics Learning

Element 2.2 - Build a community of learners

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

Strategy From Tell to Ask

Technique **Explore before explain:** Ask students to try their ideas first.

Level	Before	After
Primary	Example 1: Calculate 45 ÷ 3 $3\overline{)45}$ = 15 Example 2: Calculate 72 ÷ 4 $4\overline{)72}$ = 18	How can you divide larger numbers? Think about what you understand about division. Work with a partner, to have a go at one (or both) of these questions: Calculate 45 ÷ 3 Calculate 72 ÷ 4 Check your answers with a calculator.
Secondary	Simplify: $\frac{a}{2} + \frac{2a}{3}$ $= \frac{a \times 3 + 2a \times 2}{2 \times 3 \quad 3 \times 2}$ $= \frac{3a + 4a}{6 \quad 6}$ $= \frac{3a + 4a}{6}$ $= \frac{7a}{6}$ Questions: 1. $\frac{b}{5} + \frac{5b}{10}$ 2. $\frac{c}{2} + \frac{2c}{7}$	Use your skills with adding fractions, to challenge yourself to work with fractions that include variables. Work with a partner, to have a go at these two questions. 1. $\frac{b}{5} + \frac{5b}{10}$ 2. $\frac{c}{2} + \frac{2c}{7}$ Prompts: • How would you usually add fifths and tenths? • Would it help if you tried some fraction addition without variables? • Would it help if you drew a diagram?

How do you think the technique Explore before explain might support *Element 2.2 - Build a community of learners?*

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

ELEMENT 2.2

Domain 2 - Create Safe Conditions for Rigorous Mathematics Learning

Element 2.2 - Build a community of learners

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

How does the technique Explore before explain support *Element 2.2 - Build a community of learners?*

Using the technique of 'explore, before explain' will not automatically lead to the development of a community of learners. This element is developed when the teacher sets up appropriate working arrangements during the student's exploration. Arrangements might include:

- students work with different (randomly selected or teacher selected) groups of peers while they explore a new problem.
- small groups of students take collective responsibility for developing a possible process/solution. Students know that any one person in the group could be called upon to explain the group's thinking. This leads to the group ensuring that everyone gets involved and understands the thinking.

NB. It is essential that students feel safe in their learning community for them to be able to work on an unfamiliar problem. They must feel supported and valued in their community, knowing that a selection of approaches will be listened to. Approaches can be valued and evaluated for their efficiency, transferability, ease of use, visual representation etc.

ELEMENT **2.2**

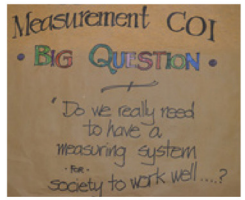
Domain 2 - Create Safe Conditions for Rigorous Mathematics Learning

Element 2.2 - Build a community of learners

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

Strategy From Tell to Ask

Technique **Use dialogue:** Ask students to interact and build meaning through learning conversations.

Level	Before	After
Primary	The teacher asks: • Why do we measure things? • What things do we measure? • What do we measure with?	The teacher asks: **Do we really need to have a measuring system?**  Community of Inquiry(COI) /Philosophy for Children(P4C) discussion. Listen to and respond to each other's ideas/ questions/ wonderings Possible prompt questions to initiate discussion: • What's a measuring system? • Is one type of measurement more important than another? • What form of measurement could we live without/ did we live without? Why change? • Could we estimate measurements in cooking? Would we still need a measuring system to do that? COI process can be found online eg http://museumvictoria.com.au/education/community-of-inquiry/
Secondary	Teacher: "I've noticed that some people are trying to add fractions by adding the numerators, then adding the denominators." $\frac{b}{5} + \frac{5b}{10} = \frac{6b}{15}$ This does not lead to the correct answer. The way to add fractions is: Start by finding the lowest common denominator...	What do you think? Does: $\frac{b}{5} + \frac{5b}{10} = \frac{6b}{15}$ Discuss your thinking with a partner. Think about these questions: 1. Do you think that $\frac{6b}{15}$ is more or less than $\frac{5b}{10}$? Would you expect that? 2. Could you test this for different values of b? If possible, discuss your ideas with another pair who thinks differently to you. 3. Share your ideas with the class. Has anyone changed their mind about $\frac{6b}{15}$ being the solution? Ask someone who has changed their mind to share their thinking about why they did that. What are other possible solutions? How could we test the accuracy of our ideas?

How do you think the technique Use dialogue might support *Element 2.2 - Build a community of learners?*

After reflecting on this question, compare your response to the answer on the next page

ELEMENT 2.2

Domain 2 - Create Safe Conditions for Rigorous Mathematics Learning

Element 2.2 - Build a community of learners

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

How does the technique Use dialogue support *Element 2.2 - Build a community of learners?*

Human intelligence is primarily developed through speaking and listening. The quality of our lives depends on the quality of our thinking and on our ability to communicate and discuss what we think with others. Talk is intrinsic to literacy and to our ability to form relationships with others. It is the foundation of both verbal and emotional intelligenc.e (Fisher, 2007).

There is much research that reflects Fisher's position about the importance of dialogue in learning and in forming relationships and hence a community of learners.

Community of Inquiry (COI), used in the Primary Years example, supports large groups of students to listen to and build on each other's questions and ideas. The purpose of a COI is to grapple with challenging questions and explore different perspectives or approaches. It is not intended to be a time for students to download disparate pieces of information. Instead, the purpose is to foster a culture of divergent thinking amongst the community of learners, unearthing the questions that we have as well as the insight that we bring. Teachers can intentionally use COI to develop skills in listening to peers and challenging opinions respectfully. Together with modelling appropriate COI behaviour, teachers may wish to explore appropriate sentence starters with students. Eg I disagree with that thinking, rather than I disagree with Tom (challenging the thinking rather than the person). I'm not sure, but I'm wondering if…. (this can make the participant feel safe about sharing their idea, because they have declared that they are unsure).

NB Community of Inquiry has been used successfully with groups of Secondary Years students.

The Secondary Years example challenges students to work in pairs or small groups, but the teacher can still be intentional about developing a community of learners through applying processes such as random pairing of students to work together in the initial stages of the lesson. Processes such as this need to be backed up by teachers ensuring that students are respectful about working with any member of the group.