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Study of mathematics declines

The study of mathematics, particularly higher mathematics, is important if Australia is to develop a scientifically literate workforce. Participation in mathematics study at higher levels is declining, and a recent paper begins to consider some of the reasons for this.

Year 12 Students and Higher Mathematics: Emerging Issues, was presented at the Australian Association for Research in Education conference in 2007, and published in 2008. The authors were Mohan Chinnappan (University of Wollongong), Stephen Dinham (ACER), Anthony Herrington (University of Wollongong) and Dale Scott (University of Wollongong).

A study that looked at the percentage of year 12 students studying mathematics from 1995 to 2004 found that while the overall percentage of students enrolling in Year 12 mathematics remained high (about 80 per cent), the percentage figures for advanced mathematics have declined, and there was a steady increase in the percentage of students enrolling in elementary mathematics.

At the university level, the 2003 OECD Education report showed that only 0.4 per cent of Australian university students graduated with qualifications in mathematics or statistics, compared with an OECD average of 1 per cent.

Enrolment figures for science and technology degree courses show that between 1989 and 2002 mathematical and physical sciences were the only areas to decline. Enrolments in all the other courses increased, especially in IT-based courses.

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The number of students completing a bachelor degree in mathematical sciences declined 44.8 per cent between 1989 and 2002, while the number of students completing an information technology degree increased 395.6 per cent. This raises the question of whether those with mathematical/scientific capability are taking up studies in ICT and science/ICT at the expense of mathematical and physical sciences.

The reasons behind students' choices whether to enrol in advanced mathematics subjects could include lack of career information and lack of understanding of the role of mathematics.

The lack of quality and qualified teachers was also raised as an issue. A 2006 study revealed that eight per cent of high school mathematics teachers have not studied mathematics at tertiary level. Three in four schools experience difficulty recruiting suitably qualified teachers for mathematics classes.

Many primary teachers feel under-equipped to teach mathematics and science. In a 2007 study of 160 Australian primary school teachers, they devoted only three per cent of their time to the teaching of science and 18 per cent of their time to teaching mathematics. There is concern that if students receive an insufficient grounding in mathematics and science in primary school, this will cause difficulties in secondary school.

A study of Australian mathematics teachers found that only 64 per cent of schools now teach advanced mathematics, so lack of access to advanced high school mathematics courses may hinder some students.

At the university level, there is concern that mathematics prerequisites have been lowered, which may undermine enrolment in secondary school mathematics. Stricter prerequisites could result in either more students undertaking mathematics at an advanced level in Year 12, or students not applying for courses with those prerequisites.

Lack of access to university mathematics courses is also an issue. Only four universities have sufficient staff to teach mathematics to users of mathematics and statistics, and also to those doing advanced study in the field.

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The paper's authors are designing a study in which a cohort of Year 10 students in NSW secondary schools will be surveyed and interviewed about their attitudes to and experiences of mathematics, and their plans for enrolment in mathematics in the future, including Years 11 and 12. The study will focus on the students' reasons for choosing advanced or elementary courses, and the influence the advice of others and their beliefs about a career in mathematics have on their decision.

The full paper, including references, is available on the [AARE website](#)

Reference:

Chinnapan, M.; Dinham, S.; Herrington, T. & Scott, D. (2007). 'Year 12 students and Higher Mathematics: Emerging issues', paper presented to Australian Association for Research in Education, Annual Conference, Fremantle, 25-29 November 2007.

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Australian teacher named 'Cultural Educator of the Year' in ACER-VIF program

An Australian teacher has been recognised in the annual awards for the United States' Visiting International Faculty (VIF) program. The VIF program is the largest cultural exchange program for international educators who want to teach in the United States. The Australian Council for Educational Research (ACER) has recently formed an alliance with the VIF program with an aim to expand opportunities for Australian teachers to benefit from the rich professional development to be gained by teaching in different contexts and in different cultures.

Australian teacher Amanda Wheeler, on exchange in the US since August 2006, says that the program has given her the opportunity to broaden her personal and professional experience.

While all the Australian teachers participating in the VIF program have been very well regarded, Wheeler in particular has excelled, this year receiving the program's Cultural Educator of the Year award for the state of Georgia, where she teaches Grade 3 at Porter Elementary.

"It's an honour that's given to a teacher in each state who has gone over and above in bringing the culture of their home country to the classroom," Wheeler explains.

In the last year Wheeler has instituted a range of activities and programs designed to foster the students' cultural awareness through teaching US students about Australian songs, animals, sports and food – including making her class eat Vegemite sandwiches.

"Generally Americans don't travel like Australians do, so the kids get a lot out of having an exchange teacher. On top of the curriculum that they learn, they get to see another perspective. They realise that they're actually part of the whole world, and they're exposed to other countries and other cultures," says Wheeler.

According to Jennie Hayes, the VIF Program Manager at ACER, "The VIF program provides an opportunity for teachers to work in an American school for one to three years and when they return here their wealth of experience will be hugely valuable to our system. We consider it a brain gain rather than a brain drain," she says.

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"The VIF has been placing Australian teachers since 1990, but ACER's role, initiated in 2008, will be to increase the number of applicants, to manage selection of teachers in Australia and to ensure recognition for the professional development that teachers will gain through the program.

"It's a chance for Australian teachers to have a look at a different educational system, expand their professional development and come back to Australia with a wider view of the world," she says.

Jane Larsson, Director of International Partnerships at the VIF Program, agrees. "Teaching in the United States can be a great opportunity for Australian teachers to complement their professional development.

"Undertaking a new adventure and experiencing a new culture, while learning and applying new skills, can be a wonderful personal growth experience. We know that exposure to a new system of education and a new country and culture is influential in developing teachers' perceptions and instructional abilities as they prepare students for their roles in the global marketplace.

"The endorsement and recommendation of ACER will ensure local recognition of the reputation of the program. Our collaboration with ACER, an organisation that has a deep commitment to improving learning, assures Australian teachers that they'll benefit from a high-quality experience in the VIF Program," says Larsson.

For more information about the VIF program in Australia contact Jennie Hayes, 03 9277 5747 or [\(JavaScript must be enabled to view this email address\)](#)

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Defining disadvantage

Next month federal, state and territory education ministers will meet at the Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA). School funding reform should be high on their agenda argued ACER researcher Dr Andrew Dowling in this recent opinion article posted on Online Opinion and published in The Advertiser.

Australia's annual \$32 billion school funding system is in disarray and requires urgent reform to ensure that fair and adequate funding is provided to all of the nation's schools. The current system is too complicated and too obscure and has at times led to blame shifting between governments at the expense of much needed debate about the relationship between student performance and school resources. It should be replaced with a transparent, national system that is simple to understand and publicly accessible.

Part of the problem with the current school funding system is the lack of consistency between jurisdictions. This makes the system unnecessarily complicated and it is difficult to understand how money is allocated to any individual school. Differences exist at level of government (state or federal), type of school sector (government or non-government), location (state or territory), accounting approach used (cash or accrual), and time period (financial or calendar year). Income flows into schools from several sources, but not in unison and not in a way that permits reporting at an individual school level in a timely manner.

Even worse than the complexity of the system is the obscurity that surrounds it. The process of school funding, including the way in which amounts are calculated, distributed and reported upon, is unavailable not only to the wider public but, to some extent, even to those working in education. For example, the Commonwealth allocates funding through a system known as the Average Government School Recurrent Costs (AGSRC) model. Although this system has been around since 1993, details of its operation are difficult to access.

Government schools tend to enrol students who cost more to teach. They are more likely to enrol students from lower socio-economic backgrounds, Indigenous students and students with disabilities.

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In recent years, it appears they have been losing students who tend to cost less to teach (for example, those from higher socio-economic backgrounds) to non-government schools.

This flow of students tends to increase the average cost of educating a child in a government school. However, under the current AGSRC model, as average government school costs increase, a corresponding increase in Commonwealth funding is applied to non-government schools even when those non-government schools may not necessarily be facing the same cost pressures. It is not possible to establish precisely the extent of this phenomenon because most state governments cannot identify how much particular student groups cost to teach.

Most states cannot report financial information on a school-by-school basis, much less a student-by-student basis, even notionally. Most states do not make public either their funding rationale or the actual funds provided to individual schools. This is because most states have never been asked or required to do so. They provide broad information across all schools (for example, teacher salaries, redundancies, capital) but not the funds made available to individual schools or student groups.

Although an argument can be made that the country's most needy students should receive the most funding, one of the main problems with the current system is that there is no agreed measure of school need in Australia. The Commonwealth has one measure while the states have their own measures, each of which is different from the others. So even if financial data from states were available, the debate about whether government schools are financially disadvantaged compared to non-government schools would still be hampered by a definition problem.

In April, the new Federal Education Minister, Julia Gillard, will meet with her state counterparts at the Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA). School funding reform should be high on their agenda. The problems are not insurmountable. The introduction of similar funding methodologies at both state and commonwealth levels and across school sectors would improve transparency and accountability as well as create a more sound footing for future funding debates.

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This article was posted on [Online Opinion](#) on 27 February 2008 as part of a February feature on the 'education revolution.' The article had previously been published in the Adelaide Advertiser. ('School funding methods fail test,' by Andrew Dowling, The Advertiser, 8 February 2008, page 20).

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ACER UPDATE

Assessing teachers for professional certification

A new book by ACER Principal Research Fellow Dr Lawrence Ingvarson and University of Auckland Professor John Hattie outlines the development over the first ten years of the National Board for Professional Teaching Standards (NBPTS) in the USA.

Assessing Teachers for Professional Certification: The National Board for Professional Teaching Standards brings together, for international as well as non-specialist audiences, papers written by the key researchers involved in the development of National Board assessments between 1987 and 1997.

The authors argue that NBPTS provides an example of a well researched certification scheme for measuring teacher quality that can provide a service to governments and employers seeking a reliable indicator of teacher quality.

Assessing Teachers for Professional Certification: The National Board for Professional Teaching Standards is published by Blackwell. It can be purchased in Australia online through the [Holistic Internet Store](#).

Information and communications technology (ICT) terms described

A new set of terms used in education to describe information and communications technology (ICT) is now available through the Australian Thesaurus of Educational Descriptors (ATED) managed by ACER's Cunningham Library. The terms were developed through a collaborative project by *education.au* and ACER as part of the *InspireED* project.

Around 80 new and revised terms have been described including 'accessibility,' 'bandwidth,' 'Blogs,' 'digital divide,' 'mobile learning,' 'internet safety,' and 'Wikis.'

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uniTEST to be administered at Danish university

uniTEST will be administered by the University of Southern Denmark (USD) to assist the selection of students into its medical faculty. The test will be taken in Danish in May. Around 1500 prospective students are expected to participate.

2008 Employer of Choice for Women

ACER has been awarded 2008 Employer of Choice for Women status by the Equal Opportunity for Women in the Workplace Agency (EOWA). ACER is one of 99 Australian employers to receive the citation.

ACER was awarded the citation on the basis of our policies and practices that support women across the organisation and have a positive outcome for both women and our business. The citation is a significant public acknowledgement of our efforts in the area of equal opportunity for women.

A media release and other information is available from the Equal Opportunity for Women in the Workplace website

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