Newsletter No. 14 **June 2002**

Electronic failure – the curse of the teaching classes

What a mess! I don't know if you know how things usually happen with this newsletter so I'll tell you anyway. Russ Dear is now the editor. He sends a virtually complete newsletter to me (Derek) well in advance of the deadline. I check it out and I may add something that Russ may not have known about. Next it is sent to Gill and Joe for their sections, and then it's put on the web.

This month was no different until May 24. At that point my laptop decides that it doesn't want to charge the battery. No big deal you say but I am currently in England working with Afzal Ahmed and Honor Williams. My laptop is my lifeline to the rest of the world and the place I keep all I hold near and dear. This means lots of important files and my email. Russ' latest newsletter is on that laptop. I can't access it! So why don't I just email Russ and get another copy? Well it's just about now that he too decided that it's better to be in England than New Zealand and I don't think that I can get hold of him. But I'll try using a computer from the University College Chichester where I'm spending my study leave. Well I **would** try but UCC's email has suddenly gone down too. They've been having problems with their mainframe for a week or so now and it has finally collapsed. Fortunately someone else in the Mathematics Centre here has a laptop and I can email out through that. But now I don't know Russ' email address! It's on my laptop though! (This is beginning to sound like 'There's a hole in my bucket, dear Liza, dear Liza'.)

My solution? Write a whole new newsletter, and send it off to Gill (who's email address I **do** know) by the colleague's laptop. But it didn't ever come to this. Fortunately, UCC's mainframe came up in the nick of time and this newsletter hit the electronic highway with about 24 hours to spare. And that's how you've managed to have this on time for the first week of June. Russ' good bits for the June newsletter will now be held over until July. That is assuming that I don't lose anything off of the hard drive. The laptop manufacturers are warning me that that might happen during the repair phase. Happy Days!

On another point, we wish to correct the impression given in our May issue that the main emphasis of the New Zealand Association of Maths Teachers(NZAMT) is in the secondary sector. This is not the case. The Association has worked very hard to make it an organisation that is of interest to all maths educators, for example, in its promotion of primary maths days and the awarding of scholarships for primary teachers to attend conferences. It aims to bring together educators from pre-school to tertiary (see their homepage at www.nzamt.org.nz).

On a related issue, perhaps it is time to recognise the contributions regional maths associations have made towards promoting mathematics at all levels. It is true that some were formed to address the lack of advisory support for secondary maths in the late sixties but all associations have moved on a long way since then. The initiatives of the Canterbury Maths Association in setting up competitions for students from Forms 1 to 4 soon spread around the country and widened to include a host of situations where primary and secondary teachers worked alongside each other to promote mathematics. It is very pleasing to see the developments since then.
Perhaps we can encourage maths association secretaries to let us know of the activities they encourage in their area.

Thanks for your letters both brickbats and bouquets. Keep letting us know how you feel about the newsletter and any other issues relating to mathematics.

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WHAT'S NEW ON THE NZMATHS SITE THIS MONTH?

We have added 10 new links to the site and one of them comes highly recommended from our reviewer.

http://arcytech.org/java/patterns/patterns_j.shtml
This on-line activity can be used to familiarise students with different shapes, their relations, their proportions and their symmetry. It can also be used as a tool to learn and practice fractions. Strands covered: Number and Geometry

Eight units of work have been written for Levels 5 & 6, these will be on line shortly.

The Rauemi Reo Mäori component of the site is now up and running. Three units of work are currently available:

- He Këmu Häkinakina
- Te Ahunga me te Taunga
- He Këmu Tüpono

There are further three units in production which will be available soon.

NZAMT WEBSITE

In last month's newsletter I did a review of the nzamt website (this is still available if you want to see it). Since that review we have had responses from local mathematics associations pointing out the comment about NZAMT being mainly for secondary maths teachers was incorrect. I was unaware just how much the various local associations are doing to encourage the participation of primary teachers and I would like to apologise most sincerely for giving readers the wrong impression. Because the details of their responses are on my laptop, I will add to this apology in the July newsletter.

While I'm at it I should say that I had planned to review another country's maths association site this month. As I don't currently have any access to the web, I'll leave this till July.

THE AUSTRALIAN EARLY NUMERACY RESEARCH PROJECT

Valuing and Building Upon Young Children's Mathematical Thinking

I was pleased to be able to get this article from Doug Clarke. He is an Associate Professor of Mathematics Education and directs the Mathematics Teaching and Learning Centre at Australian Catholic University (St Patrick's Campus, Melbourne, Australia). In recent years, his professional interests have included problem solving and investigations, building number sense, and manageable and meaningful assessment. Doug was Director of the Early Numeracy Research Project in Australia. Doug enjoys working in classrooms with teachers and students to make mathematics relevant and enjoyable. I think those of you that are involved in the current Numeracy Project here will see much in common with the Australian project. Doug's email address is D.Clarke@patrick.acu.edu.au.

"How did you work that out?" "How is *this* shape different from *that* shape ?" These seem the kind of questions that one might expect to hear in a mathematics classroom, and yet often they were the exception rather than the norm. For many adults, the experience of school mathematics was that there was just *one way* to do a particular mathematics task (the teacher's or the textbook's way), and the teacher's task was to make sure that we "got" that way. There was little need therefore to enquire into how a particular student may have solved a problem.

But things are changing, and increasingly children's methods and strategies in solving problems in mathematics and their ways of thinking about mathematics are being valued, and teachers are using children's methods and strategies to help children to further build their mathematical understanding. This is quite empowering for students and exciting for teachers as they discover the wealth of knowledge that young children bring to school and to the mathematics classroom.

Staff at Australian Catholic University, along with colleagues at Monash University, have just completed the three-year Early Numeracy Research Project (ENRP). This $1.3 million research and professional development project was designed to explore the most effective approaches to the teaching of mathematics in the first three years of school. 70 Victorian Department, Catholic and Independent schools participated. There were several features of the project:

- The ENRP team drew upon available research to develop a framework of key "growth points" or "stepping stones" in young children's understanding of mathematics. In this way, teachers could focus on key mathematical ideas in their teaching.
- A forty-minute, one-to-one assessment interview was developed for use by teachers with their children. This interview was used in project schools with all children in Prep to Year 2 (the first three years of school) at the beginning and end of the school year, and gave teachers a detailed picture of children's mathematical understanding. The interview has now been used on over 36,000 occasions.
- Teachers met regularly for central and regional professional development, during which they worked with the ENRP team on how best to take what they had learned about their children through the interviews and build on this knowledge. The research team also worked in schools and classrooms, making 578 visits to schools over the three years.
- The research team conducted parent information nights in all project schools, sharing information on how mathematics teaching is changing, and the kinds of everyday, enjoyable activities that families can do to support the maths learning of their children.
- In 2001, the final year of the project, the research team conducted detailed case studies of six particularly effective teachers, seeking to describe what it was that these teachers did that made a difference for their students.

Having the opportunity to interview all the children in their class provided wonderful insights into what young children know and can do, as individuals and as a whole class. A teacher commented, "In every grade there is that quiet child you feel that you never really 'know'. To really talk to them showed great insight into what kind of child they are and how they think". Another teacher commented that "no matter at what level the children were operating mathematically, all children displayed a huge amount of confidence in what they were doing. They absolutely relished the individual time they had with you, the personal feel, and

the chance to have you to themselves. They loved to show you what they could do".

The assessment interviews showed that we have some very capable children in our junior primary classes. Imagine being a teacher who discovers in the first two weeks of school that she has a five-year old who can read an eight-digit number (24,746,154) as "twenty-four million, etc." As the teacher commented: "I used to spend the whole of Prep focusing on the numbers from 1 to 10. Now I have to re-think my teaching".

The research team conducted detailed case studies of six particularly effective teachers of junior primary children, as measured by data on the growth of their children's understanding over time. The team identified 25 teaching practices and characteristics of particularly effective teaching. Some of these were the following. Effective teachers of mathematics

- focus on important mathematical ideas;
- structure purposeful tasks that enable different possibilities, strategies and products to emerge;
- choose tasks that engage children and maintain involvement;
- encourage children to explain their mathematical thinking and ideas;
- have high but realistic mathematical expectations of all children; and
- show pride and pleasure in individuals' success.

Many teachers commented that the kinds of questions used in the assessment interview provided a model for questions that teachers could use in their day-to-day interactions with children. We have enjoyed some of the more humorous responses to the question: "how did you work that out?" Our favourites include "my brain told my mouth and then I told you", "can you write it down and I'll ask my mum and tell you tomorrow?", and even "God told me!". One child, when asked to count backwards, stood up and walked backwards, counting "1, 2, 3, …". So, there have been many enjoyable moments during the project.

The funding bodies are now exploring ways to respond to the many recommendations that emerged from the ENRP. It continues to be an exciting time for mathematics teaching in primary schools, and our research team looks forward to continuing to make a major contribution to current developments. Further information on the project can be found on the Mathematics Teaching and Learning Centre website: **www.acu.edu.au/mtlc/ENRP1.html.**

TEACHING FELLOWSHIPS

There was a press release that came round from the RSNZ last week about the Teaching Fellowships. I'm not sure when the closing date is but it is soon. If you want more information email Peter Spratt on spratt.p@rsnz.org.nz and he'll give you the details. I'd urge you to apply – if not this year, start now to put together a case form next year.

Below are some brief outlines of some of last year's projects.

Lesley Mackintosh of St Mary's College, Wellington, worked with NIWA scientists on the Grow Otago Project, which mapped climate resources and hazards to assist regional development. This project uses climate observations, satellite imagery and computer modelling techniques. Lesley's Fellowship project was based on the belief that using real-life examples is a great way to get students interested in practical applications of mathematics and technology in contexts that are relevant and meaningful to students.

During the year Lesley developed her computer skills by preparing online resources for the NIWA Education web page thus providing climate information to school students and teachers. These resources include data tables, classroom activities, and information on numerous climate topics with relevant links and frequently-asked questions. Students can access selected raw data from the Climate Database for use in projects through a special free subscription for schools.

In her time at Auckland University's Mathematics Department Nicole Roper of Auckland's Diocesan School for Girls worked with mathematicians solving problems as broadly spread as the electrical activity of the heart, maintaining ecological balance, radiocarbon dating (to estimate when certain areas were inhabited), and determining the ratios of clear-fell areas in forestry.

Her fellow mathematicians were also working on medical problems relating to cancer therapy and medical imaging and airline industry problems, including the stationing of rescue services, and crewing and rostering of flight staff. Nicole gained a better understanding of the work of mathematicians in these areas and its relevance to the mathematics studied at school. She also realised that new fields of mathematics are developing and expanding constantly. Yet while technology is vital, basic skills are still fundamental and need to be emphasised and perfected at school level.

Riverton School teacher Robert Guyton investigated a new (for New Zealand) method of revegetation. Robert made contact with botanists, entomologists, mycologists, soil scientists, habitat restoration researchers, nurserymen and women, plant conservationists, volunteers and iwi to gather information to enable him to make and use the best seedballs possible. Seedballs are made from clay, compost and native seeds.

Their beauty lies in their simplicity. Anyone can become involved in both making and scattering the marble-sized balls. In any area free from thick grasses, they will sprout when conditions are right and the plants best suited to local conditions will survive to carry on the revegetation process.

Paremata School teacher Kelly Cooper spent her fellowship year developing her understanding of Earth. One public outcome is an interactive exhibition, which has just been opened in the Museum of Wellington City and Sea. The museum's major temporary exhibition for the year, 'Earth, Sea and Sky' focuses on the science of Wellington harbour, its geology, marine life and climate.

Working with NIWA (National Institute of Water and Atmospheric Research Limited) Kelly gathered information and resources for the exhibition from various disciplines like climate applications, aquaculture and atmospherics. She studied the geology of the harbour, compared Wellington's weather with that of other main centres, found where to catch the best fish and how to tell their age, and produced text panels in conjunction with a design firm.

MAY PROBLEM

I apologise if there were any solutions of last month's problem sent to me in the last week or so of May when all of the troubles with computers were plaguing my life. If there were I'll sort them out later. At the time of laptop failure, however, I had received no solutions.

If you remember, the May problem went like this. A unit square has perimeter 4 units. When two such squares are placed, non-overlapping in a plane, the minimum perimeter of the shape they form is 6 units. For three squares the minimum perimeter is 8 units.

(i) What is the minimum perimeter when four units squares are placed, non-overlapping, in a plane? (ii) How about five squares? (iii) Six squares? (iv) 200 squares?

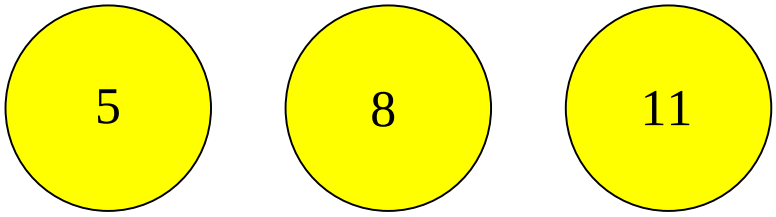
The solutions that I was expecting were … Now just hang on. Why don't I leave this open for another month? The prize will still be there.

JUNE PROBLEM

Russ had produced a truly amazing problem for this newsletter but we'll have to hold it over until July. So, instead, I've made up a real rip snorter that you should definitely get your students to have a go at. The usual prize of $50 worth of petrol vouchers is up for grabs. I look forward to all your solutions on derek@nzmaths.co.nz.

While I think of it, that sort of prize wouldn't be very useful here in England. With petrol at 75p a litre the little 1.2 litre Vauxhall that I'm currently driving would just about get half filled. I long since told myself that £1 was actually $NZ1. Especially as it costs me over £30 to fill my empty tank.

But on to the problem: I have three discs. They have a number on each side. Three of these numbers are shown in the diagram.



I toss the numbers up into the air and add the three numbers that I see. After a while I notice that all the totals I get are consecutive numbers. What numbers are on the other sides of these discs?

Enjoy your teaching!

Gill, Derek, Russ and Joe.