

SMALL GROUP TUTORING LEADING TO STUDENT PEER TEACHING

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The workshop will include many practical ideas, based on recent research findings that leaders of mathematics and teachers can share with teacher aides in Primary schools to assist them to meet the needs of learners. Small group and peer tutoring techniques will be a key component. Also emphasis will be on the use of various hands-on activities with easily attainable equipment.

Meeting the needs of at risk students

How does the school you teach at ensure the needs of ‘At Risk Students’ are met? Are these students part of the classroom teaching programme or are they isolated away from students who are succeeding? Who teaches these students; the teacher, teacher aide or maybe other students? Who is responsible for assisting the teacher aide to meet the needs of students at risk? Are teacher aides equipped with the knowledge and skills required to meet the needs of these students? Could students assist to meet the needs of these students? Could students at any ability level be involved in peer teaching?

In New Zealand the Ministry of Education (2009) definition for Numeracy ‘Students at Risk’ are those who are sufficiently below expectations that their future learning in mathematics is in jeopardy. “Students rated “at risk” require special teaching, modified classroom programmes and extra support to continue their development and maintain positive attitudes. The support required is likely to be beyond what can be reasonably expected from their classroom teacher alone.” (www.nzmaths.co.nz)

Last year in the Canterbury region the Numeracy facilitators initiated a number of initiatives to try to improve student achievement for at risk students. The case study below will outline the journey I, as a Numeracy Facilitator, and a small cluster of Mathematics Lead Teachers traveled last year and the resulting initiatives we developed for teacher aides, parent helpers and students to use to assist students to improve in Numeracy.

One cluster group approach

Introduction

The four schools that opted to be involved in the cluster were very diverse. School A was a residential school for at risk students from Years 4-8. School B was a low decile city school with students from Years 0-6. Two of the schools were high decile Intermediate Schools, School C and School D, with students in Years 7&8. School C, had a Learning Needs Unit to meet the needs of students not succeeding in the mainstream classroom for Mathematics. Each school acknowledged that they needed support to raise the achievement of at risk students in mathematics and they wanted to use small group teaching and possibly teacher aides to do so.

When we first met as a cluster we had no idea about the direction we would travel in. The initiative began with findings shared from the work Professor Bob Wright does with his intervention in number learning. Wright, Maitland, Stafford & Stanger (2006) informed a lot of our early work through his Learning Framework in Number (LFIN), as the framework mirrors many similarities to the New Zealand Numeracy Framework (2007). His teaching framework is designed to meet the needs of low achievers through one-to-one or small group teaching.

We also looked at a Numeracy intervention initiative the Otago Numeracy Facilitators had developed in 2007 which they called, 'Best Practice for Children at Risk' (BP4CAR).

Both of these interventions considered used repetition as a key strategy for number knowledge acquisition. This idea is supported by Nuthall (2007, p. 63) who found a student needed to encounter, on at least three different occasions, the complete set of information she or he needed to understand a concept.

As a cluster we also discussed best practice in Numeracy for meeting the needs of at risk students. We debated at length whether interventions were best placed in a classroom setting or in another space.

The New Zealand Education Review Office (ERO) presented findings from a nation wide review entitled 'Schools' provision for students at risk of not achieving.' They report that "the most successful initiatives to meet the needs of at risk students involved inclusive

approaches, most often undertaken in the classroom, alongside the peer group. Students stayed with their class group but received instruction from a teacher aide or additional staff member in a way that supported their learning needs but also helped them to remain connected to their classroom programme.” (p.1) Yet often we see students working with a teacher aide in a staffroom or resource room corner.

We also debated whether the best person to assist at risk students is a teacher aide? Meyer and Bevan-Brown (2000) state that in New Zealand, “teacher aide hours are perhaps the most common and most requested service provided to students with significant special needs within the general education environment” (p.170). If a teacher aide is in a class to support a special needs child are they also available to assist at risk students also? But we questioned whether most teacher aides were trained to teach Numeracy. In a small study conducted with teacher aides last year in New Zealand, 31 teacher aides were asked what topics they had professional development in recently. Four said Numeracy.

As a cluster we decided to begin trialing intervention initiatives to meet the needs of at risk students, with each school choosing to do whatever best suited their setting. There was a variety of teachers, teacher aide and parent helper combinations trialed. The Lead Teachers opted to meet regularly to support each other and also invited teacher aides and parent helpers to become involved in these meetings and school activities as ideas evolved in the cluster group meetings.

Cluster meetings occurred on seven occasions and met many purposes. At all times the focus was on professional development, and the Number Knowledge and Strategy Frameworks were unraveled in detail to identify key teaching ideas. Often equipment use and suggested learning activities were shared. Usually one school shared an approach and at the next meeting another school shared an extension or remodel of the first idea. All participants, including teacher aides and parent helpers gained confidence to share their thinking with others and were very open to feedback and suggestions. At times meetings became a venue to share issues and frustrations and to appreciate that even though the four schools were diverse they did often have similar tales to tell. Of course one key focus was celebrating successes achieved by individual students and staff.

Outside the cluster meetings Lead Teachers needed to constantly negotiate time, space, resources and programmes of work with school leaders to have the flexibility to trial new ways to meet the needs of at risk students. I visited each school on at least two occasions. Visits included observation of the programmes, discussions with people involved, providing some professional development as needed and facilitating meetings as required with school management. I never left a school without ensuring that the principal knew what fantastic activities were being used to develop ways to best meet the needs of students at risk in their school.

Each school had to gather and analyse school wide data carefully to select the children who they deemed most likely to benefit from some form of Numeracy intervention. All the schools used the New Zealand Numeracy Project IKAN and GLoSS assessment tools to identify students. The IKAN tool provided data regarding Number Knowledge and the GLoSS tool provided Number Strategy data.

These tools are accessible from <http://www.nzmaths.co.nz/assessment-tools>. Schools continued to gather and analyse data throughout the trial to ensure evaluation was directly reporting on student achievement. The intervention initiatives occurred in the four schools in Terms 2-4 2008.

Small group tutoring

Following the sharing of various intervention approaches all the lead teachers involved decided to implement a small group tutoring system in their school. All four schools decided to target children in years 6-8 who were working at the New Zealand Numeracy Framework Stage 4. The schools agreed to teach the same group of children for four or five 30 minute sessions per week for at least six weeks.

The initial framework, in Table 1, was adapted from Professor Wright's LFIN framework. It was also an adaptation of the BP4CAR programme that the Otago Numeracy Facilitators implemented. Carol Butel, another Christchurch Numeracy Facilitator colleague also strongly influenced our decision making, as she allowed us to see and adapt a student peer tutoring programme, she developed with a teacher in a Year 2 class at a low decile school.

In the three intervention initiatives mentioned in the previous paragraph, the teacher, teacher aide or parent helper asked a question and the children used numeracy equipment provided to answer the questions. Eventually with confidence and experience the children are able to work out the answers in their heads without having to use the available materials.

School A decided to use two classroom teachers to work with a group of four students in their own classrooms. School D trialed two groups of four students. One group was taught by the lead teacher. The second group was taught by a teacher aide. The groups were withdrawn from the classroom and taught in the school staffroom. The teacher aide has not taught Numeracy before. At school B the school decided that a teacher aide and a parent helper would co-teach a group of four students in a resource room. In the learning centre at School C the special needs teacher and two teacher aides co-taught two groups of eight students.

It was recommended that each week the programme below was varied to give emphasis to different aspects of number knowledge depending on the identified needs of the students.

For example, in week 1 questions from sets numbered 1, 2,5,6,& 8 below may be used. These questions were supplemented with ideas and games the schools had at Numeracy Stages 4 and 5 between buddies &/or group of four students.

It was also decided that the teacher, teacher aide or parent helpers would initially ask the questions but eventually the intent was that the process became a student peer teaching programme.

Actually, only one school got to the point where the programme was being student driven by the end of the trial period. A small segment of school D's programme for basic facts and place value is shared later in this article.

Table 1 Small Group Tutoring programme for Stages 4-5

Number Knowledge Stages 4-5 (based on pg 19, Numeracy Book 1)

1. Number identification and sequence and order

Say a number (between 100-999) Make me this number on the flip chart/place value house

Write the number in words

Say the number 1 more, 1 less, 10 more, 10 less, 100 more, 100 less, 9 more, 9 less, 90 less, 90 more

2. Skip counting

Say 2 numbers between 90 & 999 Skip count in 2's from this number to this number and back again

Say 2 numbers between 90 & 999 Skip count in 5's from this number to this number and back again

Say 2 numbers between 90 & 999 Skip count in 10's from this number to this number and back again

Say 2 numbers between 90 & 999 Skip count in 3's from this number to this number and back again

3. Number ordering

Give out cards with various numbers from 19-999 Order these 10 numbers in order from smallest to largest

Point to two number cards Say the number 1 more, 1 less, 10 more, 10 less, 100 more, 100 less, 9 more, 9 less, 90 less, 90 more than

What is the difference between this number and that number?

4. Doubles and halves

Use the top two rows of the Slavonic abacus to show these doubles and say the related addition & multiplication equations (give 6 examples) eg $4+4=8$, $2 \times 4=8$

Use the top two rows of the Slavonic abacus to show these doubles and say the related subtraction and division equations (give 6 examples) eg $8-4=4$, $8 \div 2=4$

5. Fractions

Roll a dice that has $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$, $\frac{1}{8}$, $\frac{3}{8}$, $\frac{5}{8}$ on. For each turn make the fraction rolled using foam fraction pieces or draw on grid paper.

6. Grouping and Place Value A

Tens frame cards – how many more makes 10 (5 examples), how many more makes 20 (5 examples),

Slavonic abacus or happy hundreds cards – how many more makes 100 (5 examples)

Tell me how many 2's in these numbers (5 examples between 10-20)

Tell me how many 5's in these numbers (5 examples between 10-50)

7. Grouping and Place Value B

Show me on a place value house, how many \$10 notes to make these numbers (5 examples with numbers between 100 & 999)

How many 100's in these century numbers (5 examples between 100 & 900)

How many 100's in these thousands numbers (5 examples between 1000 & 9000)

8. Rounding

Round these numbers in the thousands book to the nearest 10 and tell me why it is nearest (5 examples).

Repeat for the nearest to 1000 (5 examples)

9. Basic Facts A

Use the Slavonic abacus to model 5 different 'teen and 'ty numbers. Discuss 'teen means ten and a one, eg thirteen= three plus ten. Discuss that 'ty means lots of ten, eg thirty is 3 tens.

10. Basic Facts B

Use a pack of cards, place a 1-10 card down and state how many more makes 20 (5 examples)

Place 2 cards (1-10) down and call out the answer as quickly as possible (5 examples)

Place 2 cards (1-10) down and state the family of facts for the 2 cards (5 examples)

Place 1 card down and call the answer if that number was subtracted from 20 (5 examples)

11. Basic Facts C

Throw a ten sided dice and multiply each number thrown by 2 (5 examples), repeat for 5's, 10's and 100's also.

Following the success of this programme for New Zealand Numeracy Project Stages 4-5, I as facilitator, in collaboration with other facilitators, and also cluster members created programmes for lower and higher numeracy framework stages. A small sample is available in Table 2 below. These lower and higher staged programmes were implemented in three of the schools during the trial period with other students or after the trial had concluded.

Table 2 A small segment of the Small Group Tutoring programme for Stages 5-6

Number Knowledge Stages 5-6 (based on pg 19, Numeracy Book 1)**1. Number identification and sequence and order**

a) *Say a number (between 1000 - 1 000 000)*

Make me this number on the flip chart/ place value house/ record the number.

Write the number in words.

Say the number 1 more, 1 less, 10 more, 10 less, 100 more, 100 less, 9 more, 9 less, 90 less, 90 more.

Count on from the number – 10 forwards and 10 backwards.

b) *Say a number (between 0.009 and 1)*

Make me this number on the flip chart/ place value house/ record the number

Write the number in words

Say the number 1 more, 1 less, 10 more, 10 less, 100 more, 100 less, 9 more, 9 less, 90 less, 90 more.

Count on from the number – 10 forwards and 10 backwards.

c) *Use a number flip chart and show a number between 1000 – 1 000 000 with 2-6 nine digits (eg 99 999)*

Roll over / roll back 1, 10, 100, 1000, 10 000)

d) *Then show a number between 1 -100 with 3 decimal places with 2-5 nine digits (eg 99.999)*

Roll over / roll back 1, 0.1, 0.01, 0.001)

Evidence of success – listening to the people

As a result of implementing and adapting the intervention in Table 1 above, each of the four schools could provide evidence that each student had experienced success with numeracy number knowledge and this impacted in number strategy use for the majority of students also. Initial, ongoing and summative data gathering and analysis demonstrated this. However the stories I wish to tell are from the positive voices of the people involved: Students:

“I now know I can learn.”

“My Maths has improved. Now do my times tables. It helped me do a lot of stuff with my other Numeracy group.”

“Doing the same thing each day helped us with our numbers.”

“I enjoy being part of a smaller group and getting more help.”

“The maths is the best programme I have ever been to and at the right level for me.”

“I am now faster at doing my maths.”

Teachers who implemented initiative:

“Children are more willing and confident when attempting maths work. The majority of children have moved up a stage.”

“These students are much more positive, engaged and enthusiastic in learning in general.”

Teacher Aides:

“Teaching in a small group situation at a level students could understand was great.”

“We need to introduce this programme to other teacher aides and parents to spread this programme through the school.”

“The students responded well to the more individualised attention”

“I enjoyed doing the programme because I can already see the growth in their knowledge”

Parent Helper:

“It has helped the students with their confidence in class when they take part in maths activities.”

Keys to success

During later cluster group meetings schools shared very openly and honestly about the intervention and collectively the group came up with several statements to ensure other schools could experience the successes that they did:

- The programme must be planned for in schools’ long term plans and budgets each year
- Other teachers in schools want to know more and were to be encouraged to get involved.
- The confidence and ability of teacher aides and parent helpers developed and this was crucial. There needs to be professional development before and during the intervention
- Programmes were tweaked to best meet the needs of each setting and students. Each school had a unique approach
- Regular cluster meetings and openness to share ideas is very motivating for everyone involved, and ensures ongoing reflection and refining occurs.

As one lead teacher said, “This has been great to develop my own ability, to access different resources, and to have more one to one with the facilitator. I feel more able to support children who are not grasping concepts.”

Issues that surfaced

Of course many issues were highlighted as a result of the intervention. Some of these were pertinent to every school involved:

- Sustainability of initiatives in 2009 & beyond needs to be planned
- Teacher Aide funding and the balance of time allocated between Literacy and Numeracy support needs to be established with school management
- Teacher Aide knowledge and confidence needs to be developed
- Withdrawal of students from classroom is not the only way to meet the needs of at risk students
- There are numerous other students at risk across each school that need access to the programme and schools need to consider ways to meet the needs of all students
- Retention of experienced staff, teacher aides and parent helpers will add to the success of any intervention long term
- The importance of regular moderated data gathering & specifying the format for data to be presented needs to be established from the start of any intervention
- Finding a physical space for groups to work both in and out of the classroom can be very problematic in many schools
- The teacher aides collectively felt they needed ongoing training from a qualified teacher, eg. Maths terms and strategies. This is also true for student buddies.

Not one size fits all!

The collective success of this cluster group came from each school adapting the intervention to best suit their context. All of the schools were going to continue to develop and implement further interventions for at risk numeracy students in 2009.

School A says the intervention is now the basis of the programme for all classes at their school as all teachers teach students who are at risk. The key teaching ideas and resources trialled last year are shared across the whole school.

School B is continuing with the intervention with at least four students involved at a time. The teacher aide and a parent helper are involved and they are training more parent helpers in 2009.

School C used 2008 trial data to discuss the sustainability of the school's 'Learning Centre'. The centre is continuing and using the interventions established with the special needs teacher and two teacher aides. At School C another classroom teacher is also trailing a peer tutoring system in their classroom with at risk students.

School D decided that every student in the school would benefit from a student peer teaching programme for number knowledge.

Student peer teaching is continuing at one school for all students

School D is continuing to use two teacher aides to assist small groups of four students who are most at risk this year. These programmes are based on the small group tutoring programme above and include number knowledge games also.

At School D the school numeracy lead teachers and I developed student peer tutoring systems in basic facts & place value to individualise all students' learning. Several teachers are already using the student peer teaching programme. Further systems are planned for number sequence and order, and fractions.

Resource folders for each classroom include a peer tutoring programme. This includes the learning intention, the peer teaching script, plus a list of available games and resources to support the students learning of knowledge. Table 3 is a small segment of this basic facts programme that is for Numeracy Stages 4-8.

The students are regularly assessed using the IKAN knowledge test. The children mark and analyse their own data. "I like to monitor my own learning", was a comment from a student.

They are then assigned a group to work in to meet their similar needs. Within the group the students find a peer who has a similar number knowledge focus to work with. For example, two children may need to work on basic subtraction facts at Stage 5.

There are numerous benefits to the students being involved in peer tutoring. Peers serve as an important resource, away from the demands of whole class communication, for developing mathematical thinking. (Walshaw & Anthony, 2007)

One student at School D said, "We like the routine of the programme and the fact the teacher is not telling us what to do all the time." Another student said, "we enjoy not having to sit at desks. Our teacher lets us work anywhere around the room as long as she can see we are on task."

Boaler (2008) argues that "students become very good at questioning peers rather than telling them the right answers. They also are good at motivating each other if they sense others are unmotivated."(p.23) Another student comment was, "We can learn through games and peer questions and not just doing activity sheets like we used to."

It is also important to acknowledge that both the peer tutor and tutee can both benefit from the interaction. Students who give elaborate explanations typically learn more than those who receive them (Webb, 1991)

Student peer teaching fits very comfortably with the vision, principles and key competencies of the new New Zealand Curriculum (Ministry of Education, 2007). The new curriculum aims to have all students confidently and actively involved in the learning process. It puts an emphasis on children managing themselves, relating to others, participating and contributing. The way School D has set up their peer teaching

strongly endorses the curriculum and encourages all children to have ownership in their own learning.

Ongoing professional development for teachers and in-class training for students at School D ensures that everyone understands the key understandings, content and teaching ideas. Over time some teachers have made this an integral part of their numeracy knowledge programme and students are able to participate in the programme with minimal teacher involvement. It is the intention at School D that every teacher and student in the school will be involved.

Table 3 A Segment of the Peer Tutoring for Place Value Stage 4

What I am Learning	Games	Peer Activities
Groupings with 10 Eg: 10 and 2, 10 and 3 and the pattern of the “teens”	Calculator Plus 10 (nzmaths)	Use tens frames / abacus / number fans with numbers 1 - 10, Show a number and ask how many more makes 10?(5 x) Use tens frames / abacus / number fans with numbers 1 - 10, How many more makes 20? (5 x) Use tens frames: I have 7. What does it look like with counters and a tens frames (5x)
Groupings within 20 Eg: 12 and 8, 6 and 14	Pairs to 20 Add to 20	Use tens frames / abacus / number fans with numbers 11 - 20, Show a number and ask how many more makes 20? (5 x) Use tens frames: I have 17. What does it look like with counters and tens frames?(5x)
Number of tens in decades Eg: tens in 40, in 60	Big Steps (nzmaths) Decades	Show me groupings of 10 on tens frames eg: 3 tens frames = 30 (5x)

Other schools outside of the trial cluster in this case study wanted to be involved in 2009. Several other initiatives are being trialled this year in schools across the Canterbury

region. Also, while teaching a 30 hour Numeracy certificate course for teacher aides earlier this year I taught the small group tutoring programme. The participants all found this a very useful way to get to know the numeracy framework and the key content in each numeracy knowledge domain. They also said it was useful to assist them to further develop their personal numeracy content knowledge.

This case study has highlighted the importance of trialling intervention initiatives in schools to meet the needs of at risk students. It also reminds us that all students can benefit from these initiatives, especially if they are expected to be active participants.

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