

A School Mathematics Leader's Account of her Leadership

Jill Cheeseman

Monash University

Jill.Cheeseman@monash.edu

Kerryn Driscoll

Deakin University

kerryn.driscoll@deakin.edu.au

Leading primary school mathematics involves stimulating teacher learning for the purpose of improving students' mathematical outcomes. Currently there are staff shortages and school mathematics leadership may have changed. The results of a semi-structured interview with an experienced School Mathematics Leader who reflected on her work are reported here. She was asked about her "classroom work" and to describe her goals for mathematics learning. Fullan's (2001) *Framework for Leadership* was used to shape conclusions to the study around: moral purpose, knowledge building and sharing, coherence making, understanding change and relationship building.

We hypothesise that teachers learn "on the job" and, in fact, the job changes as societies change. The recent experiences of teachers during the pandemic have shaped and impacted on their teaching and on the learning of mathematics by students. The consequences of these experiences for the leaders of mathematics teachers are largely undocumented. This paper documents the views of a single leader as she reflected on her current work.

The research literature notes that School Mathematics Leaders influence mathematics teaching and learning in classrooms and schools by improving teacher practice (Faragher & Clarke, 2014). These leaders are knowledgeable, on-site practitioners who support teachers in mathematics teaching with curriculum assistance, lesson planning, evaluation of student work and assessment (Campbell & Malkus, 2013). School Mathematics Leaders provide the necessary support for teachers to learn and develop high-quality teaching practices through on-site, job-embedded professional learning opportunities (Gibbons & Cobb, 2017). Additionally, these leaders have the capacity to create positive, practical, and sustainable change and as curriculum leaders they play a key role in providing in-class support and professional learning related to mathematics content and pedagogy (Grootenboer et al., 2015).

Authors of studies such as Ingvarson (2005) and Tharp and Gallimore (1989), have examined the types of support primary School Mathematics Leaders provide. Supportive techniques such as modelling, questioning, explaining, management strategies, feedback, demonstration lessons, professional readings and the "opportunity to observe effective examples and effective practitioners" (Tharp & Gallimore, 1989, p. 24) have been noted. Males, et al. (2010) also found that mathematics teachers benefited from the experiences of conversations focused on student learning and data. Further, Gibbons and Cobb (2017) listed activities leaders used to support teachers, including: working with groups of teachers, engaging in the discipline, examining student work, analysing classroom video, engaging in lesson study, and working with individual teachers by co-teaching, and by modelling instruction.

While it is generally accepted that continuous professional learning is key to improving practice, it is important to understand ways in which teachers learn to develop and refine their teaching practice (Hollingsworth & Clarke, 2017). Teachers in several studies indicated the importance of support from School Mathematics Leaders in their classrooms (e.g., Butler et al., cited in Clarke et al., 2013). Supportive practices such as observation, modelling, and lesson debriefing were viewed as some of the most valuable components of teachers' professional learning (Clarke et al., 2013). According to Ingvarson (2005) young teachers highly value the chance to see expert teachers at work and to get feedback from them about their own teaching. By working "shoulder to shoulder" the School Mathematics Leader can access and influence planning and teaching, model new practices, and provide informal feedback to teachers.

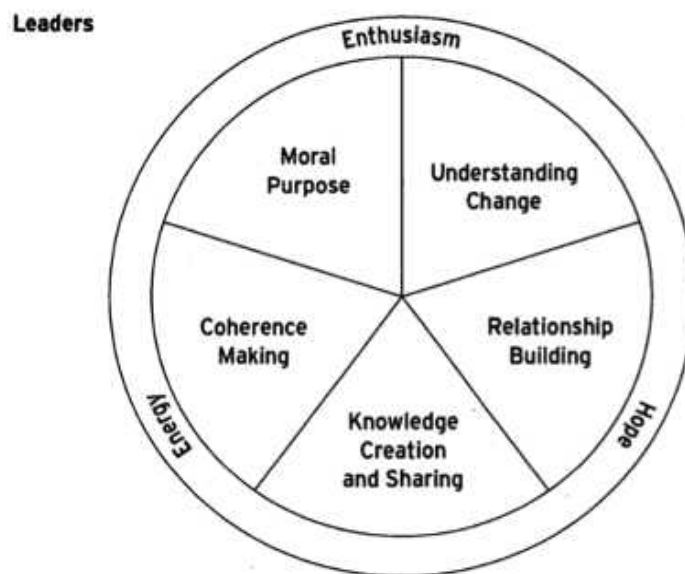
(2024). In J. Višňovská, E. Ross, & S. Getenet (Eds.), *Surfing the waves of mathematics education. Proceedings of the 46th annual conference of the Mathematics Education Research Group of Australasia* (pp. 143–150). Gold Coast: MERGA.

Leaders can create a protected environment where teachers feel confident to take risks and to learn. The intent of this study was to document details of a leader's work in the current environment.

Fullan (2001) claimed that ongoing improvement requires teachers and leaders work together as agents of change. The theoretical framework developed by Fullan (2001) and used to underpin large-scale reform of education in Canada and the United Kingdom and elsewhere, was used as a theoretical framework for the present study. In summary, the framework involving leaders is described as having five core components. These components include moral purpose which involves having a commitment to making a positive difference; understanding change which can be slow and difficult; relationship building whereby leaders foster purposeful interactions and the respect of others with diverse views; knowledge creation and sharing as an important component of effective leadership and coherence making which is complex and elusive. Pursuing moral purpose, understanding the change process, cultivating relationships, and building deep knowledge lead to greater coherence making (see Figure 1). These components are represented as a circular region of the framework with the personal characteristics of energy, enthusiasm and hope surrounding them as important characteristics of effective leaders.

Figure 1

A Framework for Leadership—Leaders (Fullan, 2001, p. 4)



The extent to which data reported in this paper can be interpreted with the Framework of Leadership will be considered as conclusions to this paper.

Method

Initially we had an informal professional conversation with a School Mathematics Leader, Kate (a pseudonym). We raised the possibility of conducting a formal interview with her to help us to understand her current work as a leader of mathematics in a primary school and Kate agreed to participate. The data reported here were collected using a semi-structured interview. The questions were designed to collect demographic details of the school, the length of Kate's experience as a School Mathematics Leader, and her approach to leading mathematics in her school. She was asked how she decided what to do and to describe her goal(s) for mathematics learning. Kate was asked what new learning she would like to see in her teachers and to describe any challenges she faced as the leader. The interview was conducted by the second author via Zoom. Video records and transcripts were produced by Zoom. The automated transcripts were

checked and edited to remove repetitions of speech and provided the data that are described and discussed here. Each researcher read and coded the transcripts. Comments which detailed the leader's role, were highlighted and each researcher summarised the main point in a few words as margin notes. These brief notes were categorised according to themes which were used as headings in the Findings section here.

Our aim was to identify current features of the process of leading mathematics, collect an account of "classroom work", and create a narrative of the school mathematics leadership. The research question we sought to answer was:

- What can we learn from one leader about current leadership practices in primary school mathematics?

The focus of the interview was an element of her leadership that Kate called her "classroom work". We were interested to know about the components of practice called *teaching alongside* by Driscoll (2021). This practice involves mathematics leaders teaching with a teacher in the teacher's classroom with the teacher's students. Essentially, we hoped to have Kate describe what she did in classrooms to lead mathematics learning with teachers. Findings from the interview will be presented in a narrative style. The general points that Kate made will be presented succinctly with matched evidence from the transcript.

Findings and Discussion

Kate had told us in conversation, and later in interview, how important her "classroom work" was to her leadership of mathematics improvement in the school. She described how she had used assessment data available to the teachers to analyse the mathematical strengths and weaknesses of classes and Year levels across the school. In a large school of 480 students and 30 teachers she had to use her full-time mathematics leadership role strategically. Initially she targeted the classes in which students had very disappointing results on NAPLAN or PAT Maths measures. Having doubts about the mathematics content that the students were being offered, Kate decided to try to influence mathematics tasks through planning.

Support Through Planning

Planning meetings have been shown to be an effective vehicle for teacher professional learning (Driscoll, 2021). Kate described attending meetings to discuss "rich" tasks and making folders of activities available to teachers on shared drives:

Planning—with the union [new enterprise bargaining agreements]—I've got to be invited into their planning time now rather than just come in at a specific time. So, there are some Year levels that are quite happy for me to come in. The ones where I want to make a difference, they want to get their planning done in their shared planning time ... I find that challenging in itself. But I will drop things [task ideas] into their planning documents, I've got 'Kate folders' all over the place and some teachers will take the ideas up.

Kate was hoping that the examples of more open and more problem-solving tasks might inspire teachers to choose and use tasks that required deeper mathematical thought "I think in my mind it was let's try and get rich tasks in the classroom first. And then I was thinking the next step was to get into the classrooms a little bit more."

Kate found that while the tasks might be chosen by her teachers, they were not always implemented with the pedagogies that pressed and extended students' thinking. As Stein et al. (2009) had noted, teachers often simplified the problem to make it one that they felt confident to use with their students. Kate said, "I find you can do it in planning, and planning is good, but then also being able to do it in the classroom has just as much of an impact."

Demonstration Lessons

Developing their pedagogies to maximise student learning was considered difficult and teachers wanted demonstrations of teaching approaches. Kate commented:

Sometimes the teachers want you to show them exactly how to do everything. So, then the real thinking, the evolving all the actual learning and doing it yourself disappears in a sense. ... But getting the students to articulate what they did, and why they did what they did, is a big thing throughout the school.

Kate had realised that she needed to model tasks in teachers' classrooms with their students:

It makes me stop and think and wonder. Teachers don't get enough opportunity to see other people in practice ... It's one thing (and don't get me wrong) planning is important and having a good task or a good lesson is very important. ... But then at the same time, actually modelling that, is also very important.

Kate was aware that teachers were happy for her to take the responsibility for teaching their students. However, for them to teach in front of her, or with her, there needed to be a relationship built on trust, confidence, and secure mathematical knowledge. She realised moving from demonstrated lessons to co-teaching or teaching alongside others was a big step:

I suppose you get a bit of "Oh, Kate did a really good job with this" and there's a bit of a vibe. So, they're quite happy for me to come and teach. I suppose the challenge is for them to teach in front of me and to get a little bit of feedback. It doesn't happen that naturally unless they're quite comfortable with me and confident in their own mathematical abilities.

Kate took heart from one of her teaching team who was a quiet source of encouragement:

There was one teacher in particular and he was quite happy for me to observe him teach and I just worked with the kids as well. But he has been a maths leader before, so probably, his pedagogical content knowledge is high enough that he doesn't feel uncomfortable about me being there.

Teachers whose students' assessment results were not high, did not feel the same about teaching with Kate:

The others [whose] PAT Maths data results didn't show as much growth in that Year cohort, they're more excited to see me teach ... It's very awkward to find out what they're not doing because they don't like being observed. ... Yeah, they don't want me to critique ... they don't want me to even focus on one particular thing. When I go in ... I'm trying to teach them something in a very subtle way.

Kate gave an example:

The kids were sitting on set spots on the floor and I asked her to just cross everybody's name and as I asked questions, I said, "Look, I just want to check my own practice. I want to see if I'm covering lots of kids rather than just answering backwards and forwards with one. So, can you please mark who I'm actually talking to and how many times backwards and forwards." So, I do a few little things like that. In the end they actually think about it with their own practice as well.

Kate described the tasks she chose to implement as more challenging than those chosen by some teachers. She seemed to be trying to convince her teachers that their students are capable of more difficult mathematical thinking—that their expectations were too low. Perhaps straight grade school organisation can allow teachers to consider students as all at one place mathematically (in the intended curriculum).

Some teachers still want to tell them [students] how to do it rather than asking them questions to get them to think. I get told that I choose tasks that are more challenging for the students than what the classroom teachers do. ... I've noticed it's one of the challenges. I think teachers put things in boxes too much because I hear, oh, that's the Year 3 curriculum.

Targeting Parts of the Demonstration Lessons

A particular part of the lesson Kate mentioned was her work on the conclusion of the mathematics lesson where the intended learning is reviewed and the mathematical ideas that students have been grappling with are elicited and explained by the students and the teacher:

I really focus on the *summarise* phase and allow that time. I say it's important and I suppose when I'm actually explaining what I'm doing with the students, because they're not used to me teaching. I use some strategies that I just naturally do. Like I say, "Turn and talk" and "Think, pair, share" and things like that because then they get an opportunity to talk amongst themselves before they answer back to me because that gives the kids confidence. So, I know I'm role modelling those strategies.

Modelling Curiosity and Experimentation as a Learner

Kate also modelled being willing to try new ideas by being inquisitive to learn more about teaching. She trialled an example of Liljedahl's (2020) management technique by bringing the students and the teacher along as participants:

I just read something that's really good by Peter Liljedahl and we're all going to use the whiteboards ... partners are going to be randomly selected and I actually tell the students, you know, this is this really good mathematician in Canada, and this is what he said and I'm going to give it a go with you guys. So, I'm really open with what I do ... and we're going to see how well it works and I'm going to ask you what you think about it. So, I take them on the journey, but I'm also taking the teachers on the journey at the same time ... There's a purpose behind it.

Kate included the students in her willingness to evaluate new interesting tasks and to seek their views as well:

I talk the students through it so that they understand, and I also tell them of tasks that are brand new because it's not like I just keep repeating what I'm doing. I'll tell the teacher. ... I've never taught this lesson before and I'll tell the students, [and ask] what did you think of that? Because they honestly sometimes think because I've been a maths leader for quite a while, that I'm the one with all the answers.

As well as being explicit about her role as a learner, Kate described some of the qualities she thought leaders need to have. She talked about the need to be curious, brave and vulnerable:

You know, I'm still learning and growing too. So, there's a bit of that vulnerability but also that idea of I'm willing to try out something new in front of them as well so that they understand and explain, you know, sort of where it came from or the reasoning behind it.

Kate recognised that a reluctance to try new things may be due to fear of failure by very anxious teachers. She was aware that teachers need to come to terms with their need to build their knowledge for teaching:

I'm the one that's going to fall or trip over or fail or whatever and especially the ones that are really anxious because they feel like, once they get over that fear that they see the students. Student's conversations with me or their responses [are seen] as a true reflection. That's the first fear. That their responses aren't good enough so it's a true reflection of their teaching straightaway. Once they get over that hurdle ... then they can go, oh yeah, well, where do we move on to next?

Opportunities to Work in Classrooms

When asked about how often she worked in classrooms, Kate said that she had been in classrooms every day often teaching 7 or 8 lessons a week. She spoke about teaching versions of the same lesson 3 times across a Year level. Kate explained that, "the teachers are quite open to me coming in to teach lessons." However, Kate explained that on occasions:

there have been times when I've tried to shift [responsibility for teaching], and it depends who the teacher is, ... certain teachers are quite happy to teach and for me to support. If there was a bit of push back and I could see that a certain individual was tense or something I would go well I'm happy to come in and teach it for you and then you can see what I'm trying to explain.

This comment also shows Kate's awareness of the need to read people and be responsive. Kate was aware that change is slow and difficult and that individual teachers needed to feel strong and resilient and ready to take a risk. She explained, "The challenge is to work out when to press and initiate and suggest and then when to hold back." Kate said that she had worked with teachers long enough to realise that sometimes if they are feeling pressured "they're not willing to take a risk, or they're more insular or more protective of what they do, so you've just got to be really careful about how you go about the process and what you're willing to do."

Kate suggested that you need to “pick your moments and to know when to push and to know when to suggest ... or keep trying with certain individuals, but the data’s helped me.” One of the strategies Kate used to develop improved teacher practice in the classroom was to have a conversation based on the student assessment data, “it’s a good thing to have a conversation ... based on the students’ learning rather than the teachers’ teaching.”

Reflection on shared classroom experiences was not a systematic part of working in classrooms for Kate. Time was seen as a constraint except in her work with new graduates:

It just depends on the day and what’s happening. I make the effort to go and see them and talk to them about it, but there’s no, you don’t get that extra time. The only time that we got to reflect was with the graduates with their programs because we just had more time allowed for that.

External Initiatives for Professional Learning

Kate noted the impact of participating in an action research project. Having external support for a short, focused professional project that looked at questioning and question types used in mathematics lessons was a successful initiative in her school. However, Kate said that using a similar action research cycle for general improvement was unlikely to be accepted by the staff:

We did a little bit of focusing on questioning and the types of questions we used. It was one little project ... I have been involved in a few action research cycles and that’s been really good. They’ve come up through my maths Masters [degree] ... I feel like I need that support from the outside in to implement something like that and if I wanted to do an action research cycle, just purely to improve the quality of the teaching I think that I’d be hitting my head against brick wall, to be honest.

Making a Difference

Kate described teachers as at different points as learners and reflected on several occasions when she felt valued by teachers. She commented, “when they’re asking you for your advice and support, you’re halfway there.” Kate felt she was making a difference, particularly while working with a graduate teacher, who according to Kate “was absolutely brilliant to work with in maths and open tasks.” The influence of professional development and “seeing it [teaching] transformed [created] wonderful moments in that sense.” Kate also commented:

I used to teach with her quite a bit. Yeah, that was good fun in that you could see her questioning, using tasks to be open enough to allow all students entry level, and then even having the discussions about the students work samples and what we could reflect on by looking at them and the students thinking in terms of, you know, the way that they were doing the task like that. ...When they’re working with you to work out what the summary phase looks like, you know you’re getting somewhere.

Conclusion

To shape the narrative data, Fullan’s (2001) *Framework of Leadership* characteristics of leaders will be used as headings for some conclusions.

Personal constellation of energy, enthusiasm and hope. Kate’s personal characteristics of energy for her leadership through her “classroom work”, together with her enthusiasm for mathematics teaching and learning, and her hope for improvement in learning outcomes in mathematics, were plain.

Moral purpose. Kate referred to improving mathematics learning for all students saying, “the conversations are really important from within that sphere of how we can best support all students at the school.” However, it is not clear from the interview that the whole school team has developed a shared purpose of improving students’ learning in the manner Kate described, as the evidence suggests that some teachers are trying to be invisible through a process of change. That is not to say that they do not want the best for their students, it may be that they do not share Kate’s vision of what is “the best”.

Knowledge building and sharing. The central purpose of Kate's leadership was to improve the quality of mathematics teaching and learning in the school. To achieve this aim, she was intent on building the pedagogical content knowledge of the teachers. Initially she examined the assessment results to identify the Year level teachers most in need of support. She then collaborated with teams of teachers to improve mathematics planning by sharing more complex and challenging tasks. However, while teachers were willing to adopt the tasks, they had no confidence in implementing them. Kate was asked to demonstrate the open problems and trial investigative tasks in classrooms with teaching techniques that required students to reason and explain their mathematical thinking. Teachers noticed increased student interest and engagement and found students were capable of more complex mathematics than had previously been expected of them. One of the teachers observing Kate also became interested in the range of question types she used. These questions became a shared topic of discussion and focus amongst the staff more broadly. Kate used her involvement in a university project to initiate investigative teaching across the year levels with teacher-negotiated goals in mind. She used what Clarke and Hollingsworth's model of professional growth (2002) termed the *external domain of influence* to create a knowledge building environment in a short-term action research project.

Coherence making. It seems that teachers were being influenced by observing demonstration lessons with a focus on students and their thinking. Opportunities were created for discussion and reflection, learning and participating, by new graduate teachers. It could be beneficial to create more opportunities for reflection and discussion across Year levels with groups of teachers whose children have been taught the same lesson content. For example, several teachers' observations of their students' learning could promote an exchange of views and analysis of the pedagogical approaches that were demonstrated. An authentic part of teachers' teaching is reflecting (Shulman, 1986) and including opportunities for staff to reflect jointly could build coherence and shared knowledge.

The approaches to mathematics teaching, that were considered by Kate to be productive, were modelled for the teachers to observe. Presumably this practice was designed to build coherence by showing teachers what actions and knowledge were required to teach mathematics well. The questions this approach raises are: Whose methods are valued and privileged? Are teachers permitted to teach in different ways? A telling comment was Kate's view that teachers would not accept another action research project like the one they had undertaken previously. It seems that in a cost-benefit analysis those teachers had decided the "costs" were too great for the perceived benefits that resulted from the projects.

Understanding change. Change is messy and takes time according to Fullan (2001). Perhaps Kate's preference for using external projects to stimulate change is understandable. However, the stimulus to constant change is exhausting. The advantage of setting goals both long-term goals and short-term ones that can be readily achieved is that the teaching team has a sense of accomplishment in the short term and a sense of the long-term vision of success. Kate may reconsider her reluctance to specify goals.

Relationship building. It was clear from Kate's comments that she appreciated working in a classroom with her experienced and knowledgeable colleague where they shared the responsibility for mathematics teaching and learning. In addition, Kate described how she mentored the new graduates by having them assist in the classroom with her taking the lead. She encouraged their suggestions and spent time reflecting on events they had shared. She enjoyed using the experience she had gained developing novice teachers' skills as their mentor.

The findings of this study are limited to the reflections of only one leader and further research is needed to paint a broad current picture of primary school mathematics leadership. In addition, this study raised new issues for investigation. Two in particular-leaders' access to planning meetings under new enterprise bargaining agreements, and developing a shared

purpose and coherence across teams of teachers where part-time appointments and job sharing is increasing the numbers of teachers and producing a lack of availability for team meetings. Apart from the changed work conditions, the results of this study outlined important elements of leadership which involved:

- Supporting quality mathematics through planning;
- Teaching students in classrooms to provide demonstration lessons for teachers;
- Modelling professional curiosity as a learner;
- Using external initiatives to stimulate willingness to change;
- Imagining ways to make a difference in the mathematical lives of students.

Acknowledgments

Ethics approval was granted by Monash University (ID 41325) and Kate's school principal.

References

- Campbell, P. F., & Malkus, N. N. (2013). Elementary mathematics specialists: Influencing student achievement. *Teaching Children Mathematics*, 20(3), 198–205. doi: 10.5951/teacchilmath.20.3.0198
- Clarke, D. & Hollingsworth, H. (2002). Elaborating a model of teacher professional growth. *Teaching and Teacher Education*, 18(8), 947–967.
- Clarke, D., Roche, A., Wilkie, K., Wright, V., Brown, J., Downton, A., . . . Worrall, C. (2013). Demonstration lessons in mathematics education: teachers' observation foci and intended changes in practice. *Mathematics Education Research Journal*, 25(2), 207–230. doi:10.1007/s13394-012-0058-z
- Driscoll, K. (2021). *An investigation of the ways in which school mathematics leaders support primary teachers' professional learning*. Monash University, Melbourne, Australia.
- Faragher, R., & Clarke, D. (2014). Teaching mathematics effectively. In M. Gaffney & R. Faragher (Eds.), *Leading improvement in student numeracy* (pp. 47–65). Melbourne, Australia: ACER Press.
- Fullan, M. (2001). *Leading in a culture of change*. Jossey-Bass.
- Gibbons, L., & Cobb, P. (2017). Focusing on teacher learning opportunities to identify potentially productive coaching activities. *Journal of Teacher Education*, 68(4), 411–425.
- Grootenboer, P., Edwards-Groves, C., & Rönnerman, K. (2015). The practice of “middle leading”. In M. Marshman, V. Geiger, & A. Bennison (Eds.). *Mathematics education in the margins. Proceedings of the 38th annual conference of the Mathematics Education Research Group of Australasia* (pp. 277–284). MERGA.
- Hollingsworth, H. & Clarke, D. (2017). Video as a tool for focusing teachers self-reflection: Supporting and provoking teacher learning. *Journal of Maths Teacher Education*, p. 457–475.
- Ingvarson, L. (2005). Getting professional development right. [Conference symposium]. ACER https://research.acer.edu.au/professional_dev/4.
- Liljedahl, P. (2020). *Building thinking classrooms in mathematics, grades K–12: 14 teaching practices for enhancing learning*. Corwin Press.
- Males, L., Otten, S., & Herbel-Eisenmann, B. (2010). Challenges of critical collegueship: Examining and reflecting on mathematics teacher study group interactions. *Journal of Mathematics Teacher Education*, 13, p. 459–471. <https://doi.org/10.1007/s10857-010-9156-6>
- Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15(2), 4–14.
- Stein, M. K., Smith, M., Henningsen, M., & Silver, E. (2009). *Implementing standards-based mathematics instruction* (2nd ed.). Teachers College Press and NCTM.
- Tharp, R. & Gallimore, R. (1989). Rousing schools to life. *American Educator*, 13(2), 20–5.