

How are schools addressing the needs of students who are not progressing as expected in mathematics?

**Principal's Sabbatical Report**

Lee Anderson

Te Kopuru School

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## **Acknowledgements**

I would like to acknowledge first and foremost the Te Kopuru School Board of Trustees for supporting my application for sabbatical leave. Thanks also go to my release principal for the support, enthusiasm, and stability she gave to our school during my absence; and to the staff for their continued hard work and commitment to the students at Te Kopuru School.

I acknowledge the Ministry of Education for making sabbatical leave available to Principals. The opportunity to be able to take time out, to reflect on my practice, and to investigate an area of need within the school is invaluable.

Many thanks also to the schools I have visited, and to the Principals, curriculum leaders, teachers and teacher aides who have so willingly shared their expertise and practice.

## **Purpose**

- The purpose of my time spent on sabbatical is to investigate how schools are addressing the needs of students who are not progressing as expected in mathematics.
- To research best practice in mathematics and explore successful interventions that meet the needs of targeted students

## **Background**

Te Kopuru School is a U4, Decile 2 full primary school situated 12 kilometres south of Dargaville, Northland. Our roll at the moment is 170 students, but fluctuates due to a large number of transient students. Sixty five per cent of our students are of Maori ethnicity; there are seven classes, including a bilingual classroom working at level 2 Te reo Maori.

In 2006, all staff took part in professional development with the Numeracy Development Project; and as new teachers came, knowledge of the N.D.P. and subsequent up skilling was, and still is, a priority.

However, compared to literacy, numeracy always appeared to be the “poor country cousin”. Literacy was the curriculum area that was visible within the school and the majority of teachers were passionate about reading and writing; inadvertently causing mathematics to take a backward stand. Our school wide data showed that we were good readers, but not confident in maths.

A school wide staff review in mathematics found:

- Some teachers had lost confidence in mathematics teaching expertise after participating in the N.D.P. They found they needed time to change their own pedagogy and thinking – a change from mathematic teaching focused on rules, procedures, and routines to the new focus on students developing their own mathematical thinking.
- Most teachers spent more classroom time teaching literacy compared to numeracy. Part of the reason for this was due to Te Kopuru School being part of the Northern Wairoa Primary Schools Cluster which led to a three year Literacy Across the Curriculum professional development contract with literacy consultant Gaye Byers.
- Teacher knowledge of mathematical language was poor, as was their ability to teach place value, fractions and problem solving. School wide student data indicated that these were the areas of student need.
- Teacher aides were used within the class maths programme to assist groups of students to complete set tasks.

Over the last five years we have systematically made change to address the above needs:

- To prioritise maths, we changed our timetable so that classroom teaching would take place at the same time each day for one hour – Monday to Thursday. Maths learning takes place first thing in the morning programme, 9.00am to 10.00am. This makes an important statement – math learning is important.
- We “skim” classes to cater for the diverse range of student learning needs. This has caused some debate among the mathematical “experts”, but it works for us. It enables us to plug the gaps of learning in identified students; and to extend those students who need it.
- Professional development for all staff is on-going, including teacher aides. Priority for staff learning has been on place value, fractions, problem solving and knowledge of mathematical language.
- In 2011 Ministry of Education provided teacher release funding for a maths specialist teacher to work daily with identified students as a targeted intervention.
- The Board employed independent math facilitator Hugh Wainwright to test our students on their basic fact knowledge, and align this data to the numeracy stages.
- Teachers have identified their own areas of weakness in mathematics, and as a result have all undertaken to up skill through the University of Auckland paper *“Understanding and Extending Mathematical Thinking.”*

Student achievement in mathematics has shown shift, and teacher confidence has greatly increased. However, we still have a number of at risk students who are sufficiently below expectations that their future mathematical learning is in jeopardy. They require special teaching, extra support to accelerate their learning. This support is beyond what the classroom teacher can be expected to do alone.

We need to address this area of need. The Trends in International Mathematics and Science study (TIMSS, 2006) showed that the mathematics achievement of New Zealand students in their middle primary school years is below the international mean. The TIMSS findings revealed that students whose teachers participated in the Numeracy Development Project did significantly better than those whose teachers did not. Yet the National Education Monitoring Project (NEMP) finding for 2009 indicate continuing disparities for Maori and worsening disparities for Pacifica in mathematics. It is clear that many teachers need more support.

*“Over 80% of schools reported providing literacy programmes to support the achievement of students with special needs....The programmes listed most often were Reading Recovery, Rainbow Reading, Lexia, Toe by Toe, and various phonics programmes. Around 40% of schools listed programmes to support numeracy, with most not naming the specific programme.”*

ERO: Including Students With Special Needs: School Questionnaire Responses (April 2012)

So, what are other schools doing to raise student achievement in mathematics?

## **Methodology**

My plan was to initially spend time reading any research that I could find on maths intervention programmes, and what actions, as a classroom teacher are critical to teaching mathematics to students who struggle.

I then planned to visit a range of schools to discuss the following questions:

- What is your school wide data telling you about student need in mathematics?
- How involved is the leadership team in your school in promoting and driving mathematics across the school?
- How do you address the learning needs of students identified as ‘at risk’ or ‘of concern’?

## Findings

### A) NZ Maths site:

I was pleased to be able to spend time exploring the NZ Maths site. It has a vast array of information and resources for the classroom teacher, from Early Childhood to Secondary. It provides information on NZC and the National Standards, the Numeracy Project, Assessment Tools, Information for Families on how they can help at home, and copious amounts of teaching material for the learning programmes. There is also online numeracy professional development available for schools to use. The modules provide information to support teachers in understanding the Number Framework, and guidance on planning and implementing a classroom numeracy programme.

**ALIM (Accelerated Learning In Maths)** resources are available for teachers on the website. These resources are aimed at students who are underachieving. Barriers to learning are outlined, providing diagnostic questions for the teacher to use, what to notice in the student response, deliberate acts of teaching, and next steps in the classroom.

**E AKO Maths** is also found on the NZ Maths site. This is a programme specifically designed to support students who are having difficulty developing sound knowledge and understanding of place value, basic facts and fractions. It provides a pathway of interactive learning modules for students to work through. Students can choose from the e –ako, with assessments, and if necessary, restricting student access to more difficult material. Each student has their own account so that they can explore the material at their own pace. It has been designed to compliment and support existing teaching programmes – not as a stand-alone tool.

### Other sites for student learning:

[mathsbuddy.co.nz](http://mathsbuddy.co.nz)

[mathscentre.co.nz](http://mathscentre.co.nz)

[studyladder.co.nz](http://studyladder.co.nz)

[primaryinteractive.co.uk](http://primaryinteractive.co.uk)

[maths.com](http://maths.com)

[jmathpage.com](http://jmathpage.com)

[maths is fun.com](http://maths.is.fun.com)

[mathgames4children.com](http://mathgames4children.com)

[nrich.maths.org](http://nrich.maths.org)

[candomaths.co.nz](http://candomaths.co.nz)

## **B) School Findings**

*What is your school wide data telling you about student need in mathematics?*

Analysis of school wide data from all schools I visited or communicated with showed student gaps in the following areas:

- Number Knowledge; in particular basic facts
- Place Value
- Fractions
- Mathematical language

*How involved is the leadership team in your school in promoting and driving mathematics across the school?*

It is important that senior management are seen to drive the mathematics curriculum across the school. All maths curriculum leaders I spoke to displayed a passion for mathematics and student learning. They saw their role to lead/coordinate numeracy staff development, to encourage/support colleagues, to lead planning, to promote student achievement, analyse achievement information and to model good practice. All maths curriculum leaders commented on the central role of the Principal, not only to staff, but ultimately to student achievement. *"..Most importantly, they determine the rationale for the school's provision for the type and range of support. Asking questions about how best to meet the needs of this group requires informed decision-making about the organisation and resourcing that will offer the greatest leverage in improving achievement outcomes for students."* ( 2008 ERO report Schools' Provision for Students at Risk of Not Achieving.)

Most of the maths curriculum leaders I spoke to acknowledged the importance and support given to them by their Principal in their role of driving numeracy across the school.

*How do you address the learning needs of students identified as 'at risk' or 'of concern'?*

I visited a total of 8 schools. Four of these schools did not have any specific intervention maths programme. These schools used teacher aides in the junior classes to support the classroom teachers and the learning of students in mathematics. None of the teacher aides had any specific mathematical professional development.

**ALIM:** Two of the schools I visited are part of the Ministry of Education ALIM programme led by a Maths Specialist Teacher. The Ministry provides funding for teacher release which enables the MST to work with small groups of students who have been identified as achieving well below the standard in mathematics. Professional development is provided for the MST, and targeted instruction is planned and co-ordinated by the MST in close communication with the classroom teacher, and whanau. Case studies on the ALIM programme are available on NZmaths.

**SPRING INTO MATHS:** One school has implemented the SPRING programme. It is a maths intervention programme for students identified as 'at risk' or 'cause for concern' against the Mathematics National Standards. The programme is over and above the normal maths class programme. The maths lead teacher does the initial and post student assessment, up skills the teacher aides, models lessons, and observes the TA, giving positive feedback and feed forward. The T.A. works with small groups of students, for 30 minutes, four days a week. The programme is knowledge and strategy based.

**COSDRRICS:** One school I visited had implemented the COSDBRRIC programme. This is a numeracy intervention programme that is facilitated by a teacher aide. Identified students participate in a 30 minute daily intensive lesson focusing on their specific number knowledge gaps. This programme is additional to the maths classroom programme. This was a successful intervention programme, but lack of funding prevented continued implementation in this school.

**CAN DO MATHS:** I visited a school which has introduced the Can Do Maths programme. The aim of this programme is to develop mathematical minds by making maths active, visual and enjoyable. The Can Do Kit bag is designed to help auditory poor students develop techniques for learning to memorise basic facts, and involves a variety of games that are fun for the students. The teacher commented to me that there has been significant shift in number knowledge, but more importantly is the shift in student attitude toward maths. Students I spoke to were enthusiastic about the programme and said that it helped them with their classroom maths.

Summary:

Over recent years significant changes have occurred in how the mathematics programme is best able to meet the needs of students. The teaching of mathematics has changed from the teacher imparting mathematical knowledge through rules and procedures to the new focus on students developing their own mathematical thinking. In NZ the responsibility falls on the teacher to design 'learning environments that foster learning conversations and learning partnerships; and where challenges, support and feedback are readily available'. (Ministry of Education 2006)

Research tells us that teachers make a significant difference to student learning and they do so most in situations where the students are needy. We have a huge responsibility for our students' mathematical well-being, and expert teachers of mathematics are the answer!

The reality is that schools do not have all teachers as expert teachers of maths! The reality also, is that schools always have a proportion of students who are underachieving in mathematics.

Explicit instruction is an important tool for teaching mathematics to students who are at risk of maths failure. From my research, it is clearly evident that the Accelerated Learning in Mathematics programme (ALiM), funded by the Ministry of Education, is making effective gains in closing the gaps in student mathematical learning. The Maths Specialist Teacher (MST) works with small groups of students who are identified as at-risk, on an intensive daily programme over a period of at least 10 weeks. The advantage of this programme is that not only is their shift in student achievement, but it is also developing the teacher into an "expert" math teacher and as such, is a valuable resource person within the school. However, the sustainability of this programme, due to on-going funding for teacher release, is an issue for school leaders and Boards of Trustees.

Strong leadership that drives numeracy across the school and embraces collaborative teaching and learning communities is pivotal. Teachers need to be nurtured by having colleagues and role models whom they are able to call on for support and guidance. Collegial critiquing of teacher practice with positive feed forward increases the likelihood of enhancing student achievement in numeracy.

'Success is achieved with the right kinds of support in the right kinds of circumstances.' Timperley, Wilson, Barrar and Fung (2007)

Teacher knowledge of mathematical knowledge and pedagogical content is a critical factor in the effective teaching of mathematics. The opportunity for teachers to attend professional development is essential. Feedback from teachers who have completed the University of Auckland maths paper "Understanding and Extending Mathematical Thinking" has been very positive. All teachers I have spoken to have stated that the paper was extremely worthwhile and it has helped tremendously with

their own subject knowledge, and the big ideas that they need to teach. Some teachers have gone on to complete the second and third year papers.

I have concern over the minimal mathematical content knowledge that many of our beginning teachers are bringing into the school. This issue was expressed by three of the maths curriculum leaders/Principals of the schools I have visited. I would take this opportunity to say that the above University paper, or similar, would be hugely beneficial for our graduate teachers.

Spring into Maths and COSDBRICS are both intervention programmes for students who are underachieving in mathematics. They are both structured and sequenced with a variety of activities aimed at increasing student number knowledge through repetition. Teacher aides are extremely valuable resources within school and both of the above programmes can be facilitated by teacher aides. However, it is important to ensure that there has been adequate training and development, including teacher modelling, teacher observation with feed forward and on-going support. Even though we know that expert teachers of mathematics should be working with our students at risk, often, due to financial restraints, systems and structures, teacher aides are utilised in this way.

As a result of this investigation, we have introduced the Spring into Maths intervention programme to a group of Year 2 students, and will further develop this in the junior area of the school in 2013. Cementing number knowledge in Year 1, 2 and 3 is critical for future success in mathematics learning for our students as they progress through to Year 7 and 8.

My role as Principal will be to continuously espouse and drive effective mathematical learning programmes throughout the school. It is my job to ensure that all teachers have the knowledge, skills, resources and incentives to provide students with the very best of learning opportunities. My role is to nurture my staff, and to continually challenge them to become “expert” teachers of mathematics.

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