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Informing mathematics pedagogy

A new analysis of a selection of mathematics items from the 2007 Trends in International Mathematics and Science Study (TIMSS 2007) has illustrated areas of strength and, particularly weaknesses, for Australian students.

TIMSS is the Trends in International Mathematics and Science Study (TIMSS), a cycle of internationally comparative assessments, conducted by the International Association for the Evaluation of Educational Achievement (IEA) every four years. The last cycle took place in 2007 with results released in late 2008.

The main Australian national report, TIMSS 2007: Taking a closer look at mathematics and science in Australia, released in December last year, provided a 'big picture' view of Australian Year 4 and 8 students' achievement in mathematics and science. It found that Australian Year 4 students displayed some improvement in mathematics achievement since 2003 but achievement levels of Australian students remained static in Year 8 mathematics.

This new report, Informing mathematics pedagogy: TIMSS 07 Australia and the world, aims to provide teachers with more detailed information on what Australian students are actually able to do in mathematics in terms of the TIMSS assessment. The report discusses a selection of items from the publicly available questions of the TIMSS 2007 assessment. It breaks down responses to individual questions to provide a more 'micro' perspective of student achievement that may help identify and address areas of weakness.

To place students' responses in a wider context, the item breakdown presented in this report for Australian students was compared with the responses from two other countries for international comparison. The first was Chinese-Taipei, which consistently performed in the top three of the 36 countries at Year 4, and the 49 countries at Year 8. Comparison with these students' responses provided an 'upper benchmark' for Australian students. The second country chosen was the United States as the two countries are often compared to one another because of curriculum and general cultural similarities.

Students' responses to five mathematics items at each year level are explored and what these responses might indicate about students' levels of understanding for a particular item and its content area considered. By exploring results at the item level, teachers can ascertain whether the mistakes typically made by students in the sample are also mistakes made by their own students. This information may help teachers to identify strengths and weaknesses and identify ways to address problems.

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Where a multiple-choice question was answered incorrectly it has been possible to determine which incorrect answer (or distracter) was chosen and why this may have been.

For example one Year 4 question asked students to calculate the area of a fence being painted. Forty two per cent of Australian students selected an incorrect answer to this question that suggested they had added rather than multiplied the width and length of the fence.

Another example indicated Australian Year 4 students had not mastered the ability to multiply 2 digit numbers together, whereas half of US students and a majority of Chinese-Taipei students had.

While it is difficult to identify trends based on a small sample of items there were also some central themes that emerged through the item analysis conducted. The Year 4 mathematics items reviewed students' skills in number, geometry and data. Australian students performed well on the item assessing their understanding of shapes but their achievement was poorer for other areas, especially in terms related to multiplication, fractions and area.

For Year 8 mathematics, the five items investigated students' understanding of algebra, number, geometry and data. Items assessing algebra revealed a particular area of weakness for Australian students as did a data question that contained components of probability and fractions.

For some of the items discussed the percentage of answers omitted was quite large. Avoidance of these items is an issue of concern whether it was due to poor competence beliefs of lack of effort. Lastly, larger gender differences for the rate of correct responses tended to favour boys. This trend meets with the general TIMSS 2007 finding that boys outperformed girls in mathematics.

Informing mathematics pedagogy: TIMSS 07 Australia and the world by Sue Thomson and Sarah Buckley is available from the [ACER Research Repository](#). A CD is included with the report that contains all of the TIMSS 2007 released items so that teachers may see the types of questions students completed when they participated in the project.

Further information and all reports on all TIMSS assessments is available from the TIMSS website at www.acer.edu.au/timss

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Language learning must focus on personal not economic benefits

The case for increased second language learning in Australia is better grounded in the personal benefits to individual learners than in arguments about economic and social benefits according to a new review of research released by ACER on 30 September.

The new review, *Second Languages and Australian Schooling* (Australian Education Review 54), authored by University of Melbourne academic Professor Joseph Lo Bianco, traces the history of language learning in Australia, outlines the findings of research from Australia and overseas and proposes a new rationale for language learning policy.

The central argument in the review is for a major improvement in the quality of language teaching across the nation. Professor Lo Bianco argues that, while the single most important variable in second language education is the quality of language teachers, at times the quality of language teaching in Australia has been too low.

"It is an unfortunate aspect of past policy that utilitarian rationales, and the often crisis-driven pressure to establish programs quickly, have resulted in a proliferation of rather superficial second language teaching endeavours."

Professor Lo Bianco believes the promotion of language study by governments as being related to labour market and economic issues has failed to convince students, their schools and parents, that the learning of a second language is worthwhile.

"We must get away from these old conflicts about which languages should be favoured that have dogged the debate for 30 years," Professor Lo Bianco said. "These arguments must be replaced with an educational rationale for major improvements in quality teaching and learning."

Almost 90 per cent of Australian senior secondary students do not study a second language at all. Professor Lo Bianco identifies seven Asian and European languages - Chinese (Mandarin), French, German, Indonesian, Italian, Japanese and Spanish – that students should have 'an entitlement to continuation' allowing them to continue studies throughout their schooling and proposes support systems for a wider range of languages.

Joseph Lo Bianco is Professor of Language and Literacy Education at the University of Melbourne.

Australian Education Review number 54, *Second languages and Australian schooling*, by Joseph Lo Bianco with Yvette Slaughter, is available for [download from the ACER website](#). Print copies can be purchased from ACER Press. Contact customer service on 1800 338 402 or via email on sales@acer.edu.au or [order online](#).

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ACER UPDATE

Australia to take part in international primary reading study

Australia will join the Progress in International Reading Literacy Study (PIRLS) for the first time in 2011. PIRLS 2011 is the latest in the series of international studies undertaken by the International Association for the Evaluation of Educational Achievement (IEA) to measure trends in reading literacy achievement at Year 4, when students are expected to be moving on from learning to read and beginning to read to learn. While previous studies have been completed in 2001 and 2006, 2011 is the first cycle that Australian students will be participating in. This will provide the first international benchmarking of reading literacy levels at this age group for Australia, and combined with the data for maths and science that are collected through TIMSS will provide a rich database on achievement levels for this age group.

Australia has elected to use the same schools/same students model for introducing PIRLS to the already established assessment portfolio of TIMSS. This will involve testing the same students at Grade 4 level in maths and science for TIMSS and then at a slightly later date, reading for PIRLS. As such, the field trials and main study will involve the same number of primary schools and Year 4 students as the TIMSS 2011 assessment for Year 4 students. The field trial will take place in the first half of 2010, with the main study to follow towards the end of the year. ACER will produce a national report on PIRLS as well as contributing to the international report that will be prepared by Boston College.

Leading Australia's Schools evaluation

ACER has been appointed by Teaching Australia to conduct an evaluation of the impact of Leading Australia's Schools participation on school effectiveness. The project team will design the survey and conduct interviews with Leading Australia's School graduates from 2006, 2007 and 2008. The report will draw conclusions on the effectiveness of the program in meeting its objectives to enhance the skills, motivation and confidence of participating principals and to extend their capacity to make a real difference in student learning and to plan and implement change and improvement within their own school. The project will commence in October 2009 and conclude at the end of February 2010.

CEET 13th annual conference

The 13th annual conference of the Monash University-ACER Centre for the Economics of Education and Training (CEET) will be held on Friday 30 October at Ascot House, 50 Fenton Street, Ascot Vale. The theme of the conference is 'Education and training in an era of economic uncertainty.' Conference presentations will address a range of topics including the contribution migrants make to labour supply and skills in Australia; Social inclusion and tertiary education; Australia's workforce development strategy; and Has the economic downturn influenced school-leaver destinations? Further information about the CEET conference, including registration details and the conference program, is available from the [CEET website](#).

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