

Leading Mathematics Reform and the Lost Opportunity

Janeen Lamb

Australian Catholic University

Queensland's primary school teachers have experienced change in every Key Learning Area in the last few years. This avalanche of curriculum reform is set to continue as schools prepare for the imminent release of the Australian national curriculum. This article reports on one school's approach to dealing with this avalanche of curriculum reform. Results indicate lost opportunity for curriculum reform in mathematics as the Principal chose not to prioritise mathematics reform, adopting a managerial or 'power-over' approach to school leadership.

Curriculum reform, including reform in mathematics, is a feature of education due to a number of context related developments including globalisation, new technology, the knowledge economy and cultural diversity as well as developments in teaching and learning (Bruniges, 2005). Together these context related developments promise opportunities for change in primary mathematics education, shaping the curriculum reform agenda of "productivity, participation and quality" (White, Bloomfield, & Cornu, 2010, p. 181) and contribute to the way in which curriculum is negotiated in schools. The challenge for leadership is to respond to the contemporary reform agenda by establishing a strategic vision for student learning.

With this challenge in mind, this article focuses on the challenge of leading curriculum reform in mathematics. In particular this article discusses the findings of a recent case study (Lamb, 2010) that focuses on the leadership response to curriculum reform in mathematics at Riverview Primary School (pseudonym) in Queensland. This case study provides valuable insights as it moves beyond the macro-political context of curriculum reform to provide a 'rich' picture of the challenge of leading curriculum reform in mathematics at the micro level of the school.

Riverview Primary School

Riverview Primary School, a public school of 700 students, was opened in 1963, and is located in a quiet and secluded suburb of Brisbane (Education Queensland, 1999). The mission for Riverview Primary School is to "provide a learning environment where each student will have the best possible opportunities to fulfil his or her potential" (Department of Education Training and the Arts, 2005). In support of this mission, Riverview Primary School has demonstrated a strong commitment to curriculum innovation with a strong focus on early years learning and middle schooling as well as special education. In 2004, Riverview Primary School completed its first triennial school review. This review presents a favourable view of the school, with staff involvement in

school activities and support for collaborative partnerships receiving special mention. This review also states, “Staff members are enthusiastic and are involved in decision making. They share leadership responsibilities” (Department of Education Training and the Arts, 2005, p. 7).

On the face of it, these features of Riverview Primary School would bode well for the implementation of curriculum reform in mathematics. However, Riverview Primary School is positioned within the institutional context of public education in Queensland, and is therefore directly impacted by the changes in policies and practices introduced by the Queensland Department of Education and Training (DET). It is therefore significant that all the syllabi for each of the eight Key Learning Areas (KLAs) have undergone change between 2001 and 2007.

The new reform *Mathematics Year 1–10 Syllabus* (Queensland Studies Authority [QSA], 2004) was released in 2004 with the intention of fully implementing this syllabus by 2007. This reform mathematics syllabus represented a significant shift in the teaching of mathematics from the previous syllabus (Department of Education, 1987). Firstly, this new syllabus introduced a wide array of new content including a new strand, Patterns and Algebra, previously restricted to secondary schools as well as a greater emphasis on strategies in mental computation. Secondly, this syllabus recommended an investigative approach to teaching mathematics. Thirdly, this syllabus also recommended new assessment procedures in line with the overarching policy of outcomes-based education.

By 2006, the reform syllabus had begun to impact upon the teaching of mathematics at Riverview Primary School, and teachers at the school were voicing their concerns about the implementation of the new syllabus. They believed that the new content and pedagogy placed too much pressure on them and their students. Moreover, they were concerned about the lack of support from the Department of Education and Training (DET) during the early stage of implementing the syllabus. Apprehension also grew as teachers reacted to new demands for teacher accountability. Historically, there were no formal performance management structures within the school as it had always had a good reputation in the local community as a result of performing ‘above state average’ on the Years 3, 5 and 7 state-based tests. In 2006, Riverview Primary School’s Year 3 students returned state test results that were below state average and this result sent shockwaves through the school.

The publication of additional curriculum documents: *Mathematics Essential Learnings* (QSA, 2007a, 2007b, 2007c) and the support document *Queensland Curriculum Assessment and Reporting Framework: Developing Essential Learnings for Queensland* (QSA, 2007d), further complicated matters. By specifying content, student achievement standards, assessment procedures and reporting requirements in mathematics, these policy documents left few decisions for the teacher in the classroom. Indeed the teachers’ reading of these documents was that they gave them ‘permission’ to put to one side, curriculum reform in mathematics, with its emphasis on investigative pedagogy, and return to traditional, transmission approaches in the classroom.

This negative response to the new reform syllabus provided the impetus for the case study research outlined below. This study was designed to gain a more informed and sophisticated understanding of the implementation of the new *Mathematics Year 1–10 Syllabus* (QSA, 2004) at Riverview Primary School. One research question was to guide the various moments of data collection, analysis and interpretation within this study:

What are the sources of support for teachers' meaning-making in the context of the implementation of the Mathematics Year 1–10 Syllabus at Riverview Primary School?

The identification of this research question followed a review of the literature with respect to educational change, teacher professionalism and professional development.

Literature Review

The challenge of leading curriculum reform has been consistently identified in the literature (Fullan, 2001) and reform in mathematics is no exception (e.g., Smylie & Perry, 2005). This challenge is not surprising given that curriculum reform represents “a serious personal and collective experience characterized by ambivalence and uncertainty; and if change works out it can result in a sense of mastery, accomplishment and professional growth (Fullan, 2005, p. 32). When it comes to curriculum reform in mathematics, there is evidence that teachers do not have the depth and breadth of content knowledge to successfully implement curriculum reform (Ball & Bass, 2003; Lamb, 2003; Ma, 1999; White, Mitchelmore, Branca, & Maxon, 2005). Thus leading curriculum reform involves dealing with the teacher’s cognitive and affective responses to curriculum reform.

These cognitive and affective responses are further explained in terms of the concept of teacher efficacy (Schatz, 2006). With every new task, teachers need to go through a process: from unconscious incompetence where a position of comfort is experienced, to conscious incompetence where they will certainly experience a sense of insecurity, before entering a state of conscious competence before entering a state of unconscious competence. They will then have no need to dwell on their competency level. In short, “the proficiency of performance creates a new mastery” (p. 228). However, this process will require greater effort and persistence.

Greater efficacy leads to greater effort and persistence, which leads to better performance, which in turn leads to greater efficacy. The reverse is also true. Lower efficacy leads to less effort and giving up easily, which leads to poor teaching outcomes, which then produce decreased efficacy. Thus, a teaching performance that was accomplished with a level of effort and persistence influenced by the performer's sense of efficacy, when completed, becomes the past and a source of future efficacy beliefs. Over time this process stabilizes into a relatively enduring set of efficacy beliefs. (Schatz, 2006, p. 228)

At the same time, this process is facilitated if there are opportunities for the individual and groups to access various “sources of self-efficacy information” (p.

228), including “mastery experiences”, “physiological and emotional clues”, “vicarious experiences”, “verbal persuasion” and “cognitive processes” (pp. 229-230). In brief, mastery experience is the most powerful source of support of efficacy, as success breeds both self-efficacy and confidence for the future. In addition, “feelings of relaxation and positive emotions signal self-assurance and the anticipation of future success” (p. 229). The outcomes of professional development, classroom observation, collegial dialogue, vicarious experiences and verbal persuasion contribute to information and provide specific performance feedback. In short, a teacher’s engagement with a new task, such as teaching a new curriculum in mathematics, will depend on his/her assessment of teaching efficacy and the availability of various sources of self-efficacy information.

In line with this thought, the literature advances the “professional learning community” (Stoll, Bolam, McMahan, Thomas, Wallace, Greenwood & Hawkey, 2006, p.1) as providing the ideal environment for curriculum reform. Here the professional learning community is typically defined in terms of:

... an inclusive group of people, motivated by a shared learning vision, who support and work with each other, finding ways, inside and outside their immediate community, to enquire on their practice and together learn new and better approaches that will enhance all pupils’ learning. (Stoll et al., 2006, p. 1)

Moreover, leadership is framed in terms of transformational and distributed leadership and the emphasis is establishing an environment that is conducive to organisational learning:

Transformational leadership (made up of individual support, culture, structure, vision and goals, performance expectations, and intellectual stimulation); distributed leadership and organisational learning (made up of a trusting and collaborative climate, a shared and monitored mission and taking initiatives and risks with ongoing, relevant professional development) and student outcomes measured by participation in and engagement in the school. Both the principal’s transformational leadership, and the schools’ distributed leadership, contribute to organisational learning. (Mulford, 2007, p. 14)

In short, transformational and distributed models of leadership allow the professional learning community to evolve through an “organic” process that evolves as a consequence of a collaborative partnership between the principal leader and teacher leaders (Mulford, 2007). Professional agency lies with the various members of the school community who are free to develop a shared vision and discern appropriate action.

Unfortunately, there continues to be a gap between the vision and reality of the professional learning community. Explaining this gap researchers point to the “avalanche” (Millet & Bibby, 2004, p. 9) of curriculum reform and, the subsequent rise of the twin discourses of “performativity” (Miller, 2000, p. 17) and “presentism” (Hargreaves & Shirley, 2009, p. 9). Here performativity is viewed in terms of high stakes accountability that relates to immediate gains in test scores. Presentism, on the other hand, reflects the apparent obsession with

short-term gains at the expense of long-term planning, resulting in a narrow view of the purpose of education reform being promoted. In this environment, school leaders are more likely to adopt a managerial or 'power over' approach to leadership that threatens professional agency and diminishes collaborative cultures in schools (Ball, 1999; Smeed, Kinmber, Millwater, & Ehrich, 2009). Moreover, when it comes to prioritising curriculum reform, the leaders may adopt a form of "educational triage" (Booher-Jennings, 2005, p. 231) that allocates scarce resources to certain curriculum reforms at the expense of others. This means that some curriculum reforms miss out on the "long and continuous redesign conversations" (Wilson & Davis as cited in L. Miller, 2005, p. 262), a key component of successful curriculum reform in the professional learning community.

Thus "from their promising beginnings, professional learning communities are increasingly turning into something else" due to "ideological and legislative emphases on only literacy and numeracy as a focus of improvement, and on test achievement as the only way to measure it" (Hargreaves, 2007, p. 183). Consequently, "instead of being intelligently informed by evidence in deep and demanding cultures of trusted relationships that press for success, professional learning communities are turning into add-on teams that are driven by data in cultures of fear that demand instant results" (p. 183).

When it comes to curriculum reform in mathematics, Millet and Bibby (2004) clearly identify the role played by the professional community. Their model is of particular interest as these authors use this theory when analysing the British teachers' response to implementing the National Numeracy Strategy (see Figure 1).

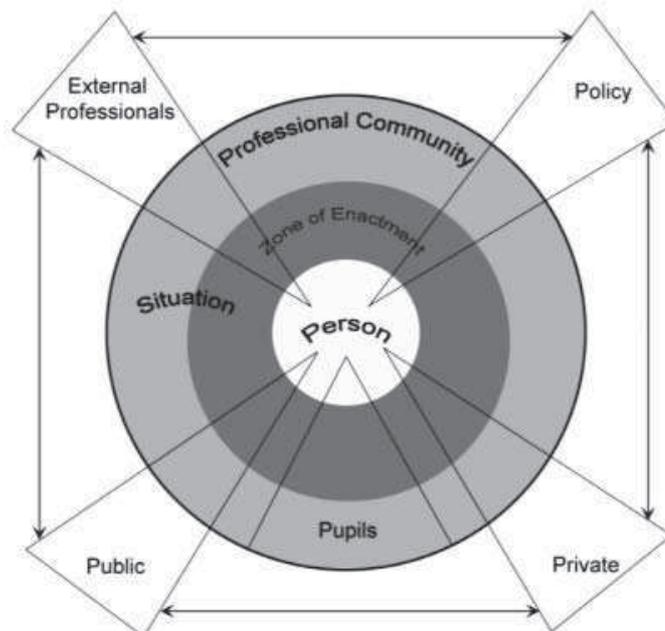


Figure 1. Theoretical model for analysing the context of curriculum reform (Millet & Bibby, 2004, p. 3)

In this model, Millet and Bibby (2004) focus on developing an understanding of a teacher's response to sources of support during episodes of curriculum reform in mathematics. In particular, this model identifies both the internal and external sources of support for curriculum reform. Internal sources of support operate within a professional learning community. This "situation" (p. 6) stimulates a teacher's "zone of enactment" leading to curriculum change. Here Millet and Bibby (2004) follow Spillane's (1999) lead by defining the "zone of enactment" in terms of "an area of potential for professional development, the space in which the individual makes sense of reform or change initiatives in essentially a social process" (p. 1). External sources of support are identified at the periphery of Millett and Bibby's model. These external sources of support include the support of external professionals (e.g., professional development) and policy-makers (e.g., guideline documents) as well as support from the general public (e.g., media, public opinion and parents) and the private commercial sector (e.g., textbooks). Together these external sources of support promote the teacher's zone of enactment within the professional learning community.

Extending this thought, Millett, Brown, and Askew (2004) later identify four enabling conditions necessary for the development of the professional community and the realisation of the teachers' zones of enactment: time, talk, expertise, and motivation. They considered time for teachers to engage in discussion and reflection essential for the development of a professional learning community. When time is allocated, teachers work in an iterative framework of trial, reflection, discussion, modification, and retrieval. Time has also been identified by other researchers (Clarke, 1994; Heid, Middleton, Larson, Gutstein, Fey, King, Strutchens, & Tunis, 2006) as essential for teacher reflection in ongoing professional development. Millett, Brown and Askew (2004) report that when teachers were provided opportunities to observe each other's lessons, they were encouraged to talk with each other about these observations as a focus for reflection and discussion. Expertise came from within the school, from other teachers, as well as external sources such as university researchers. Expertise was shared when the teachers were supported to reflect on theory and practice. *Motivation* appeared in several guises. Some teachers were motivated by internal feelings of interest in mathematics, by a desire to improve their mathematics teaching, or from fear of mathematics teaching. External motivation such as encouragement from colleagues, policy (curriculum reform), and external experts were also factors. In this way, Millett, Brown and Askew (2004) confirm the role played by the professional learning community in the context of curriculum reform in mathematics.

In summary, this review of the literature alerts us to the challenge of implementing curriculum reform in mathematics. It seems that cognitive and affective responses to curriculum reform are inevitable and mathematics reform is particularly challenging as teachers may lack the necessary capabilities to implement curriculum reform. To address this challenge, the literature advances the professional learning community as an ideal environment for curriculum

reform. However, given the rise of the twin discourses of performativity and presentism it is less likely that schools will embrace the professional learning community and leading curriculum reform in mathematics will continue to challenge school leadership.

Research Design

In line with the research question, this case study focussed on the perspectives of key personnel involved in the implementation of the reform mathematics syllabus at Riverview Primary School. Key personnel, including the members of administrative team (i.e., the Principal, Deputy Principal, Head of Curriculum (HOC) and Head of the Special Education Unit (HSEU) and 26 classroom teachers (Years 1–7), were invited and agreed to participate in this case study.

This study was informed by a particular category of research methodology, namely symbolic interactionism (Blumer, 1998). Symbolic interactionism as methodology requires the adoption of two distinct stages within the study: “exploration” and “inspection” (Blumer, 1998, p. 40). The exploration stage allows the researcher to construct meaning about “what’s going on around here” (Charon, 2007, p. 194), as well as to identify issues for further investigation during the inspection stage. This study also relied on a “mixed methods” (Creswell & Plano Clark, 2007) approach to data collection that included individual and group semi-structured interviews as well as a survey of participants. Within this study, the school’s Principal and Head of Curriculum (HOC) were interviewed. From this interview data, an instrument in the form of a questionnaire was developed, administered to all classroom teachers, validated and the data analysed. This analysis raised a number of issues that led the investigation into the inspection stage of the study. Here, focus group interviews were conducted with each year level of teachers. This was followed by further clarification of the issues with individual interviews involving each of the four members of the administrative team, the Principal, Deputy Principal, Head of Special Education Unit (HSEU) and Head of Curriculum (HOC). This two-stage data collection process was supported by a three step iterative process of data analysis termed as first, second and third order interpretation (Neuman, 2007). The first-order interpretation is from the perspective of the participants being studied. The second-order interpretation stems from the perspective of the researcher, and involves eliciting the underlying coherence or sense of meaning in the data. Third-order interpretation involves the researcher assigning general theoretical significance to the data.

The Findings

This case study identifies a number of interrelated findings in respect to supporting the implementation of curriculum reform in mathematics.

Low Levels of Teacher Efficacy in Mathematics

Overall, the teachers in this study believe that they are 'good teachers'. However, when specifically asked about investigative pedagogy and their content knowledge efficacy for the new content in the syllabus, the gaps in efficacy were illuminated with one teacher's reluctant response being:

I have just been keeping my head above water this year getting used to the new content, so I'm probably not a good one to answer that question, or not very well anyway.

Discussion with the teachers on this topic created a sense of unease, where the older more experienced teachers were most open about their reduced efficacy in the teaching of mathematics in terms of the new syllabus where they explained how difficult it was because "maths is not my best subject".

As these discussions progressed the teachers expressed their concern for limited professional development pointing to the lack of support from the Department of Education and Training (DET) during the early stage of implementing the syllabus. Here they argued that the only professional development they had was a session provided on a pupil free day in January 2006.

Impact of Accountability Issues on Reform in Mathematics

This study found that historically teachers did not believe that accountability was an important issue at Riverview Primary School. Consequently, the teachers did not have to set teaching goals, and did not feel pressured to be accountable for student results, as traditionally the students had performed well. However, teacher accountability became an issue after the school community was 'traumatised' by poor state testing in 2006. Teachers across all year levels felt vulnerable and were too afraid to take further risks and embrace the reform mathematics syllabus with its requirements for new content and recommended investigative pedagogy as this teacher explains:

We were trying to implement the new syllabus and use investigations ... But then you get this other agenda [the state tests] like a tsunami coming over the top, saying, you know, boom, boom, boom, this is down, and now you've got to have prescriptive lessons to teach these particular facts and get them ready for the big test ... This other agenda, this other accountability agenda with the mathematics, has become more important because in the end, no-one is going to sort of praise you or say "Gee, you did this wonderful investigation" and you know what, they are going to look at, and unfortunately this is how the Department is focused these days, they are going to look at a sheet of paper that says, at this school their results for Year 3, 5, 7 state tests are this.

Limited Opportunities for Planning and Collaboration in Mathematics

The inspection stage of the study highlighted a gap between the principal's vision of planning and collaboration, and the reality experienced by the members of staff. At best, the various whole school staff meetings provided information about initiatives and directives from the education authority, rather than providing opportunities for whole school planning and collaboration, including mathematics. The following statement is typical of the teachers' responses.

You especially find out new information because, I think that the meetings are an opportunity for a lot of examination of [Education] Department documentation, and I think that sort of seems to be the main purpose of these meetings.

In addition, data collected during the inspection stage of the study also confirmed that year level planning and collaboration was a feature of Riverview Primary School with comments such as the following:

This [curriculum development] has been a big ongoing task. We work on them, [unit plans] then a change comes in [from QSA or DET] and then we madly work on them again. The Principal likes everything to be current. It's a lot of work.

However, the implementation of the new mathematics syllabus did not include opportunities for year level planning and collaboration. It seems the principal, supported by the HOC, prioritises the KLAs to be considered during the planning and moderation days.

When we have these moderation days or we have planning days, we go through all the writing tasks and the science etc.; it's really supposed to be the units we've already been planning with the HOC, we really don't give maths much thought.

The Reform Mathematics Syllabus – One Among Many Reforms

Historically, Riverview Primary School has demonstrated a strong commitment to school-based curriculum development. However, in recent years, school-based curriculum innovations have operated alongside the curriculum reform required of all schools within the Queensland education system. When the reform syllabus in mathematics was published in 2004 for implementation by 2007, this represented one amongst many other reforms. Consequently, it is hardly surprising that this study found that all teachers were frustrated with the amount of curriculum change as the HOC explains:

I am a little bit peeved with the Department at the moment because of the amount of change. The *Essential Learning* worried me a lot – more than they worry the Principal. He's a lot more, "We'll cope with everything. We have processes in place." It still means more work for teachers. We've spent a long time getting these units right [in KLAs other than mathematics]. They're great,

they've been refined, the teachers are happy with them. But when I had a look at the Essential Learning – they've introduced another agenda. A lot of its not the same, they're not the same as the syllabus which means a lot of it has to be changed. It's right back again to creating units next year and we've spent the last three years creating units...I know it's been hard work for teachers – I know that some of them are going to say, "What is this?" And I don't blame them. I am fully with them. I don't trust them [the QSA] enough not to change it again in 2009. They're bringing all the syllabuses down in 2009. They've re-done them. I don't trust them enough, that if the Federal agenda changes again or something else happens, that they'll change it again. They are promising not to but I don't believe them. Not with what's happened.

Conflicting Policy Agendas in Mathematics

This case study also found conflicting policy agendas in mathematics at Riverview Primary School. The Mathematics Year 1-10 Syllabus (QSA, 2004) was released in 2004 with the intention of fully implementing this syllabus by 2007. This syllabus represents a significant shift in the teaching of mathematics from the previous mathematics syllabus (Department of Education, 1987). With the new reform syllabus there was a move towards outcomes based education, an investigative pedagogy for teaching mathematics as well as a variety of new content. However, the state testing regime together with the publication of the *Queensland Curriculum Assessment and Reporting Framework: Developing Essential Learnings for Queensland* (QSA, 2007d) and the *Mathematics Essential Learnings* (QSA, 2007a, 2007b, 2007c) were perceived by the teachers as a return to traditional mathematics content and pedagogy.

There seems to be two agendas being played out on the schools. I think the philosophy behind [the reform textbook series] is right along the lines of the philosophy of the new maths syllabus and the teaching of it and the understanding of the concepts. But I think there are some more concrete concepts, you know, getting back to the algorithms for the operations that were still tested on those important state tests ... and we've just gone back into what we need to do for the state tests. That's our school program [and the Essential Learnings]. I think at the moment, there're just two programs and its difficult working them cohesively.

Meanwhile, the teachers' thoughts of engaging investigative pedagogy according to the reform syllabus were put aside in favour of prescriptive lessons based on the school mathematics program.

Investigations did sort of get put in the 'too hard box' because there's so many other things to cover, and that's going to take all this extra time and resources, and I don't probably know enough about it to really make it as effective as I could ... therefore I was concentrating on what I already know.

And

If I give them [students] an open ended investigation I could really end up in trouble, but if I teach them something, I make sure I have that bit right at least.

Inconsistent Approach by the Principal to Curriculum Reform

Clearly, the Principal has in the past supported curriculum reform at Riverview Primary School and whole school and year level planning and collaboration were an operational feature of the school. However, with new expectations of curriculum reform across all the KLAs, the Principal together with the HOC felt the need to prioritise some KLAs over others. The principal described the situation by saying “We used to have one syllabus document change every couple of years. Since 2001 we have had every KLA change.” He went on to explain that KLAs that have the most pressing requirements for change were addressed first, and other short-term alternative measures are put in place for those KLAs that are not the priority. Whole-school planning and collaboration opportunities were scheduled for priority KLAs. In addition, there were resources and professional development support for teachers in classrooms in the prioritised KLAs. However, mathematics reform was not considered to be a priority. As a short-term measure, the school mathematics program was distributed to the teachers. This program was a substitute for school planning and collaboration in mathematics which did lead to difficulties for the teachers as this teacher explains:

So we were told you have to submit (sic) to the new program... this is our program, follow it. It's not as prescriptive as [the textbook] but I think I'm getting a bit lost as well trying to say, well here's a school program, are we still expected to get through this workbook that the kids have purchased?

Discussion

The findings of this case study are of interest as they both confirm and extend the prior research in respect to the role of school leadership in the implementation of curriculum reform in mathematics. In particular, the findings of this study further explain the challenge of leading curriculum reform in mathematics as well as provide insights in respect to the way forward for aspirant leaders.

Consistent with prior research (e.g., Millett & Bibby, 2004; Schratz, 2006; Tschannen-Moran, Woolfolk Hoy, & Hoy, 1998, p. 233), this case study identified low levels of teacher efficacy in relation to implementing the new reform syllabus in mathematics. In addition, this case study situates curriculum reform within the institutional context beyond the school. Millett and Bibby's (2004) model for discussing change locates the teacher and the school within a wider institutional context that includes “external professionals” (p. 3), external “policy” (p. 3) developed by governments and various authorities, the “private” (p. 3) or commercial sector, and the general “public” (p. 3) who are outside the school but are none the less interested in education. This case study, in particular, highlights the influence of external policy in terms of the initiation of curriculum reform as well as the on-going direction of this reform. Yet again, this case study alerts us to the current “avalanche” (Millett & Bibby, 2004, p. 9) of curriculum reform, and the emergence of the twin discourses of “performativity” (Miller, 2000) and “presentism” (Hargreaves & Shirley, 2009).

This study also highlights the role of school leadership in the context of curriculum reform. For Millet and Bibby (2004), “quality leadership” will create the professional learning community and in doing so, contribute to a “collective capacity and infrastructure for reform” (p. 7). Moreover, on a practical note, school leaders are said to be responsible for the provision of the necessary “time, talk, expertise and motivation” (Millett et al., 2004, pp. 251-252) required for curriculum reform within the professional learning community. The literature also notes that in an environment of performativity and presentism, there is a real possibility that school leaders will adopted a form of “educational triage” (Booher-Jennings, 2005, p. 231) that allocates scare resources to certain curriculum reforms at the expense of others. Moreover, they may be tempted to rely on a managerial or ‘power-over’ approach to leadership (Ball, 1999; Smeed et al., 2009).

Consistent with the literature, this case study found that the Principal, together with the HOC, dealt with the avalanche of curriculum reform by adopting a triage approach by prioritising the Key Learning Areas (KLAs) for curriculum reform. KLAs that have the most pressing requirements for change are addressed first, and other short term alternative measures are put in place for those KLAs that are not of the highest priority. In this plan, mathematics reform was not considered to be a priority as the state testing regime together with the publication of the *Essential Learnings* documentation was perceived by the teachers as a return to traditional content, pedagogy and assessment processes. Consequently time and resources were not committed to curriculum development in this KLA. Hence there were limited opportunities for planning and collaboration in support of the implementation of the reform mathematics syllabus. In addition, there were insufficient resources and a paucity of professional development to support curriculum reform in mathematics.

By making the decision not to prioritise the KLA of mathematics, school leadership lost the opportunity to establish a professional learning community around the challenge of curriculum reform in mathematics. Instead, the Principal and the HOC provided the teachers with a ‘short term fix’ (i.e. the school mathematics program) that created the illusion of reform in mathematics. It could be argued that the Principal exercised ‘power over’ the teachers by restricting opportunities for collaboration and planning in mathematics, and demanding that teachers follow the school mathematics program. However, to be fair, the teachers were also complicit in the establishment of this power relationship. Challenged by the requirements of the reform mathematics syllabus, and experiencing low levels of teacher efficacy, they accepted the new school mathematics program without question. What we have here is a lost opportunity for professional agency and student learning in mathematics.

Concluding Comment

This study has put the spotlight on how one school has responded to the implementation of the Mathematics Year 1–10 Syllabus (QSA, 2004) during a time of many curriculum reforms. In doing this it has exposed the need for

school leadership that can guide a professional learning community through successful curriculum reform in all KLAs at the same time. School leaders need to carefully consider their priorities for curriculum reform and avoid managerial or 'power-over' approaches. Otherwise it is a real possibility that reform in primary mathematics is continually put to the bottom of the list and teachers will continue to take the easy option. Further research addressing this concern is warranted.

References

- Ball, D. L., & Bass, H. (2003). Towards a practice-based theory of mathematical knowledge for teaching. In B. Davis, & E. Simmt (Eds.), *Proceedings of the 2002 Annual Meeting of the Canadian Mathematics Education Study Group*, (pp. 3–14). Edmonton, AB: CMESG/GCEDM.
- Ball, S. (1999). *Global trends in educational reform and the struggle for the soul of the teacher*. Paper presented at the British Educational Research Association Annual Conference, University of Sussex at Brighton, (17). Retrieved from <http://www.leeds.ac.uk/educol/documents/00001212.htm>
- Blumer, H. (1998). *Symbolic interactionism: Perspective and method*. Berkeley, CA: University of California Press.
- Booher-Jennings, J. (2005). Below the bubble: "Educational triage" and the Texas accountability system. *American Educational Research Journal*, 42, 231–268.
- Bruniges, M. (2005). *What is driving curriculum reform in Australia?* Paper presented at Curriculum and assessment: Closing the gap, the annual conference of the Curriculum Corporation Brisbane. Retrieved from http://cmslive.curriculum.edu.au/verve/_resources/Bruniges_edited.pdf
- Charon, J. M. (2007). *Symbolic interactionism: An introduction, an interpretation, and integration* (9th ed.). New Jersey: Pearson Prentice Hall.
- Clarke, D. M. (1994). Ten key principles from research for the professional development of mathematics teachers. In D. B. Aichele & A. F. Coxford (Eds.), *Professional development of teachers of mathematics: 1994 yearbook of the National Council of Teachers of Mathematics* (pp. 37–48). Reston, VA: NCTM.
- Creswell, J. W., & Plano Clark, V. L. (2007). *Designing and conducting mixed methods research*. Thousand Oaks: Sage Publications.
- Department of Education. (1987). *Years 1 to 10 mathematics syllabus*. Brisbane: Queensland Government Printer.
- Department of Education Training and the Arts. (2005). *Triennial school review 2004*. Brisbane: Queensland Department of Education and the Arts.
- Education Queensland (1999). *Riverview Primary School partnership agreement 1999*. Brisbane: Education Queensland.
- Fullan, M. (2001). *The new meaning of educational change* (3rd ed.). New York: Teachers College Press.
- Fullan, M., Cuttress, C., & Kilcher, A. (2005). 8 forces for leaders of change. *Journal of Staff Development*, 26(4), 54–64.
- Hargreaves, A. (2007). Sustainable professional learning communities. In L. Stoll & K. Seashore Louis (Eds.), *Professional learning communities: Divergence, detail and difficulties* (pp. 181–195). Buckingham, UK: Open University Press.
- Hargreaves, A., & Shirley, D. (2009). The persistence of presentism. *Teachers College Record*, 1–15. Retrieved from <http://www.tcrecord.org/PrintContent.asp?ContentID=15438>

- Heid, M., Middleton, J., Larson, M., Gutstein, E., Fey, J., King, K., Strutchens, M., Tunis, H. (2006). The challenge of linking research and practice. *Journal for Research in Mathematics Education*, 37(2), 76–86.
- Lamb, J. (2003). The impact of teachers' understanding of division on their students' knowledge of division. In B. A. Knight & W. Scott (Eds.), *Learning difficulties: Multiple perspectives* (pp. 147–163). Sydney: Pearson Education Australia.
- Lamb, J. (2010). *Implementing mandated curriculum reform: Sources of support for teacher meaning making*. Unpublished PhD Thesis. Australian Catholic University, Fitzroy, Victoria.
- Ma, L. (1999). *Knowing and teaching elementary mathematics: Teachers' understanding of fundamental mathematics in China and the United States*. Mahwah, NJ: Erlbaum.
- Miller, J. (2000). What is left in the field ... a curriculum memoir. *Journal of Curriculum Studies*, 32(2), 253–266.
- Miller, L. (2005). Redefining teachers, reculturing schools: Connections, commitments and challenges. In A. Hargreaves (Ed.), *International handbook of educational change: Extending educational change* (Vol. 2, pp. 249–263). Dordrecht, Netherlands: Springer.
- Millett, A., & Bibby, T. (2004). The context for change. In A. Millett, M. Brown & M. Askew (Eds.), *Primary mathematics and the developing professional* (pp. 1–17). Netherlands: Kluwer Academic
- Millett, A., Brown, M., & Askew, M. (2004). Drawing conclusions. In A. Millett, M. Brown & M. Askew (Eds.), *Primary mathematics and the developing professional* (pp. 245–255). Netherlands: Kluwer Academic.
- Mulford, B. (2007). Building social capital in professional learning communities: Importance, challenges and a way forward. In L. Stoll & K. S. Louis (Eds.), *Professional learning communities: Divergence, detail, difficulties* (pp. 151–180). Buckingham, England: Open University Press.
- Neuman, W. L. (2007). *Basics of social research: Qualitative and quantitative approaches* (2nd ed.). Boston: Pearson Education.
- Queensland Studies Authority. (2004). *Mathematics Year 1–10 Syllabus* Retrieved 13 June, 2006, www.qsa.qld.edu.au/qa/pd/workshops/1to10/math_opt_1.html
- Queensland Studies Authority. (2007a). *Mathematics Essential Learnings by the end of Year 3*. Retrieved February, 2009, http://www.qsa.qld.edu.au/downloads/p-9/qcar_el_maths_yr3.pdf
- Queensland Studies Authority. (2007b). *Mathematics Essential Learnings by the end of Year 5*. Retrieved February, 2009, http://www.qsa.qld.edu.au/downloads/p-9/qcar_el_maths_yr5.pdf
- Queensland Studies Authority. (2007c). *Mathematics Essential Learnings by the end of Year 7*. Retrieved February, 2009, http://www.qsa.qld.edu.au/downloads/p-9/qcar_el_maths_yr7.pdf
- Queensland Studies Authority. (2007d). *Queensland curriculum, assessment and reporting framework: Developing essential learnings for Queensland*, 12 February, 2009, from http://www.qsa.qld.edu.au/downloads/p-9/qcar_el_developing_qld.pdf
- Schratz, M. (2006). Leading and learning: 'Odd couple' or powerful match? *Leading and Managing: Journal of the Australian Council for Educational Leaders*, 12(2), 40–43.
- Smeed, J., Kinmber, M., Millwater, J., & Ehrich, L. (2009). Power over, with and through: Another look at micropolitics. *Leading and Managing*, 15(1), 26–41.
- Smylie, M., & Perry, G. (2005). Restructuring schools for improving teaching. In M. Fullan (Ed.), *Fundamental change* (pp. 306–335). Netherlands: Springer.
- Spillane, J. (1999). External reform initiatives and teachers' efforts to reconstruct their practice: The mediating role of teachers' zones of enactment. *Journal of Curriculum Studies*, 31(2), 143–175.

- Stoll, L., Bolam, R., McMahon, A., Thomas, S., Wallace, M., Greenwood, A., Hawkey, K. (2006). What is a professional learning community? A summary DfES-0187-2006. Retrieved from <http://networkedlearning.ncsl.org.uk/knowledge-base/programme-leaflets/professional-learning-communities/professional-learning-communities-04-summary.pdf>
- Tschannen-Moran, M., Woolfolk Hoy, A., & Hoy, W. (1998). Teacher efficacy: Its meaning and measure. *Review of Educational Research*, 68, 202.
- White, P., Mitchelmore, M., Branca, N., & Maxon, M. (2005). Professional development: Mathematical content verses pedagogy. *Mathematics Teacher Education & Development*, 6, 49–60.
- White, S., Bloomfield, D., & Cornu, R. (2010). Professional experience in new times: Issues and responses to a changing education landscape. *Asia Pacific Journal of Teacher Education*, 38(3), 181–193.
-

Author

Janeen Lamb, Australian Catholic University, McAuley Campus, PO Box 456, Virginia, QLD 4014, Australia. Email: Janeen.Lamb@acu.edu.au