

## Developing a Classroom Culture That Supports a Problem-solving Approach to Mathematics

Aspects to consider	More information on each aspect	Ideas to Try
1. Who does most of the talking in whole-class parts of the lesson?	<p>Generally, in a strong problem-solving environment the teacher needs to be doing around 30% of the talking and the students 70%.</p> <p>What do you notice about the balance in your classroom?</p> <p>What type of things are you saying when you are talking? Explaining how to do something? Asking questions?</p>	<ul style="list-style-type: none"> <li>• Look for problems that require little explanation to start yet are rich in thinking.</li> <li>• Give the students 5 minutes to explore the problem and see how they might get started. Then discuss it together as a class.</li> <li>• Show a video or live demonstration of a game. Can they can work out the rules through discussion together, rather than you telling them?</li> <li>• Discipline yourself to only make a comment on a student's answer to your question after another student has responded to clarify what was said, ask a question or take the thinking further.</li> <li>• You may like to ask the students to explain their thinking so far to the rest of the class and then take questions from their peers rather than you, as the teacher, intervening.</li> </ul>
2. What questions do I ask?	<p>Do you ask closed questions such as, 'can you see how the system works?' or open questions such as, 'what system can you see emerging in this problem?'.</p>	<p>Think about your types of questions. Here is <u>one</u> way of categorising questions – see full article for more ideas.</p> <ul style="list-style-type: none"> <li>• <i>Starter questions</i> - open-ended questions that focus the students' thinking in a general direction and give them a starting point e.g. Have you don't something like this before?</li> <li>• <i>Questions to stimulate mathematical thinking</i> – assist students to focus on particular strategies or relationships e.g. Can you see a pattern? What would happen if...?</li> <li>• <i>Assessment questions</i> – so teachers can see what student are thinking e.g. what have you discovered? Why do you think that?</li> <li>• <i>Final discussion questions</i> – draw together the efforts of the class and provide reflection e.g. Have we found all the possibilities? Can you think of another way? Have we found the best solution?</li> </ul>
3. Who answers the questions?	<p>Is it the mostly the same students?</p> <p>Is it the more articulate ones?</p> <p>Is it more often boys or girls?</p>	<ul style="list-style-type: none"> <li>• Give 5 seconds wait time before allowing the students to respond to a question.</li> <li>• Encourage the students to become fluent with the mathematical vocabulary – model this.</li> <li>• Capture key words and phrases that you hear students using as they talk and put them up on your mathematics 'talk wall' or other display to support the students to use those words.</li> <li>• Play dumb! Make a deliberate mistake and see how the students respond.</li> </ul>
4. How well do I listen to the students' answers and seek to understand what they are saying?	<p>Do I respond by telling the whole class what I think a particular student said without checking with them?</p> <p>Do I slightly adjust what they said to make better sense or fit a 'better/right answer'?</p> <p>Do I ask the student a 'clarification' question, such as 'can I just check what I think you said was ...'?</p>	<ul style="list-style-type: none"> <li>• Be curious about what the student was saying and ask a clarifying question such as, 'so what you are saying is ...?' You could alternatively invite the students to tell a partner what they think their peer said.</li> <li>• Resist the urge to finish their sentence for them with what you think they want to say or what you hope they will say! See what happens if you just repeat back to the student what they have said, using the same words they have used, and see if that helps them to finish the sentence.</li> <li>• Avoid making assumptions about what the student is saying. Check it out!</li> </ul>
5. What do I do with the	<p>Do I praise them for a fabulous answer?</p>	<ul style="list-style-type: none"> <li>• Keep quiet! Let a student speak next with a question, further idea or comment.</li> </ul>

<p>students' answers?</p>	<p>Do I simply evaluate their answers with comments such as 'Good', 'Well done', 'Right', 'OK', 'No', 'Think again'?</p> <p>Do I carry on with the next thing I was going to say?</p> <p>Do I ask other students to comment on what was said?</p> <p>Do I ask another follow-up question such as 'are you sure?' or 'how do you know that?'?</p>	<ul style="list-style-type: none"> <li>• Accept every answer as a useful contribution to the discussion by simply saying, 'thank you' rather than repeating the contribution or giving a value judgement such as 'good answer' or 'fabulous idea'.</li> <li>• Follow it with another question.</li> </ul>
<p>6. How do I facilitate the learning?</p>	<p>Do I explain how it needs to be done and make sure they understand it as fully as possible before working on their own?</p> <p>Do I give them key pointers/hints/clues to help them?</p> <p>Do I pull out the learning from the students' thinking and use that to develop the journey of the lesson?</p>	<ul style="list-style-type: none"> <li>• Decide what you want to focus on, in terms of your teacher behaviour, such as talking less, what I do to encourage the students' own thinking, what questions I ask or how I respond to their questions.</li> <li>• Be clear in your lesson plan what you are going to try out in the light of your focus above – particular questions, clarifying what the students say etc.</li> <li>• Reflect on the lesson with your colleague and decide what you want to try differently in your classroom as a result of trying out the bracelet investigation.</li> </ul>
<p>7. How confident are the students to take a risk, to try out ideas, to make mistakes?</p>	<p>What evidence is there of the students taking a risk in what they offer to the discussion or ideas that they try out?</p> <p>What evidence is there that the students are trying out their ideas rather than replicating mine?</p> <p>When is it helpful for them to replicate mine?</p> <p>What do I do when a student makes a mistake or follows a 'dead end' line of thought?</p>	<ul style="list-style-type: none"> <li>• To explore this further use the article <b>I'm Stuck!</b> <a href="https://nrich.maths.org/5727">https://nrich.maths.org/5727</a></li> </ul>
<p>8. What does my body language communicate?</p>	<p>Do I communicate interest/acceptance/frustration/disapproval ...?</p> <p>How does my body language change through the lesson?</p>	<ul style="list-style-type: none"> <li>• Identify one challenge for yourself, based on your observations from the video of your lesson. Share your 'target' with your Teaching Assistant and ask s/he to monitor that particular aspect of body language over a certain period during a future lesson. Make time to listen to his/her assessment and do that same thing later in the term.</li> </ul>

Source:

Pennant, J. (2013). *Developing a Classroom Culture That Supports a Problem-solving Approach to Mathematics*. [online] Nrich.maths.org. Available at: <https://nrich.maths.org/10341> [Accessed 25 Jun. 2018].