

# [NEW VOICES]

## MATHS MONSTERS, LEARNING TRAILS, GAMES AND INTERVENTIONS:

### SOME OF THE TEACHING AND LEARNING RESOURCES DEVELOPED BY TEACHERS IN THE MATHEMATICS FOR LEARNING INCLUSION PROGRAM



**BARBARA REINFELD,  
KEN LOUNTAIN and  
DIANE MELLOWSHIP**

describe some of  
the features of the  
Mathematics for  
Learning Inclusion  
Program

#### The program

##### **A short history of the Mathematics for Learning Inclusion program (M4LI)**

Phase 1 of the Mathematics for Learning Inclusion program (July 2005–December 2007) was developed in South Australia by the Learning Inclusion Team in the Department of Education and Children's Services, South Australia (DECS). Phase 2 of the program will begin in 2009.

The initiative is designed to improve the teaching and learning of mathematics in clusters of primary schools serving low socio-economic communities (low SES). The program specifically aims to improve the engagement and learning outcomes for low SES and Aboriginal learners by enhancing the capacity of primary teachers in the effective and inclusive teaching of mathematics. Resources developed and used in the project and referred to in this article are available on the project website: [www.decs.sa.gov.au/learninginclusion](http://www.decs.sa.gov.au/learninginclusion).

##### **A cluster model with Cluster Coordinators**

There were eight clusters of primary schools in Phase 1. Each cluster had a full-time Cluster Coordinator (CC), and comprised four to eight schools. The program involved a total of 44 schools — approximately 200 teachers and 4000 students.

The Cluster Coordinators all had high levels of expertise in primary years mathematics and although they worked in a variety of ways, all provided a mentor role supporting colleagues by:

- modelling new pedagogies with and for them;
- supporting them with planning and programming;
- forming and sustaining collaborative communities of practice; and
- influencing leadership for curriculum change across clusters of schools.

### Assumptions about teachers

Underpinning the design of the project was an assumption that all teachers wanted all of their students to be successful in mathematics and indeed wanted to be better teachers of mathematics.

The program logic was that by providing teachers with opportunities to develop their expertise in mathematics, teachers would not only increase their repertoire of successful practices, improve their confidence and understandings, skills and resources, but also have the opportunity to focus on those learners who were currently not successful in mathematics. With support, teachers were able to reflect on how their own beliefs, assumptions and practices were contributing to the learning outcomes of all students.

### Professional learning

A significant feature of this initiative was an extensive and targeted professional learning program for school leaders and teachers.

The professional learning program was designed to connect with mathematics, primary years learners, and learning inclusion, and included the following goals in one or more sessions:

- a challenging and engaging mathematics curriculum;
- data collection and analysis; and
- developing professional learning communities.

### Communities of practice

Groups of teachers formed learning communities that generally met twice per term and were structured to support teachers to reflect on their learning and to adapt and adopt this learning in their classrooms.

One of the results of this strategy was the development of teaching and learning resources, which were trialled, shared amongst the clusters, adapted for local contexts, refined, and finally developed into products which were shared across the program and beyond to the broader educational community.

### New Angles in Mathematics Expo

In May 2008, the New Angles in Mathematics Expo featured many of the products developed by students, teachers and coordinators over the previous two and a half years of the program.

### Teaching and learning resources from M4LI

#### Mathematics board games

These games were designed by a class of Year 5 students and their teacher Belinda Branford at Meningie Area School as their response to the Expo student challenge to represent “Maths in My World.” Students’ responses formed an exciting display at the Expo and these games caused particular enthusiasm from teachers eager to take the ideas back to their class.

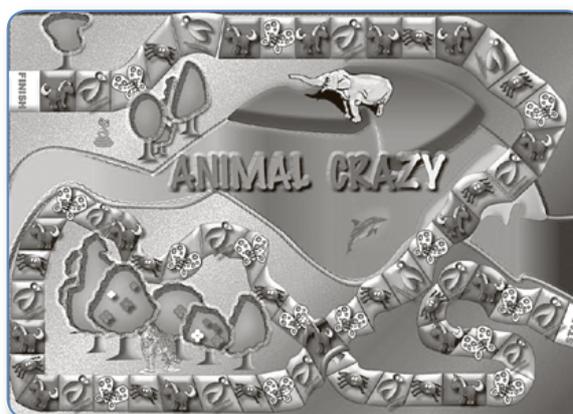


Figure 1. Animal Crazy

Students worked in self-selected groups to identify an aspect of their world where mathematics played an important role.

The list of games available online are:

- Animal Crazy (see Figure 1)
- Crazy Cricket
- Follow Those Footsteps
- Gone Shopping
- Mega Park
- Multiplication Bingo
- Operations Snake.

The development of the games challenged students both to see the mathematics in known events and activities, such as a cricket match, and to design a structure for playing the game that ‘worked’ and could actually be played. Students also wrote instructions, identified the aim of the game, and designed a range of game components including playing cards, game boards, recording sheets, and question and answer cards. Games developed and designed by students were edited and produced in their final form for the Web, with these refined versions being returned to the original designers as polished products.

Classes of students in other schools responded to the “Maths in My World” challenge in a variety of ways including using Comic Life to produce mathematics cartoons, making PowerPoint presentations, making class books and posters, and a fabulous rewrite of the “Monster Mash” that has become the “Monster Maths”! The class video version of the song was used to open the New Angles on Maths Expo to an appreciative audience of mathematics teachers.

### Family Maths Challenges

A number of clusters had a focus on developing stronger links with their community. Family Maths Challenges included a wide variety of interesting challenges including quizzes, puzzles and problems for students, the class, school and community to do together. In some schools these were regularly included in the school newsletter and successfully

encouraged school community involvement and improved dialogue with parents/caregivers about mathematics learning.

Figure 2 shows an example of a problem used as a Family Maths Challenge.



**How big was this dinosaur?**

Scientists have just found the bones of an amazing unknown dinosaur. Can you help them to work out how big it was? All they know from examining the bones is that the dinosaur’s tail was twice as long as its body, which was half as long as its neck (to the end of its nose), which was 12m long.

What do you think the dinosaur measured from the tip of its nose to the end of its tail?

Figure 2. Example of a problem

### An intervention kit in number

The purpose of the Learning Inclusion Intervention Kit is:

- to discover more about an individual student’s mathematics knowledge and the strategies they use in order to improve their understanding and/or address misunderstandings; and
- to use information gained from the assessment to plan appropriate interventions.

The kit was developed and put together by the Cluster Coordinators. It is a collection and adaptation of successful strategies used by many mathematics teachers and refined into a logical sequence in kit form for ease of use.

The kit comprises six sections:

- Number Assessment 1: Numbers 1–10, Structuring Number
- Number Assessment 2: Numbers 1–20, Addition and Subtraction
- Number Assessment 3: Using the Base 10 System
- Number Assessment 4: Saying, Reading and Writing Numerals

- Number Assessment 5: Beginning Multiplication and Division
- Number Assessment 6: Multiplication and Division

Additional materials to “move students on” following their assessment, have also been developed and feedback from teachers has been very positive about the usefulness of these two components.

The assessment is recommended for Year 3 students and above, who need intervention in number concepts, however this strategy has been used successfully with Year 9 and 10 students. Assessments should be administered to students in a one-to-one setting. Each test takes approximately 20 minutes to administer.

Instructions for making up the kit are on the website There are a number of individual components to the kit and they take some time to laminate and put together, however many teachers used their communities of practice time to make sets over time together, e.g., Section 1 in Term 1, Section 2 in Term 2, etc.

### Maths learning trails

Maths Learning Trails were successfully used in two of the schools in the program and quickly spread to be a whole program strategy. Although each cluster developed their own approach (e.g., a sports day trail), all had in common multiple opportunities for students to apply mathematics beyond the classroom, to explore their mathematical understandings in the wider environment,



Figure 3: Students working on a maths trail

and to encourage parent/caregivers and community involvement (see Figure 3).

The trails successfully promoted student engagement and, encouraged peer and cross age collaboration, mathematical thinking, and problem solving.

The following Maths Learning Trails and the support materials (e.g., a letter home to parents/caregivers informing them of the planned trail) are available on the website:

- A Generic Maths Trail (for you to adapt for your school)
- A Maths for Learning Inclusion Trail Bank - which includes a variety of tasks
- A Generic Sports Maths Trail
- A Junior Primary Trail
- A Primary Trail
- An Upper Primary Trail

### The Maths Monster

The Maths Monster is a take home pack designed to encourage mathematics learning in the home and community. The pack includes the Maths Monster which is a delightful soft toy which goes home (in a special bag) with one student each night (see Figure 4).



Figure 4: Maths Monster

The aim of the Maths Monster is to encourage students to look for opportunities to see and engage with the mathematics in the world around them. The Monster comes back in the morning (the success rate has

been phenomenal) and the student shares with the class what she/he has learnt with the Monster.

On the Learning Inclusion website, teachers will find a copy of:

- A “letter home” to advice parents/caregivers;
- A list of ideas (based on the strands of the SA mathematics curriculum) to help generate questions and ideas for the students; e.g., Can you and the Monster find a big object that is light and a small object that is heavy? How did you decide what was the largest and what was the smallest? What are some other words we use to describe the size of things? Make a list.
- A journal recording sheet to help with reflections and questions;
- Information for parents/caregivers.

Some schools also included a digital camera to help show and share with the class; e.g., “This is the Monster and me, using the scales.” These report-back sessions became a feature of class discussion and provided a terrific context for mathematics learning.

### Anti-Poverty Week (APW) resources

For the past three years, the Learning Inclusion Team has produced teaching and learning materials to support teaching and learning for Anti-Poverty Week, the Australian Government’s response to the United Nations Anti-Poverty Day, (17 October every year). The materials are designed to be used for learners from the first year of school to Year 10, and all have a focus on the use of ICT.

In 2006, the materials were designed around the following themes and invited students to investigate and take some action to address issues of poverty. The titles were:

- Hungry for Action
- Education for Anti-Poverty
- The Many Faces of Poverty
- Poverty Fact or Fiction
- Home is Where the Heart Is
- Healthy Lives Healthy Futures
- Light Footsteps for a Global Future.

In 2007, mathematics was the curriculum lens through which we explored a number of big questions. For example,

- Does being rich or poor impact on how long you live?
- What are the myths about world hunger?
- How does buying Fair Trade coffee make a difference to poor farmers on the other side of the world?
- How do children survive in the slums of Delhi?
- How do others live?

Students used a range of mathematics skills and understanding including:

- Exploring, analysing, representing and modelling data;
- Number;
- Working mathematically, particularly problem solving and using a range of technologies.

### Conclusion

This article has described an initiative designed to improve the teaching and learning of mathematics. Through our work with teachers and students, a variety of quality resources and materials have been developed. We hope that these resources will prove valuable to other educators and invite APMC readers to access the website and follow the prompts.

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Barbara Reinfeld, Ken Lountain and  
Diane Mellowship  
Learning Inclusion Team, Department of  
Education and Children’s Services S.A.  
<reinfeld.barbara@saugov.sa.gov.au>

