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THE END OF NATIONAL STANDARDS: AN OPPORTUNITY TO FIND CREATIVITY IN PRIMARY MATHEMATICS?

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On December 12, 2017 the Ministry of Education enacted the new Government's commitment to end the use of National Standards writing, "schools and kura are no longer required to use and report on National Standards and Ngā Whanaketanga Rumaki Māori for the 2018 school year and beyond" (Ministry of Education, 2018).

Begg's (2008) vision for "an increasing emphasis on a living and changing curriculum" (p. 5) alongside this particular moment in education, provides us a stimulus to reflect on what and how we teach in primary education. The demanding pressures and requirements of the teaching profession can make it difficult to find time to quietly and genuinely ponder what and how we teach, but this seems like an opportune moment to do just that.

With a focus on mathematics, one of the three key foci of the previous National Standards, a possible first question to consider is: *what do we believe mathematics to be about?* Ask a few people this question and you are likely to get descriptions of mathematics being something "they are no good at", and recollections of doing meaningless exercises from a school textbook. Such experiences and perceptions can result in mathematics being thought of as an externally existing body of knowledge containing unattainable truths to do with quantity, patterns, shape, space and chance. With this belief, learning mathematics is considered to be about trying to understand predetermined fixed ideas.

An alternative belief identified in literature is of mathematics as a constructive, creative, experiential human endeavour (Mason, 2008). With this belief, the learner does their own exploring and discovering of ideas. The mathematics is embedded within the learner and the 'doing'. Few people (unless they have not yet reached school-age!) would consider ideas of creativity, imagination and wonder in conjunction with the word 'mathematics'. I think of a recent experience looking after my 22-month-old grandson, observing him spending almost an hour loading feijoas into the engine of his tractor, shifting stones from the garden onto the top of the tractor's engine (feijoas still inside) and then listening to my explanation that we couldn't then leave the stones on the lawn because of the potential impact on his father's lawnmower. The play was focused, concentrated, and interspersed with learning to steer the tractor as Nana obligingly provided the engine power. Opportunities for learning included spatial awareness, volume, 'more'(a favourite word) and social constructs such as thinking of others. Mathematical concepts were being learned in a creative, imaginative and play-based way. Wonderful!

If the idea of mathematics being creative, imaginative and wonderful for our learners (of any age) appeals, does the second question become, *how do we teach mathematics in this way?* It seems to me there are several ways to do this. I'm not immediately drawn to the addition of extrinsic motivation such as rewards (think star charts) or even thinking of games (although these have a place). Rather, what comes to mind is embedded, and perhaps not immediately obvious, within the sentence stem of each set of mathematical achievement objectives from levels 1 to 8. This reads, "in a range of meaningful contexts, students will be engaged in thinking mathematically and statistically. They will *solve problems* [emphasis mine] and model situations that require them to:…." (Ministry of Education, 2007, n.p.). For those who remember the previous mathematics curriculum (Ministry of Education, 1992), the idea of mathematical problem-solving being at the heart of mathematics is not new. However, not having ever truly experienced the joy (and challenge) of problem-solving I recall how I used to relegate problem-solving to the occasional Friday afternoon or end of a unit – once the supposedly real (read lists of equations repeating what I, as the teacher have just shown the children to do) mathematics had been done.

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So, what is a problem? The key aspect of a mathematical problem is that there is no immediately known (by the problem-solver) means of solving it (Schoenfeld, 2013). Thus, if a teacher has just demonstrated something on a whiteboard, there is actually no 'problem'. What does mathematical problem-solving look like in action? It means the problem-solvers won't immediately know what to do, and we, as teachers, have to learn to initially stand back (there are helpful frameworks to support such lessons – see Sullivan, Walker, Borcek, & Rennie, 2015) and trust learners to be creative, imaginative and give the problem a go. Experience across a range of classrooms shows this engages children; most recently I've witnessed this in a large modern learning environment of 60 children, *all* engaged in the one 'low-floor, high ceiling' problem. Problem-solving takes time (at least a whole lesson or several), playing with a range of ideas (some of which won't work), working on one's own and in small groups, communicating with others, justifying and explaining your thinking, struggle and persistence. Opportunities to link to the current curriculum's (Ministry of Education, 2007) key competencies are abundant.

Returning to our pondering, the third question might then become *how do we learn to teach mathematics in this way?* Three things come to mind. First, it is beneficial for teachers to actually engage in solving mathematical problems (Holton, 1997). Second, research suggests that working collaboratively with other teachers is an effective way to learn about, and reflect on, one's teaching (Timperley, Wilson, Barrar and Fung, 2007). The next step then might be to find an interested teaching colleague locate a genuine problem for you both (see nzmaths.co.nz/problem-solving) and have a go. After successfully solving the problem (seek help if you get stuck – that's all part of it) have a think about what this might mean for mathematics teaching and learning. My third thought in response to thinking about learning to teach mathematics as a creative endeavour, is trusting and positioning children as capable and competent problem-solvers. If children are already entrenched in a perception of mathematics as being an external body of predetermined, fixed and difficult ideas this may take some undoing and persistence on our part. Recent work on developing mathematical mindsets could be useful here, encouraging the children to come to know themselves as capable and competent mathematicians (Boaler, 2016).

The end of the mandatory use of National Standards and the associated pressure this placed on learners, parents, teachers and schools, provides us with an opportunity to reconsider our mathematics programmes. Teachers I've spoken with have expressed delight about the ending of the mandatory requirement, explaining they see this as an opportunity to provide more creative mathematical and integrated curriculum experiences for learners. Embedding mathematical problem-solving within teaching programmes might be one useful way to achieve this. In the meantime, I'm also taking a moment to pause and ponder the curriculum I teach with pre-service primary teachers.

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