

# Embedding the Numeracy Development Projects in Two Schools

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The exploratory case study described in this paper aimed to identify the nature of school structures and practices that support schools to embed the Numeracy Development Projects (NDP). Forty-one teachers, numeracy lead teachers, and senior management members at two urban primary schools completed a survey, part of which focused on the school structures and practices that help them embed the NDP initiative in their school. Fifteen staff later participated in individual interviews to expand on their survey responses. Staff at both schools had recently completed a renewed, whole-school focus on numeracy. The schools appeared to be at different stages within the embedding phase of this reform, with both recognising that they needed to modify some of their organisational structures in order to continue focusing on improving students' achievement with greater independence from outside facilitators. A focus on students' achievement was emerging at the first school, and at the second, students' achievement had an established role in driving decision-making about numeracy.

## Background

The initial phase of implementing the Numeracy Development Projects (NDP) in New Zealand primary schools was drawing to a close in 2008. By that point, most primary schools had completed an initial teacher-focused, classroom-based introduction to the NDP, led by an external facilitator. Starkey, Yates, Meyer, et al. (2009) describe the initial implementation stage of a reform as being "designed nationally and delivered regionally with an emphasis on consistency and quality" (p. 181). The consolidation phase of the NDP is now underway and focuses on individual schools taking responsibility for embedding the initiative in their particular contexts.

The notion of sustainability appears frequently in the literature but has been labelled as ill-defined (Knight, 2005) and as an article of faith (Timperley, Wilson, Barrar, & Fung, 2007). Knight (2005) describes the notion of sustainability as "a traditional fixation of keeping something going over time with continued support from external providers" (p. 467). A theme of adaptation to specific contexts by the adopters of new practices and knowledge also appears in discussions about sustainability (Knight). Knight points out that the definition of sustainability outlined above ignores the way an intervention might be adapted to its context in order to institutionalise it (p. 467). A second theme associates sustainability with improved student outcomes (Knight, 2008; Timperley et al., 2007). Timperley et al. define sustainability as being "in terms of continual or improved student outcomes once the support provided during the earlier phases of professional development has been largely or totally withdrawn". Robinson (2008) similarly discusses the links between distributed leadership and sustaining improved student outcomes. Both Timperley et al. (2007) and Robinson (2008) use literacy as the project context, whereas Knight (2005) situates her discussion of sustainability in the context of the NDP.

Another slant on sustainability is linked to the idea of "scaling up" or taking an initiative across many sites (Coburn, 2003; Cobb & Smith, 2008; McNaughton & Lai, 2009). Coburn argues for a multidimensional definition: implementing a reform on a larger scale that specifically incorporates issues of depth, sustainability, spread, and shift in reform ownership. Cobb and Smith (2008) suggest "in educational contexts, improvement at scale refers to the process of taking an instructional innovation that has proved effective in supporting students' learning in a small number of classrooms and reproducing that success in a large number of classrooms" (p. 1). In considering implementing new practices on a larger scale, McNaughton and Lai (2009) talk about sustainability as being a

generalisation of the effects of an intervention across time as well as across new cohorts of learners and teachers. They link this to treatment integrity or fidelity and the idea of scaling up. A fourth idea related to sustainability is to do with the stage of implementation of a project. For instance, Starkey et al. (2009) suggest that “teacher professional development during the embedding stage of a national or large scale reform may differ fundamentally from other forms of teacher education and professional development” (p. 181). In this paper, embedding the NDP in their second phase is conceptualised as an individual school not only sustaining the initiative but also making necessary adjustments to the school’s structures and practices to ensure that the NDP become deeply embedded in everyday practice.

The current study builds on previous investigations around the topic of sustainability of the NDP. Earlier studies have addressed such aspects as the impact on teachers and their classroom numeracy programmes and on students’ achievement (for example, Thomas, Tagg, & Ward, 2003). Teachers’ perspectives on student achievement and their evaluation of various components of the professional development programme have also been examined (Thomas & Tagg, 2004). A number of studies have investigated factors that contribute to sustaining the NDP (Ell & Irwin, 2006; Thomas & Tagg, 2004; Thomas, Tagg, & Ward, 2003; Thomas & Ward, 2006; Ward, Thomas, & Tagg, 2007), as did Higgins, Bonne, and Fraser (2004), who described “components that fuel the dynamic of sustainability” (p. 59). Other investigations of aspects of sustainability in the New Zealand numeracy context include: Pritchard and McDiarmid (2006), who identified enabling and constraining factors that contribute to sustainability; Anthony and Walshaw (2006), who explore factors associated with sustained changes to teacher practice; and Ell (2007), in her longitudinal study of sustainability in a rural school.

## Methodology

This exploratory case study<sup>1</sup> aimed to define questions and conjectures for a subsequent study. The focus on the structures and practices that help schools to embed the NDP was one component of a larger study<sup>2</sup> that also investigated school-based instructional leadership, networks of support and influence, and the diagnostic interview as a smart tool.

This paper aims to answer the research question:

- What is the nature of the school structures and practices that support schools to embed the numeracy initiative?

### *Participants*

The two Wellington-region schools participating in the study had originally completed numeracy professional development in the NDP’s early years of implementation and, more recently, had undertaken a renewed focus on numeracy. The schools continued to call on outside facilitators to support the continued improvement of numeracy instruction. Both these urban full primary schools were selected because they reported recent improvements in their students’ achievement; for example, data from school B showed that the achievement of a target year group had improved. Also, both schools were geographically convenient to the researchers.

School A was a medium-sized, high-decile, state primary school. The school had one numeracy lead teacher – a classroom teacher and syndicate leader – who had been in the lead teacher role for approximately eight years and who currently worked with two colleagues towards embedding the NDP in their school setting.

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<sup>1</sup> See Yin (2003) for a discussion of case-study methodology.

<sup>2</sup> See other papers by Higgins & Bonne in this volume.

School B was a large, high-decile, state primary school. The lead teacher responsibilities at school B were shared by a classroom-based lead teacher (lead teacher 1) and a lead teacher who was a “walking” member of senior management (lead teacher 2). Lead teacher 1 had been a numeracy lead teacher at her previous school and had been in her current role at this school for three years. Lead teacher 2 had taken up the second lead teacher role when a colleague had left the school the year before and had also worked in the role several years previously.

The two schools can be thought of as being at different stages of implementation: school A was still undergoing the organisational redesign needed to support full implementation of the NDP; school B was embedding the structural changes they had already put in place.

### *Procedures*

All teachers, numeracy lead teachers, and senior management (including principals) were invited to participate in the study. Initially, all teachers and senior management members were asked to complete a survey (see Appendix J, pp. 195–197) at each school’s numeracy-focused staff meeting, at which the researchers made field notes. Several teachers at both schools took up the option of completing the survey after the meeting for later collection. Survey questions were generated using Cobb and Smith’s (2008) frame of leadership priorities and were designed to elicit responses about leadership, networks of support and influence, formative assessment, and the roles these play in sustaining the NDP in their school<sup>3</sup>. At both schools, almost 90% of staff returned completed surveys.

Audio-taped interviews were subsequently carried out with lead teachers of numeracy, all members of senior management, and a representative sampling of teachers from both schools. The six people interviewed at school A were: the numeracy lead teacher (who also taught year 3–4 students), the principal, the deputy principal (who also taught new entrants), the assistant principal (who also taught year 5–6 students), and two other teachers who were part of the numeracy development team (one taught year 7–8 students; the other taught year 5–6 students).

The nine people interviewed at school B were: numeracy lead teacher 1 (who also taught new entrants), numeracy lead teacher 2 (who was also the deputy principal), the principal, the assistant principal, a teacher with special responsibility for curriculum, and one classroom teacher from each of the following year groups: years 3–4, years 5–6, and years 7–8. An additional teacher (of year 5–6 students), who had undergone NDP development elsewhere and who was identified as having a particular strength in teaching numeracy, was interviewed at the principal’s recommendation. All school and numeracy leaders were interviewed with the questions shown in Appendix J. Teachers’ interview questions are also shown in Appendix J. In the case of dual roles, leadership roles took precedence over teaching roles; for example, the numeracy lead teacher at school A, who also taught year 3–4 students, was interviewed using the questions for school leaders.

Lead teachers were also asked to provide copies of school documentation that supported the development of high-quality numeracy instruction and student achievement data for the current and previous year. In summary, the school’s dataset comprised surveys, interview transcripts, school documentation, and student achievement data.

### *Analysis*

This paper is focused on the school as a unit of analysis rather than on the individual teacher and draws on the work of Anthony and Walshaw (2006) and Starkey et al. (2009) to unpack the extent to

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<sup>3</sup> See other papers by Higgins and Bonne in this volume.

which planned, purposeful, whole-school adaptations were shaped by the stage of implementation for individual schools. The data analysis therefore included electronic searches of interview transcripts and a compilation of survey responses for key words, such as “whole”, “plan”, and “achievement”. These searches led to additional themes, including appraisal and the timetabling of instruction, which were then used in searches of the documents. Other school documentation was read by the researchers to identify links.

### *Limitations*

The exploratory case study focused on staff at two schools in order to develop conjectures for wider investigation during the embedding phase of the NDP. Data relating to the sustainability of the NDP at these schools is particular to their contexts, so the findings from this initial study cannot reasonably be generalised to other schools.

## **Findings**

### *Planned, Purposeful, Whole-school Adaptation*

What emerged from the data from the two schools was similar to what was described by Anthony and Walshaw (2006):

Schools have adapted the Numeracy Development Project in a wide variety of ways to meet their individual needs. For some schools, the adaptation has been school wide and purposeful and supported through various layers of leadership. In other schools, adaptation is unplanned, convenient, and individualised at the syndicate or classroom level. (p. 26)

In the study reported here, lead teachers and senior management at both schools described similar school-wide changes in relation to NDP practices as either “becoming embedded” or “intended adaptations”. Both schools had undertaken their renewed focus on numeracy as whole schools.

The numeracy lead teacher and senior management at school A were planning to make some organisational changes in order to embed practices, such as the provision of extra support where needed and the monitoring of student achievement, and talked about the need to be “... making sure that things continue to happen, that you are in a constant state of continuous improvement” (senior management member, school A, interview). For example, the numeracy lead teacher said she “would like to see some remedial maths development for extra support for the slow learners in maths” (lead teacher, school A, interview).

A focus on students’ achievement was becoming established, with:

... term monitoring for students, and onto that term monitoring would go your basic facts and your GloSS [Global Strategy Stage] level or your NDP level ... From that monitoring, students are identified as being extension or having difficulties. (Lead teacher, school A, interview)

Their students’ achievement data was being used to identify areas of need that could be targeted in teacher professional development:

We looked at ... the national benchmarks and where we were coming, and then from there identifying that we needed perhaps to work on multiplication or that we needed to work on fractions, so looking at where our students were ... and identifying weaknesses. (Lead teacher, school A, interview)

As a school, they were exploring a range of mathematics assessments and had yet to settle on the combination that best met the needs of their students and community:

We did the PAT<sup>4</sup> maths for our interest but also to report to parents through our blue portfolio system in the first term, but it's a bit complicated. So we don't think we'll do those again. We like the "I can"<sup>5</sup> sheets and so do the parents because ... it's an example of their thinking and strategy that they're using, and the parents have found that really useful. We have used the actual number results against the norms and reported to the board against those as well and [the lead teacher] has done an analysis of those that have been useful for the board but also very useful for us about where we stand nationally. (Senior management member, school A, interview)

Adaptations that were planned included aligning numeracy targets with the appraisal system and planning for lead teacher work in teachers' classrooms. Numeracy goals were not a mandatory component of the appraisal process and were included only if a teacher elected this as an area for appraisal:

Occasionally there are people that would identify it as a need, like [a member of senior management] when she first went back into a class. (Senior management member, school A, interview)

There were not yet structures in place to allow the lead teacher to regularly work with individual teachers in their classrooms, modelling and observing numeracy instruction. This was planned to happen over the 2009 school year.

Staff at school B had deliberately made changes to a number of structures and practices in order to help embed their adaptation of the NDP into numeracy instruction, school-wide. Elements of their school organisation that they chose to redesign included: shifting from having a mathematics committee to having two lead teachers; deliberately having a classroom teacher as one of the lead teachers and a member of senior management as the other; timetabling numeracy teaching across the school; and making regular provision for release time for the numeracy lead teachers to support teachers in their classrooms. Their practices around the use of student achievement data also supported the embedding of the NDP.

Both lead teachers agreed that replacing the more traditional mathematics committee with two numeracy lead teachers had been a positive shift. One of them commented:

I think having two strong numeracy leaders this year has made a huge difference. We are very focused, we know what we want to happen, but we're not quite sure we're doing all the right things to get it there, but we are working very hard with teachers to get there. And we've improved the resources with the resource boxes, that kind of thing, and I think ... we're at the stage we need to sit down with somebody to give us some guidance about what we need to do next year ... because we're really determined to continue, but it's all very well being determined ... it's about knowing exactly the needs. (Lead teacher 2, school B, interview)

A decision had been made by the numeracy lead teachers and senior management that numeracy would be taught across the school at the same time: "Maths is quarter past 9 to quarter past 10 in every classroom every day" (lead teacher 2, school B, interview) in order to allow for complementary timetabling, that is, withdrawal of groups of students who need extra support and of those who need extending.

The lead teachers at this school had established school structures and routines for working one-to-one with teachers and their students. This typically involved the lead teacher modelling an aspect of a mathematics lesson for the teacher to observe, then discussing what they observed. Later, the lead teacher would return to observe the teacher's instruction, after which they would meet to discuss the

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<sup>4</sup> *Progressive Achievement Test: Mathematics Years 4–10*, New Zealand Council for Educational Research (2006). Wellington: NZCER.

<sup>5</sup> "I can" assessment sheets are a resource available from [www.nzmaths.co.nz](http://www.nzmaths.co.nz).

lead teacher's feedback. In their survey responses to a question that asked them to describe the three most important factors that have contributed to sustaining their learning and development, there were 22 comments from 28 respondents relating to the value of the modelling, observation, and feedback processes. A teacher of year 7–8 students commented that an important factor was:

Leaders modelling strategy and knowledge warm-ups for class, as well as watching you do the same and giving feedback. Important to see it being used with your own class as you can see how it is meant to be used properly. (Teacher, school B, survey)

Another teacher valued:

modelling and feedback – teaching practice can change through teacher modelling and feedback, rather than dialogue alone. (Teacher of year 0–1 students, school B, survey)

The challenge of changes in staff was mentioned by principals in both schools. While this may have been an issue in the past, school B had recognised the importance of consistency of practice across all teachers, so they had put in place several strategies to cater for teachers arriving at the school. In their implementation plan for the mathematics and statistics learning area, professional development for new teachers was described as including “mentoring, modelling, observing, and other practical ways of helping teachers develop their understanding and confidence” (Implementation Plan, school B). This was the responsibility of the two lead teachers, and because this was a large school, they were sometimes able to group new staff for such development. In relation to the beginning of the school year, one lead teacher observed:

We have got quite a few new teachers coming in next year, so we will be starting back supporting new teachers again. (Lead teacher 2, school B, interview)

Also in the implementation plan, consistency of practice was clearly stated as a goal and was supported by expectations for such aspects as programme planning and assessment:

We're calling it an implementation plan. So we've got aims, we've got achievement expectations, we've got professional development, reporting to parents and the board, special needs and special abilities, assessment practices, our goals, we've got classroom expectations ...” (Lead teacher 2, school B, interview)

Students' numeracy achievement data drove decision-making about numeracy at school B. This included decisions about setting the school's goals for students' achievement and developing programmes to meet the learning needs of targeted groups of students: “... there is both remedial and extension. I had forgotten about that, but we just do that as a matter of course” (senior management member, school B, interview). Student results were also used to identify staff's professional development needs and to help individual teachers identify how they needed to shape their classroom programme to cater for their students' needs.

Student data is initially used by a classroom teacher as part of formative assessment and the where to next. Very important, and then obviously school-wide data is analysed by the team for reporting to parents as a whole and then ... assessment for each classroom, as far as each classroom teacher is concerned, is used for reporting to parents. (Senior management member, school B, interview)

At school B, appraisal was also used as a means of maintaining teachers' focus on improving their numeracy instruction:

As part of our appraisal system, we have targeted areas that we go in to observe ... Numeracy has been a targeted area, and that comes and goes depending on our focus for professional development. So it has been quite a focus over the last few years, and it's around modelling and feedback. I was going to say positive feedback – constructive feedback is a better way of putting it. [We've got] past the fluffy stuff. (Senior management member, school B, interview)

Appraisal visits with a numeracy focus were an established norm in the school, as one teacher described:

and also, I think the appraisal system as well, because they come in and it's not threatening, it's just you know, they just come in and watch and say "Look, it's going like this, have you thought about this?" Yeah, it's fine. (Year 3–4 teacher, school B, interview)

## Discussion and Conclusion

McNaughton and Lai (2009) talk about sustainability as being about generalisation across time of the effects of the intervention as well as across new cohorts of teachers and learners. The process of generalisation is likely to be associated with embedding practices in the school structure so that they can be sustained. School A appeared to be at an earlier stage of embedding the NDP than school B: school A had fewer structures and practices in place to support embedding the initiative into their context, but continued organisational redesign should support this. At school B, their adaptation of the NDP "has been school wide and purposeful and supported through various layers of leadership" (Anthony & Walshaw, 2006, p. 26). Particularly evident at school B was a combination of leadership enactments, all focused on the goal of raising students' numeracy achievement, with which they had already had some success. This may be related to the way leadership is distributed in their school. As Robinson (2008) suggests:

Schools with stronger distributed leadership will, it is argued, have more staff who are knowledgeable about and take responsibility for the improvement of educational outcomes. (p. 242)

Starkey et al. (2009) suggest that:

teacher professional development during the embedding stage of a national or large scale reform may differ fundamentally from other forms of teacher education and professional development. (p. 181)

The description in this paper of how two schools were working to embed the NDP in their respective contexts illustrates that, within this important phase, schools may be at different stages. Timperley et al.'s (2007) point that "sustainability was not neglected in the literature, but it was treated as an article of faith rather than a condition subject to empirical verification" presents a challenge to both researchers and implementers in determining the focus appropriate for the stage of the implementation (Starkey et al., 2009). In the current phase of NDP implementation, it may be appropriate for facilitators to shift their focus from developing individual teachers to considering ways in which they can help schools to ensure their organisational structures and practices support the adaptation of the NDP to their context in order for the NDP to endure.

## For Further Research

Further investigation of leadership functions and practices is needed in order to understand what is important in embedding the NDP. Identification of the hallmarks of a school that can be said to have successfully embedded the NDP should be included in such an investigation.

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