

Promoting Change in Teacher Practices: Investigating Factors which Contribute to Sustainability

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Sustaining long-term growth from in-depth professional development has become an increasing concern to stakeholders in education. An action research study was undertaken in five New Zealand primary schools exhibiting limited sustained gains through Professional Development in Numeracy. Teachers' lack of in-depth knowledge of numeracy content and pedagogy, lack of mathematics leadership within schools, and limited change in school-wide practices were identified as contributing factors. The study developed a variety of tools which supported school leaders to embed practices and to provide teachers with opportunities to explore and reflect on ideas encountered within the professional development.

Theoretical Perspectives

Sustainability of professional development can be defined as “the development of the school’s capacity to manage and internalise change without external support” (Knight, 2005). Hargreaves and Fink (2003) claim sustainable improvement requires investment in building long term capacity for improvement, such as the enduring development of teachers’ skills. They explain that sustainability “addresses how particular initiatives can be developed without compromising the development of others in the surrounding environment” (p. 693). Measuring sustainability as outcomes, such as student achievement, or as a process of improvement in teacher practices and pedagogical content knowledge, requires the consideration of a variety of contributing factors.

Research shows that the process of change in pedagogical practices takes time. MacGilchrist, Myers and Reed (1997); Franke, Carpenter, Fennema, Ansell, and Behrend (1998); Higgins (2003, 2002); King and Newmann (2004, 2000); and Timperley (2003); confirm that change in teaching pedagogy is tenuous and continued support is needed in order to sustain change. Timperley (2003) refers to growing evidence that shows improved student achievement “depends on both the learning of individual school professionals and improvements in the capacity of the whole school organization to solve problems and create new ways of doing things” (p. 9).

King and Newmann (2000) identify a missing element in many professional development programmes — the school capacity. This comprises: development of teachers' knowledge, skills and dispositions; the strength of the school-wide professional community; and coherence of the school programme. School leadership needs to use and build on the strengths of individual teachers to assist other teachers in their learning. Principals and lead mathematics teachers are believed to be key players in sustaining such professional development (Millet, Brown, Askew and Johnson, 2004; Hargreaves & Fink, 2003).

If professional development is to result in ‘self-sustaining, generative change’ (Coburn, 2003; Franke et al., 1998), a school’s professional learning culture also needs to be addressed (Higgins, 2003; Timperley, 2003). Ingvarson, Meiers and Beavis (2005) claim that a “substantial level of professional community is vital to significant change” (p. 17),

and that it is an important ‘mediating variable’ in the learning process. Professional learning communities (Hord, 1997) help to generate and support change by enabling teachers to develop, refine and practise ideas within a reflective and supportive environment. Kruse, Louis and Marks (1995) identify five elements of a professional community as: shared values, a focus on learning, collaboration, deprivatised practice and reflective dialogue. These elements need to be actively encouraged throughout all the phases of in-depth professional development.

Reflective practice is a key component within effective teaching and professional development (Ferraro, 2000). It comprises a deliberate act of reviewing and critically thinking about practice with the purpose of increasing learning opportunities for students and teachers: “teachers need to learn how to analyse practice — both other teachers’ practice and their own” (Willis, 2002). Reflection on practice can lead to self-generative change and develop the five elements of a professional learning community. It is a collaborative process where colleagues enter into a reflective dialogue about practice and/or student achievement data, promoting a shared focus and negotiated understanding within a school.

Background

Major resourcing from government initiatives has resulted in intensive professional development in numeracy for teachers in a majority of New Zealand primary schools. Professional development has focused on developing teachers’ mathematical content and pedagogical content knowledge and promoted characteristics of distinctive characteristics of effective numeracy teaching (Askew, 2000). Numeracy Professional Development Projects (MoE, 2005) have been developed ‘to improve student performance in mathematics through improving the professional capability of teachers’ (Bk. 1, p. 1). The Numeracy Projects are initially delivered by facilitators to in-service teachers through a combination of intensive workshop programmes and in-class support for teachers. Recently there is concern that initial progress made in schools during the in-depth phase of the professional development has not been sufficiently sustained or developed.

This study worked in depth with principals and Numeracy Lead teachers of five city schools that had previously participated in the Numeracy Professional Development Projects. The research formed part of a national pilot study, which aimed to identify issues to be addressed in order for schools to develop self-responsibility for sustaining numeracy developments. The selected primary schools comprised three lower socio-economic schools (Deciles 1 and 2), and two upper-middle socio-economic schools (Decile 7 schools). Two schools within the study had a high percentage of Maori students, two schools had predominately Pasifika students and one school’s students were mainly New Zealand European. All schools indicated they were struggling to maintain a cohesive approach to mathematics teaching.

This study aimed to a) discover ways in which these schools had acted to sustain numeracy practices developed since their in-depth professional development b) explore factors which contributed to or inhibited learning development within each school.

Methodology

An action research approach was taken to this study as a means of “injecting additional and innovatory approaches to teaching and learning into an ongoing system” (Cohen &

Manion, 1994, p.189). It required participants to make changes after critical reflection of their practice (Kemmis & McTaggart, 2000).

Baseline data was gathered to ascertain the learning needs of the teachers within each of the schools. This was analysed and interventions developed to support leadership and teachers, with a view to enable schools to be self-sustaining. Interviews and discussions with teachers, analysis of documentation and student data, and evaluative questionnaires were collected at significant intervals over an 18 month period to determine movement towards sustainable practices.

Initial Data Gathering

Discussions with lead teachers and principals of each school occurred to establish any sustaining measures already in place, progress made since the school had completed their Professional Development, and areas which required attention. Each teacher completed a strengths and needs analysis survey examining their current level of confidence in teaching numeracy, content knowledge, strengths in and concerns about mathematics teaching. The exercise also assisted teachers to reflect on their current classroom numeracy practices. A follow-up questionnaire was completed by teachers nine months after the study began. Facilitators observed mathematics lessons for a 30-minute period in each of the classrooms. Observations were recorded on a checklist based on Fraivillig, Murphy and Fuson's (1999) examples of instructional strategies to advance children's thinking. Each occurrence of selected strategies was noted over the 30-minute time period, and results were presented and discussed at subsequent lead teacher and principal workshops.

From the analysis of baseline data some key issues emerged: key understandings of numeracy ideas, effective pedagogy, school 'capacity', and school policy-making and implementation. To address these, a variety of interventions were undertaken through leadership workshops (for the lead teachers and principals), staff workshops, and in-class visits. The interventions were influenced by findings from current research.

Establishing/Revising Key Understandings of Numeracy Ideas

The lead teacher and principal workshop days focussed initially on key aspects of numeracy to ensure participants had a firm grasp of the Number Framework and were able to identify 'strategy stages' of their students accurately. Several of the lead teachers subsequently ran workshops with their staff focusing on some of these ideas. A staff workshop was held at each school early in the project to review or familiarise staff with key aspects of the Numeracy Project. Each of the schools received project material as required, including online workshop material. The teachers were encouraged to read/reread the material and to work through the online workshops independently.

Establishing and Modelling Effective Numeracy Teaching

Effective numeracy teaching was a key focus for the leadership workshops. Links were made to the Best Evidence Synthesis (Alton-Lee, 2003), Numeracy Project material (MoE, 2004) and research by Askew (2000) identifying aspects of effective teaching. Fraivillig, Murphy, Fuson's (1999) strategies for Advancing Children's Thinking (A.C.T.) were used as a basis for reflecting on teaching practices. Lead teachers discussed findings from observations made in their schools under these criteria, and used them as foci for aspects of

their workshops with teachers. They also viewed several video models of effective teaching practice, analysed teacher-student conversations (Higgins, 2002) and examined a variety of questioning techniques (Clarke, Timperley & Hattie, 2003). Facilitators modelled strategy and whole class lessons in classrooms.

Promotion of Professional Learning Communities

Developing professional learning communities was a core theme of the leadership workshops. Research from King and Newmann (2001), Franke et al. (1998) and Timperley (2003) were highlighted to challenge schools to create environments that encourage teachers to reflect meaningfully on their numeracy teaching practices. Models of reflective practice such as: Artzt and Armour-Thomas (2002), Hole and McEntee (1999) and Taggart and Wilson (1998), were discussed and used to promote the use of individual action plans for each teacher. A key focus within the workshops was the promotion of the use of video, associated with a critical ‘friend’, to enhance reflection and improve teaching practices: “Video data provide new avenues for teachers, schools...to engage in rigorous and serious observation and analyses of classroom activity to support and improve teaching and learning” (Hollingsworth, 2005, pp. 150-51).

A teacher from a current numeracy school shared an example of how the development of Quality Learning Circles (Stewart & Prebble, 1993) and analysis of videotaped lessons had led to improved numeracy practices within their school.

Assisting with Planning, Monitoring and Assessment Procedures

Staff workshops were held to assist teachers to reassess their students’ strategy stages and facilitators modelled the Numeracy Project assessments for teachers as required. Samples of student assessments were moderated by facilitators in two of the schools and discussed these with teachers.

Within the leadership workshops, emphasis was placed on establishing school-wide monitoring and assessment procedures to align with numeracy practices. Models for planning and assessment were offered and discussed, both in lead teacher workshops and within the schools. Schools were encouraged to use student achievement data as a basis for setting targets and benchmarks for the forthcoming year.

Results

Baseline Data

The initial survey identified a variety of strengths in teachers; however there was also a wide range of needs described within each school. Although a majority of these teachers had undergone a full year of professional development, and further access of up to two years of continuing support, the ‘opportunity to learn’ block (Ingvarson, 2005), many of the responses indicated a lack of confidence and understanding about the key ideas of the Numeracy Project. Notes taken during initial staff meetings supported this, e.g. “*As well as figuring out what they’re doing, which is quite new, we have to deal with the language*”; “*She’s seeing the algorithm in her head — isn’t that ‘imaging’?*”; “*I find this quite difficult without the book. I have to refer to notes*”. Other commonly identified areas of need included on-going assessment, appropriate use of resources and equipment, group teaching

and management issues. Most teachers expressed confidence in their mathematical content knowledge, but this was not supported by evidence from the survey or by participation in subsequent staff meetings.

Initial observations in mathematics lessons focused on recording examples of teachers' attempts to Advance Children's Thinking (A.C.T.) in mathematics (Fraivillig et al., 1999). Teacher discourse designed to elicit, support or extend thinking was recorded and analysed. Teachers averaged 9.4 examples of these strategies throughout the 30-minute sessions. Three teachers used 20 or more examples of A.C.T. strategies and three teachers used none of these strategies in the 30-minute lesson. The most common strategies (62%) were those seeking to elicit ideas from students. 18% of the examples were strategies which supported children's thinking, and 20% extended children's thinking. High use of closed and leading questions were also noted in these sessions. Results from these observations served as a focus for workshop discussion and established some future directions for development with teachers.

Erratic and minimal progress in policy implementation of numeracy practices was reported from the schools. Two schools reported no changes to school practices in data-gathering, assessment, reporting procedures or target-setting for mathematics since they had undertaken the initial professional development. Three of the schools had established systems for gathering student achievement data but little analysis of this data was made. Much of the variance in numeracy progress was attributed to staff and leadership change within the schools.

Interventions

As a result of participating in the study, schools became more focused on improving student outcomes and developing effective numeracy practices. Each of the schools developed a school-wide action plan to address a range of issues that emerged.

All schools demonstrated an increased value of numeracy professional development by supporting staff to attend workshops and access support material as required, particularly staff new to their school. Workshops focusing on aspects of numeracy occurred in all schools, several run by lead teachers. One school committed each of their teachers to attend the in-depth Numeracy Project workshop sessions and were provided with in-class modelling and observation opportunities.

All schools collected achievement data using the Numeracy Project assessment tools. This meant each of the teachers had detailed assessment information from which to form their groups for teaching, and a baseline from which to monitor and report on progress. Teachers from all schools reported that they grouped their students for numeracy teaching and have developed confidence and accuracy in formative assessment in numeracy. Subsequent analysis of student learning and achievement promoted professional discussion which has impacted on their ideas and beliefs about teaching and learning mathematics.

School-wide practices in monitoring student achievement have developed in most schools. Schools are using numeracy data in target-setting and reporting procedures. One school that comprises classes of 'special character' reported difficulty in developing a collaborative approach to numeracy. This may be an example of 'balkanisation' (Pollard, 2002) where development of a collaborative culture is impeded by the existence of strong pre-existing identities.

In three of the schools there was evidence of an increase in 'deprivatised practice'

(Louis & Marks, 1996; Timperley, 2003). Teachers observed numeracy lessons both within their own school and at other schools. However, there was little evidence of a critical or reflective approach to feedback from these sessions, or a shared exploration of data gathered, although there are signs that the process was beginning in some of the schools. To date there has been no use of the video for self-reflection, although most schools indicated their intention to explore this. In two schools, teachers used individual action plans to target areas needing development, and three schools included numeracy as a focus for internal appraisal of teachers.

Discussion

All of the schools involved in the project shared concern that numeracy practices had not been maintained since the professional development. It was evident to researchers that teachers' understanding of the content and pedagogical ideas implicit in the project was limited. A number of possible factors contributed to this situation: i) The loss of informed staff or lead mathematics teachers in some of the schools had had a major impact, particularly in instances where they were replaced by less informed teachers; ii) There was a lack of teacher engagement or belief change within the initial professional development, which may have resulted in a lack of challenge to pre-existing beliefs; iii). Initial and subsequent phases of professional development had given little cognisance to the fostering the growth of professional learning communities focussed on mathematics learning and teaching within or between schools. This meant that schools were less able to develop support systems that promoted effective practices and that the original challenges to teaching practices had not been resolved or developed through a negotiated, shared understanding within the schools; iv). Further hindrances may have also occurred by limited or no changes occurring to school-wide assessment, monitoring or reporting practices; v). Many of these schools had undergone a variety of professional development foci over the last few years which meant that the initial professional development was not reflected on sufficiently before the school professional development focus changed.

A lack of reflection on their practice meant teachers were less likely to work towards an evidence-based inquiry approach (Timperley, 2004) to identify how aspects of teaching practices impacted on student learning. Teachers within the schools demonstrated a certain reluctance to deprivatise their practice through using video to analyse teaching practices, reflecting Hollingsworth's (2005) observation: "the most pertinent challenge relates to developing a culture among teachers that values and embraces the collection and use of video data" (p. 151). This reluctance could have been influenced by the teachers' tendencies to regard video footage as a record of events with a potential for broadcast, instead of as a tool to promote reflection or assist analyses of practice. The use of video as a tool for reflection could also have been impacted by lack of confidence in the use of the technology, the commitment of time required and the lack of support for analysis.

Many of the needs identified in the earlier stages of the project have begun to be addressed in the schools. This has occurred through: greater teacher understanding and increased knowledge of numeracy content and pedagogy through revision and observation of effective teaching models; the creation of forums among and between schools to address relevant issues; and through the provision of support for leadership initiatives in numeracy. This has begun to impact on levels of teacher confidence in implementing aspects of numeracy teaching in classes, a focus on reflective teaching practices and changed school-

wide assessment, monitoring and reporting of student data.

Conclusions

Sustainability of in-depth professional development is dependent on a variety of factors coexisting. Schools in this study initially presented with a number of essential elements lacking, and in addressing these, a process of change within some of these schools was evident. It appears that a complex network of elements work together in a synergy to create the fertile environment necessary to promote and sustain growth begun in the initial stages of professional development.

The school context appeared to have had a major impact on sustaining the professional development, as noted by Ingvarson et. al. (2005), and aspects of school capacity had not been adequately addressed. The schools exhibited few elements of a professional community such as: shared values, a focus on learning, collaboration, deprivatised practice and reflective dialogue (Kruse et. al., 1995). The interventions focussed the schools on developing a more reflective approach to their teaching, as teachers began to be challenged by evidence presented through observations of their teaching, and through professional discussions about numeracy practices and student data. For growth to continue, schools need to be cognisant of ways in which to develop their capacity to provide teachers with adequate support to actively reflect on their teaching practices in order to become autonomous learners: "Reflective practitioners do not continually look to outside agencies for professional development, rather they are instrumental in developing themselves as professionals" (Serafini, under revision, p.13).

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References

- Alton-Lee, A. (2003). Quality Teaching for Diverse Students in Schooling: Best Evidence Synthesis. Wellington: Ministry of Education
- Artzt, A.F. and Armour-Thomas, E. (2002). Becoming a Reflective Mathematics Teacher: a guide for observations and self assessment. New Jersey: Lawrence Erlbaum Associates
- Askew, M. (2000). Effective teachers of Numeracy. London: King's College
- Clarke, S., Timperley and H., Hattie, J. (2003). Unlocking Formative Assessment: Practical Strategies for Enhancing Students' Learning in the Primary and Intermediate Classroom. Auckland: Hodder Moa Beckett
- Coburn, C. (2003). Rethinking scale: moving beyond numbers to deep and lasting change. Educational Researcher; v32 n6 pp3-12 Aug-Sep 2003
- Cohen, L., and Manion, L. (1994). Research Methods in Education. (4ed) London: Routledge
- Fraivillig, J. L., Murphy, L. A., Fuson, K. C. (1999). Advancing children's mathematical thinking in everyday mathematics classrooms. In Journal for Research in Mathematics Education, 30 (2) pp148-170
- Ferraro, J. M., (2000). Reflective Practice and Professional Development. In ERIC Digest
- Franke, M. L., Carpenter, T., Fennema, E., Ansell, E. and Behrend, J. (1998). Understanding teachers' self-sustaining, generative change in the context of professional development. In Teaching and Teacher Education, 14 (1) pp67-80
- Hargreaves, A. and Fink, D. (2003). Sustaining Leadership. In Phi Delta Kappan, 84 (9), pp693-700
- Higgins, J. (2002). Evaluation of Advanced Numeracy Project 2001. Ministry of Education: Wellington. Te Kete Ipurangi website: http://www.tki.org.nz/r/literacy_numeracy/professional/evaluation_anp.pdf
- Higgins, J. (2003). Evaluation of Advanced Numeracy Project 2002. Ministry of Education Wellington. Te Kete Ipurangi web site: http://www.tki.org.nz/r/literacy_numeracy/professional/eval_anp2002.pdf
- Hole, S. and McEntee, G. H. (1999). Reflection is the heart of practice. In Educational Leadership, May, pp34-37

- Hollingsworth, H. (2005). Learning about teaching and teaching about learning: Using video data for research and professional development. Conference presentation: Using Data to Support Learning. <http://www.acer.edu.au/workshops/documents/HilaryHollingsworth.pdf>
- Ingvarson, L., Meiers, M., and Beavis, A. (2005). Factors affecting the impact of professional development programs on teachers' knowledge, practice, student outcomes. In S. Dorn (Ed) Education Policy Analysis Archives, 13 (10) pp1-28
- Kemmis, S, and McTaggart, R. (2000). Participatory action research. In N. Denzin, & Y. Lincoln, The Handbook of Qualitative Research, (2ed) London: Sage Publications Inc. pp567-603
- King, M. B. and Newmann, F. M. (2000). Will teacher learning advance school goals? In Phi Delta Kappan, 81(8) pp576-581
- King, M. B. and Newmann, F. M. (2001). Building school capacity through professional development: conceptual and empirical considerations. In the International Journal of Educational Management, 15 (2) pp86-93
- King, M. B. and Newmann, F. M. (2004). Key Link. In Journal of Staff Development, 25 (1) pp26-28
- Louis, K and Marks, H. (1996). Does professional community affect the classroom? Teachers' work and student experiences in restructuring schools. Paper presented at the Annual Meeting of the American Educational Research Association: New York
- MacGilchrist, B. Myers, K., and Reed, J. (1997). The Intelligent School. London: Paul Chapman
- Millet, A., Brown, M., Askew, M. and Johnson, D. (2004) (Eds). Primary Mathematics and the Developing Professional. Dordrecht: Kluwer
- Ministry of Education (2004, 2005). Numeracy Professional Development Projects.: Wellington: Ministry of Education
- Pollard, A. (2002). Effective and Evidence-informed Professional Practice. London / New York: Continuum
- Serafini, F. (under revision). Dimensions of reflective practice. Downloaded on 30 March 2006 from: <http://serafini.nevada.edu/MainPages-Index/readings.html>
- Stewart, D. and Prebble, T. (1993). The reflective principal: school development within a learning community. Palmerston North, N.Z: ERDC Press, Massey University
- Taggart, G. L., Wilson, A. P. (1998). Promoting Reflective Thinking in Teachers: 44 action strategies. Thousand Oaks, California: Corwin Press
- Timperley, H., Wiseman, J., Fung, I. (2003). The Sustainability of Professional Development in Literacy, Part 2. Final report to the Ministry of Education. Wellington, NZ: Ministry of Education
- Timperley, H. (2004). Enhancing professional learning through evidence-based inquiry. Paper prepared for the Symposium on Teaching Quality. Jun 2004
- Timperley, H. and Parr, J. (2004). Using Evidence in Teaching Practice: implications for Professional Learning. Auckland: Hodder Moa Beckett
- Willis, S. (2002). Creating a knowledge base fro teaching: A conversation with James Stigler. In Educational Leadership. March 2002