

**“From little things, big things grow...”**

**Address to the first “lead teachers” graduating from Sydney Catholic Schools  
Mathematical Expertise and Excellence Program, 16 October 2020.**

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There is nothing more important in life than to have a purpose that is bigger than yourself. In this respect, teachers are to be envied. As teachers, you have such a purpose. You have such a guiding principle, an overarching value which orients your professional choices. Your goal is to expand the knowledge, skills and understanding of the next generation so they can shape their individual and collective future for themselves.

As a former teacher myself, I know that nothing gives a teacher greater joy than when, after having worked with their students on a difficult problem, and seen them struggle with the tension of inquiry, the student suddenly “gets it”, they have that “Eureka!” moment, the “Aha!” experience of joy, when all the pieces of the puzzle fall into place and they gain insight, understanding and knowledge. This is what teachers live for, to see that look of understanding in their students faces. There is nothing like it.

Unfortunately, this experience is not as common as it should be when it comes to the teaching and learning of mathematics in Australian primary schools. A report released just this week by the Australian Council of Educational Research highlighted the phenomenon of maths anxiety and the negative impact this is having on achievement in STEM subjects. The report talks about the need to stop the negative domino effect that starts, in the authors’ view, with poor motivation and self-concept in maths. That domino then leads to maths anxiety, which then leads to low levels of perseverance in maths, low feelings of self-efficacy and ultimately low achievement in maths.

But the report does not go far back enough. The row of dominoes doesn’t start with low student motivation and self-concept. It starts with maths anxiety on the part their teachers. That is where we need to target effort.

An analysis of data from a 2018 survey conducted by the Australian Mathematical Sciences Institute shows evidence of maths anxiety and perceived inadequate pre-service training among primary teachers, as well as evidence that change in improving teachers’ mathematical skill base and reducing their maths anxiety is possible through suitable intervention.

The findings from the literature and the data analysis are of concern and demonstrate the need for urgent action, not only in initial teacher education, but also in professional development for teachers already in the classroom, if we want to see a reduction of maths anxiety in pre-service and in-service teachers and their students. Most primary teachers and their students are **not** experiencing the joy of mathematics, and that has had, is having,

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and will continue to long-term consequences for our economy and for gender equity in the STEM-oriented workforce of the future.

But **you**, who have been on the Mathematical Expertise & Excellence journey now for three years, **have** experienced this joy for yourselves, and you will have seen your students experience it as well, and you will have seen how your colleagues, whom you are mentoring and inducting into this better way of teaching, have experienced it. That's what it is all about!

When you reflect back on your journey, many of you will notice the movement from scepticism to understanding, from ignorance to knowledge, from frustration to joy. You will see how far you've come and how your teaching practice has improved. It's as if the scales have fallen from your eyes and you are seeing the truth for the first time. You will have said to yourselves, "Why wasn't I told this before? This makes so much sense!" Instead of just going through the motions that felt routine and dry, with some old blackline masters, you are now collaborating and creating launch tasks and learning intentions and success criteria that based on conceptual understanding that delivers the Eureka moment.

You are experiencing that collective teacher efficacy that comes with awareness of being part of a great mission. "Go out to all the schools and preach the good news!" The ME&E news. But you are under no illusions about the difficulty of the task. There will be those who don't understand that this is a long and difficult journey, who will demand miracles and signs and wonders.

Here the lessons of history are instructive. It took Germany nine years – nine years – to start turning around their PISA results after implementing changes to their education system in response to their shocking 2000 results. OECD research into policy implementation suggests that five years is too soon to see the impact of major reform.

Patience and perseverance and commitment are the key. History tells us that many "quick wins" can also be short-lived wins, like the seeds that were sown on the side of the path, that sprung up in shoots but quickly died away because they had no soil into you which to grow roots. You need to prepare the ground. That is what bears fruit. You not only need to get with the program, you need to stick with the program.

We know from John Hattie's work and that of the Grattan Institute that improving the quality of teaching will turn student results around eventually. Hattie identifies collective teacher efficacy as the thing that has the biggest effect size in terms of improving outcomes (outside what the students bring themselves to the classroom). It's not rocket science. The intervention logic is clear. If you want improved outcomes, you need to invest in quality teaching, preferably using a model that builds collective efficacy, not just individual efficacy.

As lead teachers, your role in your schools will be crucial. Well supported, your example will inspire others to become not just better Maths teachers, but better teachers in other subjects as well. That is because the underlying method is applicable in other subjects.

This is because ME&E develops teachers who not only enhance the mathematical knowledge, skills and understanding of their students, but who also develop students' capabilities in creative and critical thinking through the way you teach mathematics. When you present the students with a problem and ask them to try different ways of solving it, that is encouraging them to be creative. You get them to look at the data – the various elements of the problem – and ask questions about it. Are there any patterns here? What's a different way of grouping these things? What if I did it this way? This is creativity, creative thinking. This paves the way for critical thinking.

Then the students have to make a decision about what approach they will use and whether the answers they come up with are likely to be true. They have to apply criteria, and make a judgement based on the evidence before them and having asked all the relevant questions. This is the essence of critical thinking.

When you point out to them the steps they have undertaken, they come to understand and enjoy that they are creative and critical thinkers able to solve problems. This metacognitive confidence in their abilities will flow over into other areas of learning.

This role of teachers in helping young people discover themselves and the world – and how they can then shape the world through their ability to think creatively and critically – is why teaching is not only the most important job in the world, but also the most important job *for* the world.

No other occupation offers as many ways to help others learn and grow in their most formative years and take responsibility for their own lives. As a student and as a teacher, to my current role as the CEO of ACARA, I've been fortunate to meet many good teachers – but what makes a teacher great?

**First**, great teachers will always aspire to be the best teachers they can be. They will be open to learning, they will aspire to excellence and will constantly think about ways to improve their practice. They won't just adopt change for change's sake because they know that not all change leads to improvement. They will think critically, evaluating carefully the latest trends to sort fad from fact. They won't be taken in by new theoretical baubles that are shiny on the outside and vacuous beneath the surface. They will take their professional learning seriously, evaluating those experiences and offerings through the lens of whether it is going to lead them to changing the way they teach for the benefit of their students.

**Second**, a great teacher will be respected and respectful. When I was training to be a teacher, at the end of my first practice round, the Dean of Studies at the school told me: 'There are two types of teachers: popular and successful. You were popular.' Ouch!

Obviously, the Dean of Studies didn't mean to say all good teachers are unpopular. He himself was well-liked, but he wouldn't admit that. His point was that my relationship with my students is fundamentally a professional one, and that the measure of a good teacher is the learning that takes place.

Certainly, great teaching involves having a good relationship with students. But those good relationships are based on trust, expertise and respect, on being fair, being reliable, being a person of your word, being a person who offers structure and consistency in order to provide a classroom environment where learning happens.

It is true that, often, the realities of the classroom and the school seem light years away from such elevated visions of teaching. Rowdy kids, unsettled Friday afternoons, outbreaks of bullying, encounters with parents who are either too demanding, or not demanding enough – all these occur and place far more immediate challenges on teachers. Teaching is a challenging profession.

But, as many teachers know, it is often *through* these experiences, not in spite of them, that teachers find the way to relate to their students professionally, which puts their needs as learners at the forefront.

**Third**, that trust of which I just spoke is based on deep subject matter expertise. Many of us, in choosing to become teachers, have been inspired by great teachers we had at school – people who showed they were committed to our intellectual and personal development by the way they taught. In particular, it was their deep knowledge and passion for their subject that was inspiring.

I had a number of such teachers, but one stands out in particular. His name was Kevin Garrity and he was my HSC maths teacher. He was slightly eccentric. He wore a t-shirt with "I love Maths", and he would take any opportunity he could to help us see how mathematics could be applied to our understanding of the world. Kevin would set us tricky calculus problems, and as he wandered around the room, he would often wave a hand-held fan over us. One day, I asked him, 'Sir, what are you doing?' and he replied, 'I am fanning the flames of wonder!'. 'Fanning the flames of wonder' is the best summary I have ever heard of the role of teaching.

**Fourth**, a great teacher has the ability to inspire students to ask more questions, not just to answer them. Their role in leading students to knowledge is not to satisfy their desire for knowledge, but exactly the opposite: it is to make them hungrier and thirstier for more – more knowledge, more skills, more understanding.

A good lesson will conclude with students knowing they have learnt something, but a great lesson will conclude with students being *unsatisfied* with what they've learnt, wanting to learn more, and asking more questions. That's fanning the flames of wonder. That's great teaching.

And the nature of their questions will branch out into an ever-widening circle of interests and concerns. Which brings me to a fifth dimension of great teachers.

**Fifth**, a great teacher will have self-awareness. Not only aware of their own authority and expertise and efficacy, they will also be aware that they never stop learning and growing.

The earliest known curriculum document was a two-word inscription on the Temple of Apollo at Delphi in Greece. It read simply, 'Know yourself'. Knowing yourself and examining one's life in a systematic and fundamentally honest way, so as to become wise – this is the most profound outcome of a successful education.

Developing in students a commitment to thoughtful, honest, purposeful human agency, respectful of others and embracing the common concerns of one's communities, this is the wider objective of the calling of a teacher: to help young people come to know themselves and the power they have to change the world.

When teachers do these things well, their conversations with their students about knowledge and the world under construction will flourish from the creative and critical thinking of a new generation of lifelong learners who understand that they have minds, and that they can use them responsibly for the common good.

**Finally**, great teachers are team players. This relates to the self-awareness I was just talking about. Let me illustrate by asking, what do fire-fighters and teachers have in common? They have some obvious differences, of course. Their job is put out physical flames, but your job is fan metaphorical ones. But there are similarities.

Consider the conduct of a fire-fighting operation being carried out by a brigade that has a mix of experienced old hands and fresh-face volunteers. The experienced members will instinctively know, from years of fire-fighting, the small tell-tale signs that a fire might be at risk of getting out of control – a subtle change of wind-direction, an ember coming from an unexpected angle, smoke where there should be none, sounds of cracking wood from a distance beyond their actual vision - and they adjust their approach accordingly.

All the time brigade members are monitoring their own position and that of their colleagues, sharing information and communicating with others in the brigade about risks and developments. The old hands will explicitly pass on their knowledge to the newcomers, encouraging them to see what they see, understand that the data of their sensory experience is part of a pattern, and they bring to bear their expertise in making decisions about how to respond. They alert one another to aspects of the situation about which they may not be aware. "Look out!" "Move back!"

The members of the brigade rely on their own judgement, but not exclusively. They must be open to the possibility that they might be wrong about something crucially important and be willing to change what they are doing when that judgement is shown to be

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erroneous. They cannot afford to get defensive. They can't afford to fight against the facts of the situation.

When the event is over, they conduct a debrief, reflect on what actually happened, what they did well, what not so well, how they could be better next time, what they learnt individually and collectively. Through this process of data-triangulation and critical reflection on their own practice in dialogue with their colleagues, they bed down and improve their skills and set themselves goals for getting better and quicker at certain things.

This kind of intellectual humility and openness to critique is a kind of moral accomplishment that is key to continuous improvement. It demonstrates a commitment truth over and above one's own current state of understanding. It's the sign of genuine professionalism.

Now consider teachers. Great teachers will work as a team and bring to bear that same intellectual humility and commitment to continuous improvement through professional conversations and self-assessment. Through modelling, mentoring, providing feedback, goal-setting and leading professional conversations, you lead teachers will help build the collective efficacy of your colleagues, that sense that they make a bigger difference when they are part of a bigger team. This is the professional learning model that is adopted through ME&E, and it is a great model.

So to conclude, congratulations to the first Lead Teachers from the Mathematical Expertise and Excellence program. You are trail-blazers, pioneers. In the words of Paul Kelly, from little things, big things grow. May you be the start of a powerful movement for improvement in the competence and confidence of our teachers in the teaching of mathematics.