



Catherine Attard continues her guidance about making Maths come alive in your primary classroom...

What does it look like, feel like and sound like when your students are deeply engaged in a mathematics task? What is it like when they are disengaged? In my previous article for the JPL I provided a definition of engagement as a multidimensional construct, consisting of three domains: operative, cognitive and affective. The coming together of the three domains leads to students feeling good, thinking hard, and actively participating in their Mathematics learning (Fair Go Team NSW Department of Education and Training, 2006; Fredericks, Blumenfeld & Paris, 2004).

I also provided a discussion on the importance of establishing positive pedagogical relationships as a foundation for student engagement in Mathematics. In this paper I will move beyond pedagogical relationships to discuss what happens in practice – the pedagogical repertoires that promote positive student engagement.

The following figure (Figure 1) is an excerpt from the Framework for Engagement (FEM), (Attard, 2014), which provides a summary of the critical elements of engaging pedagogies.

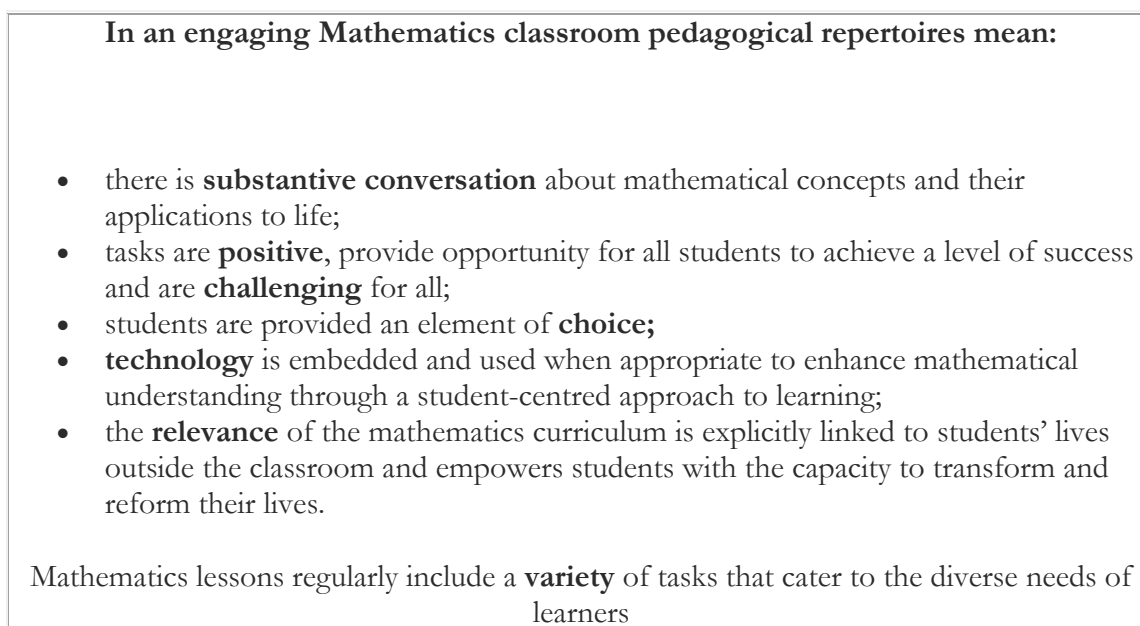


Figure 1: Engaging Repertoires (Attard, 2014)

What do these elements look like in practice? I will expand on each of the points illustrated in Figure 1, and provide some practical advice on how the pedagogies can be applied.

Firstly, how do we provide opportunities for substantive conversations between students and the teacher, and amongst students? If you consider a traditional approach to teaching where the Mathematics lessons are based on a drill and practice approach, it is difficult to see where important



mathematical conversations can take place. However, consider an approach where collaboration is encouraged through problem solving and investigation, and where student reflection is an integral aspect of every Mathematics lesson, regardless of the types of tasks and activities implemented.

We must also consider the Working Mathematically components of our K-10 Mathematics Syllabus (Board of Studies New South Wales, 2012). Promoting substantive conversation allows students access to each of the five components: Reasoning, Communicating, Understanding, Fluency and Problem Solving, and provides teachers with opportunities to assess them.

The provision of tasks that provide opportunity for all students to succeed can be a challenge for teachers. It is often difficult to differentiate activities to ensure the diversity of academic ability is not only addressed, but provides sufficient challenge. Learners need to experience success and a sense of achievement if they are to develop a positive attitude towards Mathematics. One way of ensuring all learners are challenged is to provide open-ended, rich tasks rather than closed problems that only have one correct answer or limited opportunities to apply a range of strategies.

Allowing student choice in the Mathematics classroom is an important element of engagement and sends important messages relating to power and control. You can provide choice by having alternative activities within a specific mathematical content area, or you can have students choose how they present their work. Perhaps students may choose to work with concrete materials or interact with appropriate technology. This does not have to occur in every lesson, but allowing students the freedom to make choices every now and then can contribute to their overall engagement.

Technology has become an integral part of contemporary life, and as such, our curriculum requires us to use it meaningfully to enhance the teaching and learning of Mathematics. The challenge with using technology in Mathematics lessons, however, is to ensure that we promote a student-centred approach. If you take for example, the interactive whiteboard, consider how it positions the teacher. The whiteboard is fixed and usually located at the front of the classroom. Any interactivity usually occurs between one person (often the teacher), and the whiteboard. The teacher has control and students are generally passive (Attard & Orlando, 2014). How can this engage all learners?

Many schools have introduced 1:1 laptop or tablet programs, however there is a danger that the devices may be used simply as a replacement for a traditional textbook or as a word-processing device to replace pen and paper. Online Mathematics programs provide some functional improvement to textbooks, however the opportunities for students to collaborate and become involved in substantive mathematical conversations is limited.

Fortunately, the introduction of mobile technologies such as tablets has now provided us with rich opportunities to develop highly engaging, student-centred mathematical activities and tasks.

The use of contemporary technologies in Mathematics lessons provides opportunities to illustrate the relevance of Mathematics and bridge the digital divide between the school and students' lives outside school. However, it does not necessarily mean students will be engaged. Caution must be taken to ensure the use of technology is driven by good pedagogy, rather than the technology becoming the focus of the lesson. Other ways to illustrate the relevance of Mathematics is to, where possible, embed mathematical concepts into real-life contexts and allow opportunities for students to apply Mathematics in meaningful and purposeful ways. This not only deepens mathematical understanding but will



enhance engagement. Of course, as mathematical concepts become more abstract in the senior years it is not always possible or practical to apply all concepts to real-life contexts, however if students have developed a love of Mathematics through quality practices, their engagement will be sustained.

The final aspect of the FEM relating to pedagogical repertoires refers to the provision of variety within Mathematics lessons. Although young students do require some structure, variety can be provided within that structure. For example, in the primary classroom children can be presented with a range of tasks that use a range of resources. Sometimes Mathematics lessons can be conducted outside the classroom – consider running a maths trail at your school where students can participate in interesting mathematical investigations based upon their physical surroundings. Explore the use of tools such as Thinkers' Keys (Attard, 2013) to provide Mathematics tasks that are open-ended and creative, and set homework that takes advantage of the Mathematics in students' lives, rather than drill and practice activities.

I have provided a brief exploration of engaging pedagogies that are listed in the Framework for Engagement with Mathematics (FEM), (Attard, 2014). Engagement with Mathematics during the compulsory years of schooling is critical if students are to develop an appreciation for and understanding of the value of Mathematics learning. Students who are engaged are more likely to learn, find the experience of schooling more rewarding, and more likely to continue with higher education. How can you adapt your practices so that your students value the Mathematics they are learning and see connections between the Mathematics they do at school and their own lives beyond the classroom now and in the future?

References:

- Attard, C. (2014). "I don't like it, I don't love it, but I do it and I don't mind": Introducing a framework for engagement with mathematics. *Curriculum Perspectives*, 34(3), 1-14
- Attard, C. (2013). *Engaging maths: Higher order thinking with thinkers' keys*. *Modern Teaching Aids: Brookvale*
- Attard C, & Orlando J, 2014, *Early career teachers, mathematics and technology: device conflict and emerging mathematical knowledge*. In J. Anderson, M. Cavanagh, & A. Prescott, *Curriculum in Focus: Research Guided Practice, proceedings of the Mathematics Education Research Group of Australasia annual conference*, pp 71-78. MERGA: Sydney
- Board of Studies New South Wales. (2012). *Mathematics K-10 syllabus*. Retrieved from <http://syllabus.bos.nsw.edu.au/>
- Fair Go Team NSW Department of Education and Training. (2006). *School is for me: pathways to student engagement*. Sydney: NSW Department of Education and Training, Sydney, Australia.
- Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). *School engagement: Potential of the concept, state of the evidence*. *Review of Educational Research*, 74(1), 59 -110

Dr. Catherine Attard worked as a school teacher and proceeded to complete a PhD on student engagement. She has been a part of the Fair Go Project Team at the University of Western Sydney. She is also editor of the journal Australian Primary Mathematics Classroom.

Catherine Attard conducts a weekly blog at: http://engagingmaths.co/about/?blogsub=confirming#blog_subscription-3 that has a number of resources that teachers are able to access and use."