

## *Numeracy in practice: teaching, learning and using mathematics*

### Welcome

This edition of *Research eLert* features a report titled: *Numeracy in practice: teaching, learning and using mathematics*. It focuses on evidence-based approaches that support continuous improvement in student learning outcomes in numeracy. The report highlights those aspects that make a difference to student numeracy outcomes including information on assessment of, for and as learning.

The report will be a valuable resource for regional staff, school leaders and teachers when developing policies and programs that support effective numeracy teaching and learning.

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Deputy Secretary  
Office for Policy, Research and  
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### Feature article

#### **Numeracy in practice: teaching, learning and using mathematics**

This report is based on a focused literature search undertaken to identify local and international research in the area of numeracy learning and teaching. It focuses on the characteristics of effective numeracy teachers and how to address key classroom issues of what to teach, how to teach it, how to cater for diversity and how to make best use of technology. It also reports on

assessment practices and the ways in which the school and the community can support effective teaching.

The final section provides information on a range of resources available in Victoria to support schools and teachers in implementing best practice. The report includes a regional strategy that aims to address the challenge of promoting success in numeracy teaching and learning.

The report is available at:

[http://www.eduweb.vic.gov.au/edulibrary/public/publ/research/publ/Research\\_eLert\\_Issue\\_19\\_Numeracy-rpt-v1.0-20090529.pdf](http://www.eduweb.vic.gov.au/edulibrary/public/publ/research/publ/Research_eLert_Issue_19_Numeracy-rpt-v1.0-20090529.pdf)

### Related research

#### **National Numeracy Review report**

The Council of Australian Governments commissioned the National Numeracy Review to identify the teaching, learning and assessment practices that lead to improved numeracy outcomes for students. It examines directions for teacher standards to improve the teaching of numeracy and acknowledges that societal expectations for numeracy development are significantly different today, with changing workforce demands requiring a numerically literate society to sustain human capital. The recommendations of the report focus on the need for early, systemic teaching of numeracy and

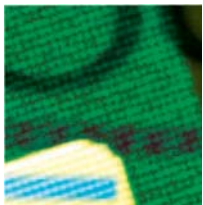
mathematics that includes assessment activities to ensure that all students have the foundational skills to progress through a developmental continuum. It also recommends increasing resources for teachers in terms of professional development and pre-service teacher education. This will address the identified shortfalls in both mathematics content knowledge and pedagogical content knowledge to ensure quality teaching of numeracy and mathematics across the curriculum.

Council of Australian Governments 2008, *National Numeracy Review report*, COAG, Canberra. Available at: <http://www.coag.gov.au/reports/index.cfm>

For further information on the National Numeracy Review: [http://www.dest.gov.au/sectors/school\\_education/policy\\_initiatives\\_reviews/reviews/national\\_numeracy\\_review/default.htm](http://www.dest.gov.au/sectors/school_education/policy_initiatives_reviews/reviews/national_numeracy_review/default.htm)

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## Inquiry into the promotion of mathematics and science education

'Mathematical and scientific literacy are part of the necessary skill-set required by all Victorians.' With this clear statement, the Parliament of Victoria's Committee on Education and Training introduces its key priority for mathematics and science education, that all Victorian students attain a high level of mathematical and scientific literacy. The Committee aspires to the highest international standards in mathematics and science literacy for all Victorians by 2020 and emphasises the need to prepare a substantial number of students for specialised studies and future careers in the enabling and new sciences. Teacher supply and demand and the quality of teaching also have significant focus in this report, with the Committee tabling strong recommendations to address the emerging shortages of highly qualified mathematics and science teachers in some geographic locations and the existing variability in the capacity of teachers to engage students effectively in mathematics and science education.

Parliament of Victoria, Education and Training Committee 2006, *Inquiry into the promotion of Mathematics and Science education*, Parliament of Victoria, Melbourne. Available at: [http://www.parliament.vic.gov.au/etc/fs\\_inq\\_prom\\_math.html](http://www.parliament.vic.gov.au/etc/fs_inq_prom_math.html)

## Moving on from 'Count Me In Too': Evidence-based teaching and learning in numeracy in the early and middle years of schooling

Can teachers be certain they are making the best decisions for children's learning in mathematics? The New Zealand Numeracy Project acknowledges and explores ways of utilising experienced teachers' 'accumulated wisdom of practice'. This project, informed by the research-based New South Wales' program, Count Me

in Too, helps teachers to manage change, build confidence, challenge beliefs and create an environment where they feel a certainty about their judgments for children's learning. A teacher development program, framework, diagnostic interview, and teaching model are key components of the Numeracy Project. Data collection and analysis are intrinsic to the project and have the strong potential to assist teachers to make sound decisions about children's learning in numeracy.

Tozer, L & Holmes, M 2005, 'Moving on from "Count Me In Too": Evidence-based teaching and learning in numeracy in the early and middle years of schooling, Using data to support learning', Australian Council for Educational Research (ACER) 2005 conference proceedings, Melbourne. Available at: [http://www.acer.edu.au/research\\_conferences/2005.html](http://www.acer.edu.au/research_conferences/2005.html)

## The Trends in International Mathematics and Science Study (TIMSS)

TIMSS is the world's longest running mathematics and science study. Involving more than 60 countries, it collects educational achievement data on students at Year 4 and Year 8 to provide information about trends in performance over time. TIMSS is conducted on a four-year cycle, with the most recent data gathered in 2006–07, when more than 10,000 Australian students participated.

The latest results show that Australian Year 4 students have displayed some improvement in mathematics achievement since 2003, whilst progress in science has remained static. Achievement levels for Australian Year 8 students have changed little over the period in mathematics but have declined significantly in science.

Thomson, S, Wernert, N, Underwood, C & Nicholas, M 2008, 'Highlights from TIMSS 2007 from Australia's perspective: Highlights from the full

report, *Taking a closer look at mathematics and science in Australia*, ACER, Camberwell, Victoria. Available, along with further TIMSS information, at: <http://www.acer.edu.au/timss/>.

## Science, ICT and mathematics education in rural and regional Australia: The SiMERR national survey

For some time there have been concerns that schools in rural and regional Australia struggle to achieve comparable educational outcomes in science and mathematics to those in metropolitan areas. The reasons behind the geographical divide in achievement levels have not yet been explored to any great extent. The SiMERR National Survey was established to identify key issues that rural teachers, parents/caregivers and students, in selected schools across Australia, see as affecting these outcomes at the primary and secondary levels. As part of the survey, base-line data on the characteristics, motivations and needs of teachers were collected, along with perspectives from the three stakeholder groups on the strengths and obstacles associated with science, ICT and mathematics education in their schools. In the second phase of this study, researchers in the eight state and territory hubs of SiMERR Australia interviewed over 550 teachers, students and parent/caregivers in 38 Provincial and Remote schools to further explore these key issues.

Lyons, T, Cooksey, R, Panizzon, D, Parnell, A & Pegg, J 2006, *Science, ICT and mathematics education in rural and regional Australia: The SiMERR national survey*, National Centre of Science, ICT and mathematics education for rural and regional Australia, University of New England, Armidale, NSW.

More information available at: [http://www.dest.gov.au/sectors/school\\_education/publications\\_resources/profile/s/issues\\_teaching\\_science.htm](http://www.dest.gov.au/sectors/school_education/publications_resources/profile/s/issues_teaching_science.htm)



Report available at:  
[http://www.une.edu.au/simerr/national\\_survey/index.html](http://www.une.edu.au/simerr/national_survey/index.html).

### Maths? Why not?

Why is it that capable students are not choosing to take higher level mathematics in senior years of schooling? To answer this question, the researchers drew principally on the perceptions of mathematics teachers and career advisers through online surveys, supplemented by student surveys and focus group discussions involving students and mathematics teachers. The report highlights key factors that deter students from studying higher level mathematics in senior secondary years, and presents 16 actionable recommendations for schools, education authorities, governments and universities, to increase numbers of Australian students undertaking higher level mathematics subjects in the senior secondary years.

Australian Association of Mathematics Teachers & the University of New England 2008, *Maths? Why not?*, Final report prepared for the Department of Education, Employment and Workplace Relations, Canberra. Available at: [http://www.dest.gov.au/sectors/school\\_education/publications\\_resources/profiles/maths\\_why\\_not](http://www.dest.gov.au/sectors/school_education/publications_resources/profiles/maths_why_not)

### AAMT Standards for Excellence in Teaching Mathematics in Australian Schools - 2006 edition

The Standards were developed in a widely consultative process between 1999 and 2001, and provide a framework for teachers' career-long professional growth. Since their adoption by the AAMT, members and staff have undertaken a program of research and development to identify ways in which the Standards can support teacher learning and acknowledge those who are working at the level described. The Standards are organised into three domains: Professional knowledge, Professional

attributes and Professional practice. Each of these is shaped by and inter-related to the others. The Standards do not seek to advantage a particular style or approach to teaching – instead, the need for diversity is recognised and encouraged.

Australian Association of Mathematics Teachers 2002, *Standards for Excellence in Teaching Mathematics in Australian Schools*, AAMT, Adelaide, SA. Available at: <http://www.aamt.edu.au/Standards>.

### International Congress on Mathematical Education (ICME)

The eleventh ICME conference was held in Mexico in July 2008. Between 2000 and 2500 professionals from 100 countries in the mathematics education area attended, including researchers, educators and teachers. The discussion groups at the conference explored themes such as Mathematics education: for what and why?; Dilemmas and controversies in the education of mathematics teachers; Promoting creativity for all students in mathematics education; Shaping of mathematics education through assessment and testing; and current problems and challenges in mathematics education at all levels. Papers presented at the discussion groups are available at: <http://dg.icme11.org/>. Topic study groups included: new developments and trends in mathematics education at all levels; classroom practice; new technologies; task design and analysis. Papers presented at the topic study groups are available at: <http://tsq.icme11.org/>.

### School case studies

Case studies and accounts from teachers and schools trialling innovative 'next' practices related to numeracy can be accessed at:

<http://www.education.vic.gov.au/studentlearning/research/researchpublications.htm>

### Upcoming events

Below is a list of upcoming events and conferences which may be of interest. For a comprehensive list of conferences, workshops and events, visit the Education Network Australia site at: <http://www.edna.edu.au/edna/go>

#### The Mathematical Association of Victoria (MAV)

The Mathematical Association of Victoria is a membership-driven Association that provides a voice, leadership and professional support for mathematical education. The MAV provides an extensive program of Professional Development for teachers of all year levels. PD is offered by experienced presenters, many of whom are practising classroom teachers.

<http://www.mav.vic.edu.au>

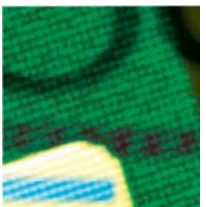
#### Mathematics Education Research Group of Australasia (MERGA)

MERGA is an association that aims to promote and share quality research on mathematics education for all levels particularly in Australasia. MERGA has an annual conference and a regular schedule of publications. These include refereed conference proceedings, two journals, a four-year review of mathematics education research in Australasia, publications arising from Special Interest Groups, and some sponsored monographs. Papers presented at MERGA conferences are available at:

<http://www.merga.net.au/node/37>

#### MERGA32 Conference (5–9 July 2009) Massey University Wellington, New Zealand

The theme of the 32<sup>nd</sup> annual MERGA Conference is *Crossing Divides*. These divides include the physical, educational (research and practice), cultural and interdisciplinary. The theme was chosen to celebrate both the diversity within mathematics and the



collaborative nature of international research activity which is promoted within MERGA.

<http://www.eenz.com/merga32/>

### Professional Development Network Leadership Conference 2009 (6–7 August 2009), Broadbeach, QLD

The conference, titled 3 Rs of Leadership: Revolutions, Revelations & Reality, offers school leaders an opportunity to engage with the future of education and discuss ways to drive academic and cultural changes in schools. Speakers include Professor Allan Walker (The Chinese University of Hong Kong), Professor Barry McGaw (McGaw Group Pty Ltd) and Ms Kathe Kirby (The University of Melbourne).

<http://www.griffith.edu.au/conference/professional-development-network-leadership-conference-2009>

### Assessment and Student Learning: Collecting, interpreting and using data to inform teaching (16–18 August 2009), Perth, WA

This conference will explore the information that can be gained from quality classroom and system wide assessment and how effective teachers use that information to guide their teaching.

[http://www.acer.edu.au/research\\_conferences/index.html](http://www.acer.edu.au/research_conferences/index.html)

### NCVER & DEEWR - Young people: Finding their way in a new era (10 November 2009) Melbourne

The National Centre for Vocational Education Research and the Australian Department of Education, Employment and Workplace Relations will present a policy forum in November.

This event brings together new research to throw light on the issues that really matter. Drawing on findings from a

range of research using data from the Longitudinal Surveys of Australian Youth (LSAY), the event will seek to inform policy makers on how they can improve education outcomes for young people, provide them with skills for the contemporary labour market, as well as ensure that they lead full and meaningful lives.

<http://www.ncver.edu.au/>

### MAV Annual Conference (3–4 December 2009) La Trobe University, Bundoora

Conference details will be made available at:

<http://www.mav.vic.edu.au/conference/index.html>

### VCE Specialist Professional Learning series

The six workshops will be run by experienced teachers of Specialist Mathematics who will share their subject knowledge, course implementation and curriculum content. The series will be run in Term 3. Please email Jennifer Bowden [jbowden@mav.vic.edu.au](mailto:jbowden@mav.vic.edu.au) if you are interested in being placed on the waiting list.

### ACER Centre for Professional Learning numeracy workshops

Various one-day workshop dates from May to October 2009, including:

Introduction to maths intervention – primary to Year 8 focus

Developing mathematical capabilities – primary focus

Linking maths and science – early years OR primary focus

Open-ended maths tasks – early years OR primary focus

What to do with students mathematically 'at risk' – primary to Year 8 focus

Using a real world context for mathematics – Years 3–6 focus

Engaging all students in maths and numeracy – secondary Years 7–10 & VCAL focus

For workshop descriptions and further details, see:

<http://www.acer.edu.au/proflearn/numeracy.html>

