Response to Schools Workforce Issues Paper

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Disclaimer: The response is personal and should not be attributed to the University of Melbourne or the Australian Mathematical Sciences Institute (AMSI) where I am based.

Additional material supplied
The following documents give extensive information concerning the state of mathematical sciences and mathematics teacher supply:

1. Review of mathematical sciences (2006)[1]
2. Deans of Science report on the preparation of secondary mathematics teachers[2]
3. National Strategy for the mathematical sciences[3]

As indicated each is available for the web but they are substantial documents so hard copies will be forwarded to the Commission.

Introductory remarks
The outcomes of this study have the potential to affect the lives of many young Australians, the contribution they can make to society and to national capabilities and prosperity.

There are two areas of the curriculum that are essential to participation in modern Australian society — English and mathematics. The first is a given but the second has assumed greater significance in a world driven by technology that is underpinned by mathematics.

My response will deal especially with mathematics teachers, specifically but not exclusively, those in secondary schools. Some issues are, of course, common across the teaching profession.

However, because of the critical role mathematics plays in the opportunities for young people to participate fully in society, the workforce for delivering these skills is especially important. Numerous reports over the years have documented the decline in mathematical capacity in Australia. As will be documented here, this decline spans student outcomes, the percentage of graduates with a major in mathematics or statistics, chronic teacher shortages, shrinking university mathematical sciences departments and unmet demand for mathematically literate people for research, business and industry.

The problems are rapidly approaching a situation where they will be intractable. I do not make this statement lightly but from long experience in the field and involvement in policies in mathematics education and the mathematical disciplines.

I taught mathematics in two inner urban Melbourne secondary schools and was a mathematics and ESL consultant involved in schools across Victoria. My involvement with issues of teacher quality and supply began about 25 years ago when I was employed by the Victorian Education Department to work on a project assessing the 'quality and quantity of mathematics teachers'. Since that time I have been involved in two Australian Research Council funded reviews of the mathematical sciences in

1 http://www.review.ms.unimelb.edu.au/
2 http://www.acds.edu.au/docs/Prep_Math_Teach_Aust.pdf
3 http://www.amsi.org.au/images/stories/downloads/pdfs/general-outreach/National_Maths_Strategy.pdf

Australia, been a member of the Academy's National Committee for Mathematical Sciences, coordinated a Graduate Diploma of Education (DipEd), had five years as Vice-President of the Federation of Australian Scientific and Technological Societies (now Science and Technology Australia—STA) and been Executive Officer for both the Australian Mathematical Society and, until march 2011, the Australian Mathematical Sciences Institute. I had extended periods of overseas study leave in 1988 (University of Utah) and in 2000 (USA, Canada, UK, Japan) where I was able to gain insight into mathematics education in other English speaking countries and a snapshot of education in Japan.

Over this period of time there has been a steady decline in both the quality and quantity of mathematics teachers. This submission will document a downward spiral that will require action at many levels if Australia is to have the mathematical talent it needs and young people the opportunities to fully participate in modern society.

The problem with mathematics teacher supply is not new. From my archives:

2.0 QUALIFICATIONS OF SOME NEW TEACHERS OF MATHEMATICS

Nine teachers with mathematics allotments attended the First Year Teachers In-service conducted by Fawkner School Support Centre on 15/4/88.

Their formal qualifications in mathematics are set out below:

	HIGHEST LEVEL OF MATHEMTICS	TEACHING ALLOTMENT
TEACHER 1	First year tertiary	3 maths/1 science
TEACHER 2	Year 10	2 maths/2 science
TEACHER 3	First year tertiary	All maths
TEACHER 4	Year 12 (Stats at tertiary)	2 maths/ economics
TEACHER 5	Year 10	2 maths/3 science
TEACHER 6	Year 11	1 maths/4 science
TEACHER 7	Pure 1/2nd year stats (tertiary)	3 maths/1 science
TEACHER 8	Maths major	3 maths/1 science
TEACHER 9	Maths major	3 maths/2 science

In the group:

* Only teachers 8 and 9 had a maths method.

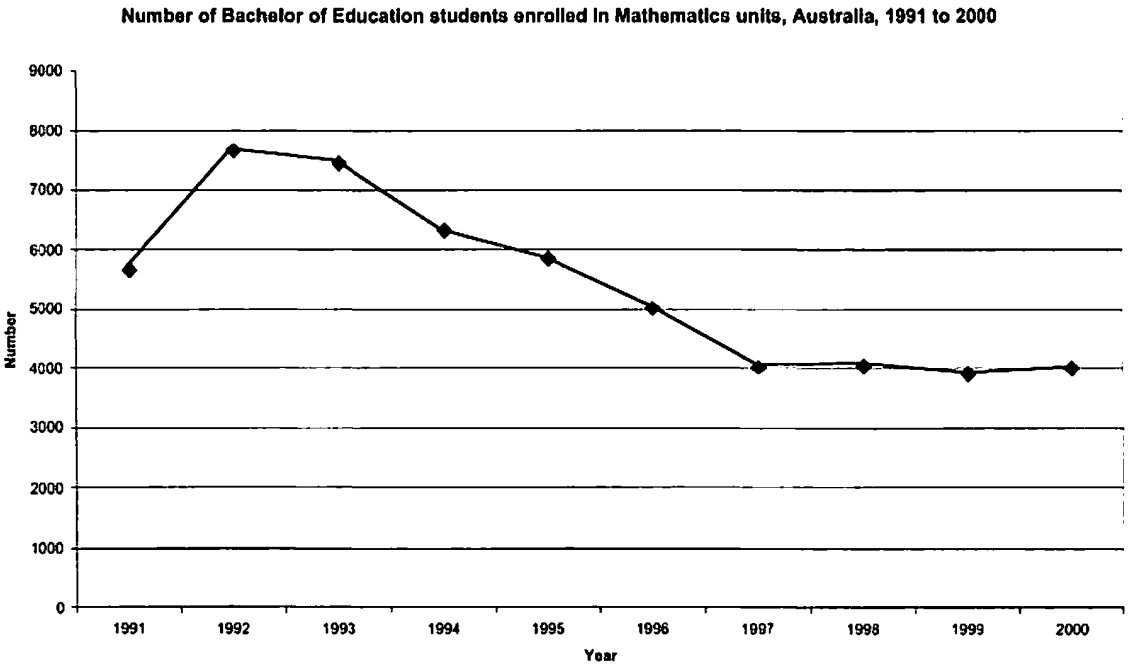
* Most of the group believe their pre-service education should have included a junior maths method. Teacher 7 had wanted to do a maths method but was not allowed to do so because she had insufficient maths to meet current tag requirements.

And some years later:

Extract from Secondary Mathematics Method student's assignment based on observations of mathematics classes during their teaching rounds:

Many of the teachers in the maths department couldn't teach for relational understanding of mathematics as they only had an instrumental understanding of the mathematical concepts themselves. Some teachers while keen to adopt relational understanding modes of teaching mathematics, felt that they could not succeed without a text book set up for teaching relational understanding of mathematics as they do not have this type of understanding themselves. In fact one year seven mathematics teacher failed year ten mathematics. Other teachers were too set in their ways or saw no problem with how they currently teach mathematics (it was the way we were taught).

And in teacher education[4]:

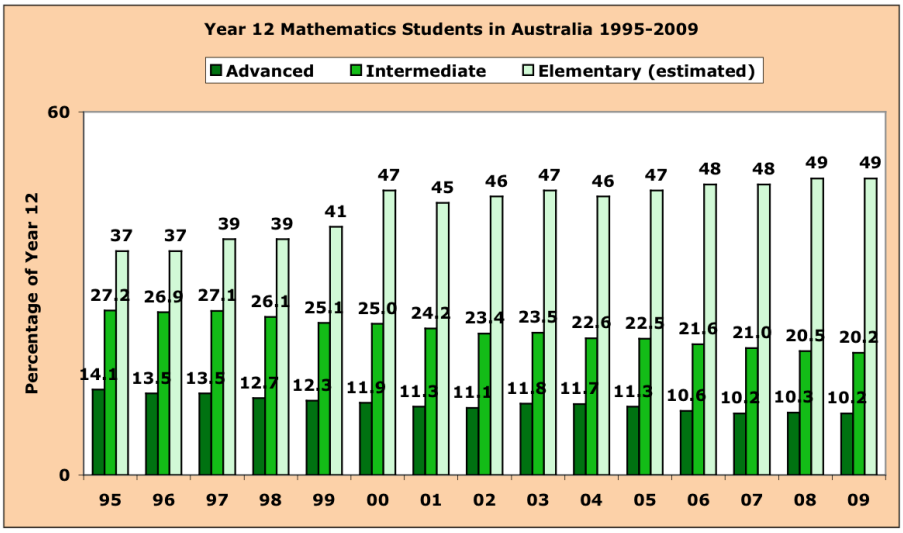


The situation has deteriorated since and it is the hard to staff city, rural, and remote schools that bear the brunt of this. I have argued that this is a social justice issue because access to a decent mathematics education in Australia is now is largely determined by where you live and parental income[5].

Some key indicators

Before commenting on the individual sections of the Discussion Paper, the critical state of mathematics teacher supply is documented. A downward spiral has emerged that cannot be addressed by any single measure. There is strong evidence for this:

1. The percentage of students completing the advanced and intermediate Year 12 mathematics courses has continued a slow decline[6]:



[4] Source unknown and 'Mathematics units' may include units that are pedagogical rather than mathematics discipline.

[5] http://classicbackissues.australasianscience.com.au/bi2009/309conScience.pdf

[6] http://www.amsi.org.au/component/content/article/78-education/123-updated-year-12-mathematics-figures

2. This has affected enrolments in mathematics and statistics at the universities and a number no longer offer a major in mathematics and/or statistics (Appendix 1). Many of these have large enrolments in education.
3. In 2003 OECD data showed that 0.4% of Australian graduates had a major in mathematics or statistics compared with an OECD average of 1%[7]. In view of 2 above it is likely that the situation is now worse.
4. The majority of mathematics and statistics graduates are from universities in the capital cities, exacerbating teacher supply problems in remote and rural areas.

> *Dr Judy Egan*
> Dr Egan was the last person to major in mathematics at Charles Darwin University. She completed her undergraduate degree with the help of some subjects via distance mode from Central Queensland University which she says was 'tough'. As she completed her degree CDU stopped offering a major in mathematics via any means. A recent appointee with a prestigious ARC Fellowship at CDU moved to Monash and she followed and completed her PhD there. This involved moving a number of children and her husband to Melbourne. Achieving a PhD in mathematics under these circumstances was a remarkable accomplishment. It could not have been done if CDU had not had a skeleton major in mathematics.

5. Since at least 1988 State and Territory education authorities have provided advice to DEETYA on recruiting difficulties for teachers. Mathematics features consistently as having widespread recruitment difficulties[8].
6. There is a very serious mismatch between the time in the curriculum and the percentage of graduating teachers in the various discipline areas[9].
7. The Deans of Science report, *The preparation of mathematics teachers in Australia,* found three in four secondary schools experiencing difficulties recruiting suitably qualified mathematics teachers and just 64% of the schools offering the advanced Year 12 subjects[10]. The report probably understates the problems as response was voluntary and many of those teaching out of field probably did not respond.

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[7] OECD (2004) *Education at a glance*

[8] For 1988 see 1988 http://www.mceecdya.edu.au/verve/_resources/teacher_file.pdf
Subsequent reports http://www.mceecdya.edu.au/mceecdya/publications,11582.html - Teachers and teaching

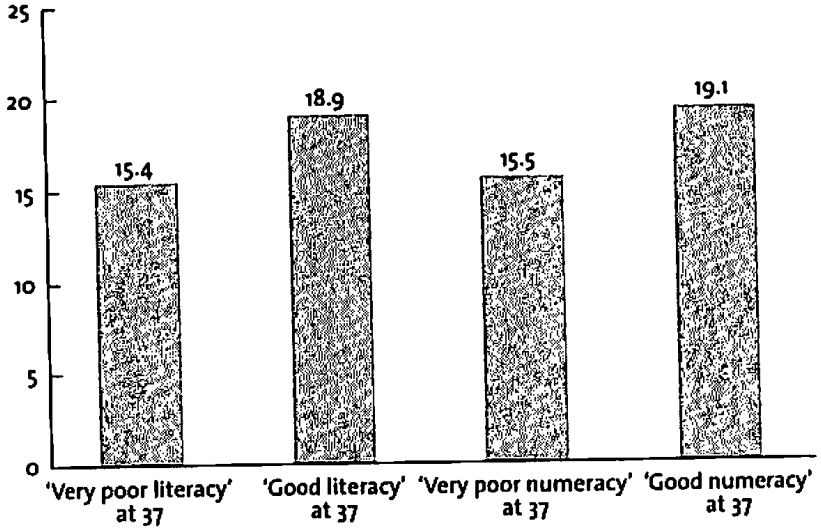
[9] http://www.dest.gov.au/sectors/school_education/publications_resources/profiles/survey_final_year_teacher_edu_students.htm

[10] http://www.acds.edu.au/docs/Prep_Math_Teach_Aust.pdf

The Commission has also been concerned with the TAFE/VET sector workforce. Many graduates from DipEd courses, in particular, find positions in the TAFE/VET sector. While I will not refer to this directly, this is also an issue for the teaching of mathematics.

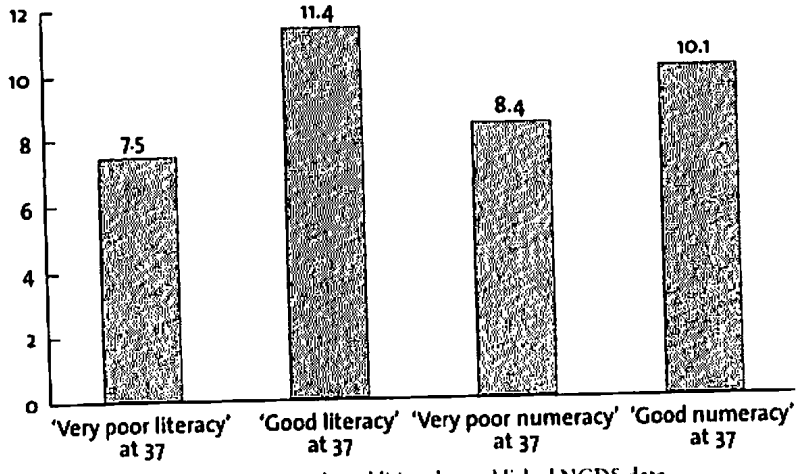
Alison Wolf has been a strong advocate for emphasis on literacy and mathematics in the schools. She has noted the earning power of people who took A-level mathematics as about 10% more than those who did not. The economic importance of literacy and mathematics is well documented in the following figures[11]:

Figure 2.6 Average years in full-time employment between ages sixteen and thirty-seven: men leaving school at sixteen



Sources: Bynner & Parsons 2000, plus additional unpublished NCDS data

Figure 2.7 Average years in full-time employment between ages sixteen and thirty-seven: women leaving school at sixteen



Sources: Bynner & Parsons 2000, plus additional unpublished NCDS data

It is very likely that the outcomes for VET and trades could be improved markedly if better literacy and mathematics skills were achieved at the school level. If they aren't achieved there, then what is required of post-school educators changes.

11 Wolf, A. (2002). Does education matter: Myths about education and economic growth, London: Penguin.

2 About the Sector

In the following sections I will response to some of the questions or provide overall comment:

• *incidence of under and oversupply.*

As already noted (footnote 9) the percentage of graduate secondary teachers with appropriate qualifications to teach in the different discipline areas does not match the time in the curriculum. This ends up in significant under-reporting of how bad the situation is, particularly to parents. For example, the % of graduates qualified to teach mathematics hovers around 7% and the time in the curriculum is double this. Principals are forced to ask teachers to teach out of field. With many schools competing for students, no principal can admit to having trouble filling positions so both principals and education ministries hide behind 'every child is being taught by qualified teachers' without specifying what they are qualified to teach.

An issue that is seldom discussed concerning the shortage of mathematics teachers is the number of changes of teachers many of the junior secondary classes endure. If a qualified teacher in the senior school leaves for any reason, difficulties in replacement often result in the most qualified person in the junior school being used as their replacement. The junior school replacement is invariably teaching out of field. This also has the effect of many teachers teaching just one or two junior mathematics classes and their primary interest being in the areas where they are better qualified.

There is a shortage of primary teachers with sufficient mathematics in their backgrounds to take on mathematics discipline-based leadership positions (footnote 9).

• *rising age profile.*

Educational authorities have been singularly unimaginative is using the talents of teachers who chose to exit teaching early. Mentoring new staff and supervising student teachers are two ways in which they could continue to contribute post retirement.

• *increasing portion of teaching staff positions filled by women.*

I find it difficult to imagine that the situation in regard to primary teaching will improve while every male is seen as a potential pedophile. So if a male teacher feels he can't give a crying child a hug?

At the secondary level gender issues are still apparent in mathematics participation and this will affect the pool of potential teachers.

• *shift in employment to the non-government sector.*

This is an issue if the wealthier schools can provide conditions for the best teachers that cannot be matched by poorer non-government and government schools. The situation in the supply of secondary mathematics teachers is so serious, it is an issue and it becomes even more serious for remote, rural and other hard to staff schools.

• *significantly unionised workforce.*

I don't think this should be an issue. Teaching is a profession where litigation is literally one step away when you take a group of students across a road. Once teachers were pretty much assured of employer provided legal support but matters have got very murky in recent years. From personal experience doctors recommended by unions have a better understanding of teachers' work related health issues and can provide better support. For these reasons I used to advise my DipEd students to join the appropriate union as a kind of insurance policy.

• *high number of qualified teachers not currently employed in schools.*

This is less of an issue than why so many leave within a few years or never teach—more

on this later.

• *declining remuneration relative to many other professions, and*
• *relatively flat pay scales.*
Teachers' starting salaries are very good[12]. However this may have been achieved at the expense of better pay and conditions for those who stay in the profession.

• *relatively uniform staffing mixes.*
It may be more important that schools can't find the teachers or other school workers with the qualifications they need. My experience of visiting schools in the Western suburbs of Melbourne post the Kennett staffing cuts was that they were putting everything they could into keeping teaching numbers up and they were cutting ancillary staff, careers advisors, subject leadership positions etc. These were schools where class size did matter but so did professional help for troubling situations[13].

• *shifting community expectations of the teaching workforce.*
There are also fewer support services readily available. See .Section 4.

What other features of the current schools workforce and its changing context are important from a policy perspective?

1. Increased reporting and administrative load on teachers. This includes State and national testing which puts particular pressure on teachers teaching out of field or in difficult teaching situations. I once took a very difficult student into my class because she was going to cause a first-year out teacher to resign. It caused a lot of difficulties for me and the other students and I wouldn't have liked the extra pressure of being expected to improve test results as well.
2. The number of teachers on contracts and the huge amount of work involved in constantly re-applying for positions.
3. The lack of opportunities for teachers to have study leave or other breaks from teaching. NZ has a very good record in this regard – see for e.g. http://www.royalsociety.org.nz/programmes/funds/teacher-fellowships/

[12] http://start.graduatecareers.com.au/ucm/groups/content/documents/document/gca001801.pdf
[13] In one Year 10 class I observed there was one very agitated young man. I was told his girlfriend had run off that day and taken their baby with her.

3 Why is the performance of the schools workforce important?

Educational outcomes—mathematics

A worrying aspect of Australian student outcomes is that they have been declining relative to other nations. This is especially true of comparisons with the UK and USA which have very similar education systems and teacher profile. The TIMSS results are particularly disturbing.

The PISA study is quoted in the discussion paper but it is a very limited instrument for assessing mathematics. The questions are embedded in text and therefore draw on students' ability to extract the mathematics. Thus reading comprehension and mathematics ability are both important. The use of context can also introduce cultural impediments for some students.

The outcomes for Australian students on the 'integrate and interpret' section of the literacy items are almost identical to those for mathematical literacy proficiency[14]. From lowest to highest band the percentages are:

Integrate and interpret	4	11	21	28	23	11	3
Mathematical literacy	5	11	20	26	22	12	4

Another aspect of PISA is how poorly students everywhere perform on some questions. The garden bed design question (p.176) is an example:

Hong Kong – China (Highest achieving country) 40%
Australian males 26%
Australia 24%
Australian females 21%
OECD average 20%
Tunisia (Lowest achieving country) 5%

The gender difference is also a concern as earlier TIMSS showed little or no difference for Australian students.

A final comment on PISA—the Shanghai cohort is unlike any that has ever been compared with others. They are from single child families who attend school in Shanghai as their parents are allowed to live there because of their educational qualifications. They have no siblings but they have parents plus four grandparents, all of whom are likely to attend educational information sessions. I have been told there are about 30 specialist mathematics and science schools in Shanghai.

Comparing Australia students with those in Shanghai is unrealistic but if our students are falling behind the US and UK then something is going seriously wrong. And they are.

The TIMSS year 8 results are probably the most reliable measure of how Australian students are performing mathematically. By this time differences in school starting ages have less effect and in most countries all of this population is still in school. TIMSS in later years of schooling is problematic as issues concerning developing countries that cannot afford universal access to senior secondary education arise.

TIMSS trends: Australia, England and USA

There is much in common with the education systems of these three countries. In regard to mathematics education, all three have problems with underqualified teachers in both primary and secondary schools and problems with supply at the secondary level.

[14] http://www.acer.edu.au/documents/PISA-2009-Report.pdf

TIMSS results show Australia performing badly over recent years compared with England and the USA.

In 2007 a scale average of 500 has replaced the 'all country mean' used previously and this should be noted in the tables below.

Year 4

	All country mean	Australia	England	USA
1995	485	498	476	476
2003	495	499	531	518
2007#	500	516	541	529

Year 4 has less countries participating and different ages of beginning school could also affect the results. However, the results above indicate that both England and the USA have had improvements that have not happened in Australia.

Australia now in group statistically below both England and USA

Year 8

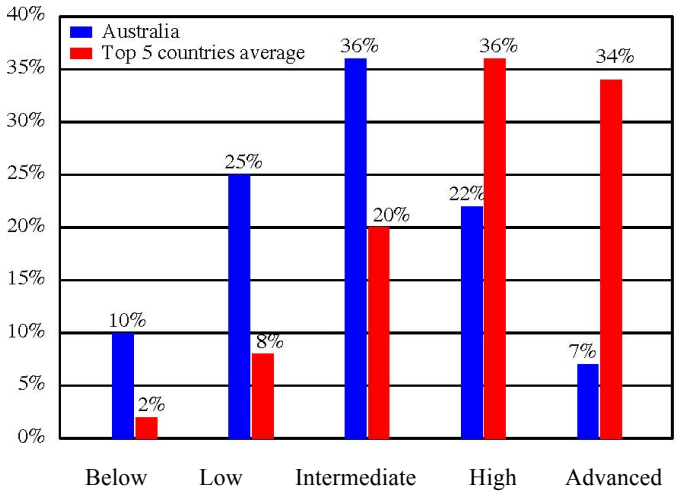
	All country mean	Australia	England	USA
1995*	514	530	506	500
1999**	487	525	496	502
2003***	467	505	498	504
2007****	500	496	513	508

*Australia statistically higher than England and USA which were not statistically different
**TIMSS repeat – Year 8 only. Australia statistically higher than England and USA which were not statistically different
*** Australia not statistically different to England or USA
**** Australia now statistically below both England and USA

Year 8 has many more countries participating and differences in curriculum and starting ages should have evened out. The decline in country mean (to 2003) is associated with more countries participating and many of these being poorer nations.

The improvement in the USA is mirrored in their National Assessment of Educational Progress (NAEP) results—not major leaps but some slow progress.

Another way of looking at Year 8 performance is shown below. It compares the percentage of Australian students reaching the benchmarks set in 2002/2003 with the average for the top five countries. It shows Australian students are capable of much better outcomes.



Response to questions:

What does the available evidence indicate about Australia's education outcomes? How policy relevant are comparisons of literacy and numeracy over time and across countries?

PISA presents some problems but is showing that Australia is losing ground to other nations. The TIMSS data is deeply disturbing as it shows Australia has gone backwards compared with countries such as the UK and US. While the long tail in lower bands means that many young people are not prepared for the mathematical demands of VET courses, there is also serious underachievement in the highest bands. This reduces the pool of potential engineers, scientists, mathematicians and other quantitative professions.

Which avenues for reform are most promising for reducing educational disadvantage and improving education outcomes more generally? How important are workforce-related changes relative to other initiatives directed at enhancing children's learning potential?

Study after study has pointed to the need for well-qualified teachers. These studies are best summed up by the report from McKinsey&Company that stated: "the quality of an education system cannot exceed the quality of its teachers"[15]. First and foremost Australia needs to adopt whatever changes are necessary to deal with teachers who are not sufficiently well prepared and to ensure that, in the case of mathematics, those that are well prepared are valued. It is not just about pay.

What are the strengths and weaknesses of current workforce arrangements? What are the priority areas for policy attention?

A major weakness is the undervaluing of content knowledge in teacher education. In the primary sector this means there is a lack of encouragement to really come to grips with the content knowledge they need to teach mathematics well.

Are major changes required to address shortcomings, or would gains be better achieved through fine-tuning of existing policy settings?

It may be that the policy is not the problem but the implementation. Irrespective of the cause, if the problems in mathematics education are to be addressed, fine-tuning is not an option. The imbalance in the discipline background of graduating secondary teachers compared with the time in the curriculum, the extent of teaching out of field, not enough graduates in mathematical disciplines, lack of competency testing of exiting

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http://www.mckinsey.com/clientservice/social_sector/our_practices/education/knowledge_highlights/best_performing_school.aspx

primary teachers and lack of mathematical content in primary courses are just some of the issues.

4 Recent policy developments

I am going to address this section from an historical perspective rather than respond to the specific questions.

The major changes that underpin current policy go back to the late 1980s, early 1990s, and a previous attempt at a national curriculum through the *national statements* and *profiles*. Since that time there has been more central decision for policy through COAG and the Ministerial Council for Education[16].

However this has also been accompanied by a massive decline for federally funded programs that support implementation of policy. The States have the funds but it leads to fragmentation of effort, particularly in addressing the needs of special groups. The States have also reduced the support services to schools.

When I was in Multicultural Education Services (MES) a rural school that had its first non-English speaking immigrant children enrol could ring MES for help. We could get them to ring Canberra and they would be supplied with free materials. Then MES could provide help to the teachers in how to use the materials.

One of the challenges schools faced while I was at MES was the arrival on a large number of Cambodian adolescents who were illiterate in their first language as well as English. Secondary ESL teachers had not generally had to deal with students with this background. Because MES existed we were able to persuade the education authorities that these students needed more time in on-arrival language centres and work with the ESL teachers to develop new strategies for teaching them.

None of this kind of support exists any more. No free materials developed as part of a national service, no MES operating at a State level.

Indigenous education suffers from a similar fragmentation. There are many projects but there is no cohesion over the overall effort. It is an area that needs commit to working in the communities over an extended period of time. I couldn't make that commit for personal reasons but greatly respect the mathematics educators who have. There is at least one who has continued to try and work in one community even thought the funding stopped after three years. Making a real difference takes much longer.

There was also national support for improving girls' participation in mathematics and science. This is another area where Australia seems to be going backwards.

In summary there is now less support for teachers of underrepresented groups than there was in the past. This impacts on teacher satisfaction.

Evidence

There is a lack of evidence for some policy and actions. For example:

1. *Teach for Australia* (TFA)—similar programs in other nations are still subject to on-going debate concerning their effectiveness. TFA is producing very few mathematics teachers and has generated another bureaucracy[17]. I have been told, but can't confirm, that it costs five times as much to support a TFA student as it does for a DipEd student.
2. *Proposals for performance pay*—effectiveness is not established and will be demoralising for the many teachers doing their best, with little support, to teach out of field in areas of shortfall.

16 The Council has had various names in this time so I've simplified

17 http://www.teachforaustralia.org/

3. *Two years of education for graduates to qualify as teachers*—currently proposed by AITSL. There appears to have been no research on the impact of this on mathematics graduates becoming teachers. But it was tried in Queensland some years ago and affected enrolments in mathematics education at the University of Queensland. The University has gone back to a one year DipEd program[18]. The normal practice across a number of universities with two-year programs is to condense them to eighteen months. But in Queensland the employing agencies did not like having to employ mid-year when the graduates became available. There appears to be no provision for increased pay for these five-year trained graduate teachers compared with the four-year BEds with two years discipline studies. I would predict that the few mathematics majors/two year education studies teachers that emerge from this policy would be employed almost exclusively in the private sector.

There are also substantive documents that could inform policy and programs to improve mathematics teacher supply and quality:

1. *Review of mathematical sciences in the universities (2006)*—provides information on mathematics in the tertiary sector and what needs to be done to improve graduate supply. This is critical to meeting the need for highly qualified mathematics teachers[19].
2. *The Deans of Science report previously cited*—this has a wealth of data especially from lead teachers in schools. It also shows that the most qualified teachers are more satisfied with their tertiary preparation and career change teachers were more confident that they would continue teaching.
3. *Drawing on strategies that have worked in the UK*—these are outlined in a presentation by Prof. Celia Hoyles, former mathematics advisor to the UK government, and included career awareness and improving teacher quality and quantity[20]. The UK introduced a national mathematics curriculum and national testing in 1988. It had little effect on student outcomes until these more recent measures. A coherent, quality national curriculum is important but achieves very little without the teachers to teach it and students realising that mathematics is important to them and their future careers.
4. *The Exceptional Schooling Outcomes Project*—describes the characteristics of teachers and other factors of NSW public schools achieving outstanding outcomes in mathematics[21]

[18] Personal communication.

[19] http://www.review.ms.unimelb.edu.au/

[20] http://www.amsi.org.au/publications/external-publications/382-prof-celia-hoyles-on-successful-strategies-in-the-uk

[21] http://www.merga.net.au/documents/RP562007.pdf

5 Further improvements in schools workforce outcomes

In regard to teachers of mathematics my responses to some of the questions are below.

What are the key factors, whether across the board or specific to particular areas, that may contribute to current or future workforce shortages? Are all of these factors amenable to policy action?

The supply of mathematics and statistics graduates has to improve and therefore this is impacted by what is happening in the universities and students perceptions of the value on mathematics. As already noted, the UK has implemented successful strategies and improved the supple of graduates by mathematics awareness programs, improving existing teachers' mathematical competence and incentives for new teachers. AMSI has produced exemplary careers awareness materials[22] but currently lacks the resources to ensure that they are well used. In particular, careers advisors need to understand how mathematics underpins many careers.

Are there weaknesses in specific recruitment and/or retention strategies that could be exacerbating imbalances in supply and demand? Are there any underlying problems in workforce planning strategies?

An underlying problem is that there is inadequate data concerning the qualifications of existing teachers. This affects workforce planning. A specific weakness in recruitment and retention is the use of short-term contracts so that many teachers are constantly reapplying for their current position or new positions. The discipline areas in most demand in schools tend to be those in demand elsewhere. Contract teachers in demand elsewhere can decide to leave teaching.

What lessons, if any, can be learned from other sectors of the economy in dealing with the staffing challenges in the schools sector?

Immigration almost certainly won't work and there are few other options. This is an Australian problem that needs to be fixed in Australia.

Are the roles of and relationships between different school workers appropriate to meet current and emerging needs? In what ways might changes in job design be useful?

Are there regulatory, institutional or cultural impediments to beneficial adjustments in job design and staffing mixes? To what extent do the national accreditation and registration requirements recognise changing professional demands for school workers?

I have already mentioned the AITSL proposal for a two-year postgraduate qualification for graduates. There are other options for a second year including work-related study completed over time. The positions teachers take vary enormously and what extra study you need reflects that. I completed more than a second year in ESL and remedial mathematics strategies that would never have been covered in a two-year course except perhaps in a very cursory way. Teachers who go into the VET or adult sector find they need other skills.

Does the current design of teaching roles give sufficient recognition to issues such as extra-curricular activities, interaction with parents and the community, or to assisting students with the transition to further education or employment?

Would further decreases in student–teacher ratios significantly improve student outcomes? How should empirical research on the cost-effectiveness of class size reductions as a means to improve student outcomes be interpreted?

Class size is far more important in schools with many special needs students. These schools need a better student-teacher ratio and additional support staff if they are to be

[22] http://www.mathscareers.org.au/

satisfying work places and attract good teachers.

Is there appropriate sharing of Australian and international experiences regarding changes to the role and mix of teachers, leaders, para-professionals, and other school workers?

Training and professional development

What are the advantages and disadvantages of the traditional Diploma and Bachelor of Education entry pathways? Do postgraduate studies in education contribute significantly to teacher quality?

BEd programs are traditionally half discipline studies and half educational studies. They do not give sufficient depth in the discipline for teachers at year 11 and 12. Unfortunately many primary BEd programs also fail to give intending teachers sufficient knowledge of the mathematics they will be required to teach. This was illustrated by an AMSI analysis of BEd courses as part of a submission to a previous House of Representatives Standing Committee on Education and Vocational Training Inquiry into Teacher Education[23].

Australia has failed to make use of the wealth data coming from places like the US on the mathematics teachers need to know at the various levels of schooling. Debate in the US was ignited by a book by Liping Ma that examined the mathematical knowledge of primary teachers in the US and China[24]. It had a profound effect on some in the mathematical community and some excellent mathematicians have since engaged in a serious examination of the issue.

Education faculties in Australia tend not to attempt to involve mathematicians and statisticians even though most of them are losing their talented mathematical staff through retirement. In short the education faculties are suffering the same fate as schools—the staff with the mathematical knowledge are retiring and their replacements do not have the same depth of mathematical knowledge. A PhD program for potential mathematics advisors or university positions of the US kind would be very beneficial. The US programs nearly all require mathematics course work as an integral part of the PhD[25].

The Deans of Science study already cited makes it quite clear what senior mathematics teachers in secondary schools think the qualifications of teachers at the various levels should be. They are unequivocal that senior class teachers need a major or higher in mathematics and DipEd with a minimum of two units of methods study.

How effectively do pre-service training courses (and the national accreditation standards for such courses) meet the current and prospective needs of the education system and teachers? Do courses place sufficient emphasis on practicum?

There are many weaknesses in the preparation of primary teachers. In recent years this has spread to the middle years.

There has been constant emphasis on the practicum and the number of days increased. This is an area where a little bit of honesty would be beneficial. The demand for placements means that many placements are far from satisfactory. Yet the student teachers are under enormous pressure as school experience reports are extremely important in job applications. It is an artificial setting with the supervising teacher in the room and the student teacher often emulating them to get a good report even if it is not a style they are comfortable with. In short, I don't think the increased school

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23 http://www.amsi.org.au/images/stories/downloads/pdfs/education/Submission_TeacherEducation.pdf

24 Ma, L. (1999). Knowing and teaching elementary mathematics, New Jersey: Lawrence Erlbaum.

25 http://www.ams.org/notices/200710/tx071001283p.pdf

experience as part of the initial teacher training is worth the stress it causes. It would be far more beneficial to put more effort into reduced teaching loads and mentoring in the first year of teaching.

To what extent are employment-based pathways a complement to standard teaching courses? Are such pathways likely to be of a niche nature, or might they have wider applicability in the future?
The costs associated with these pathways seem excessive. It also seems to be contradictory that *Teach for Australia* students can be considered 'ready to teach' after six weeks induction but a graduate on a standard pathway is currently headed for two years of educational studies before reaching the same status.
On the other hand employment-based pathways should probably be considered for career-change people. These people are very important in meeting the current shortfalls in graduates in some disciplines and they need income while studying. A useful model might consist of teacher assistant status for half a year prior to a reduced teaching load in the second half of the year.
There is far too much emphasis on getting the young into teaching and too many never teach or teach for very few years. The career change people seem to stay and be a better investment over time.

Is sufficient attention paid to professional development — not only for classroom teachers, but also principals and other school workers? What specific changes, beyond those already in prospect, would be appropriate?
There is insufficient attention paid to opportunities to improve discipline knowledge and new developments in the disciplines. This is particularly important in mathematics where teachers need to be able to discuss the role of mathematics and statistics in career options and encourage ongoing participation.

Are adequate resources available to mentor new teachers? Is there a need for formalised system-wide mentoring structures, or should the processes for inducting new teachers be left to each school?
New teachers need support within the school. However, few have on-going positions initially and discussing difficulties they are having within the school can be difficult. They need access to help outside the school. The discipline specific consultants in regional offices used to be a great help but there are few of them left.

What role do pre-service training providers play in directing aspiring teachers into areas of teacher shortage?

At what point (or points) in time should the quality of aspiring teachers be assessed: before pre-service training, before practicum, before entering the workforce as new teachers, or elsewhere in the training and development cycle? What scope is there to increase standards for entering courses, placements or the profession without exacerbating current or future shortages?
It is critical that the first year of primary teacher education courses have a solid content base in mathematics and English. If serious issues arise in their knowledge of either of these areas that cannot be resolved in their first year of university study, they should be counselled out of classroom teaching into another qualification. This is both for their benefit and of schools.
When I first entered teacher education, extensive use of interviews complemented selection for our DipEd course. As a result we had nearly 100% completion. I doubt whether any faculty interviews now but it is powerful way of assessing suitability, reasons for being a teacher, communication skills etc.

How important are the level and structure of remuneration for recruitment and

retention of teachers? What impact does the level of remuneration have on the capabilities of those entering the teaching profession? Should differentiated remuneration be used more widely to address imbalances in supply and demand?
At the recruitment stage there should be scholarships for highly qualified applicants that should be targeted at a variety of areas—areas of shortfall, minority groups, indigenous applicants, remote rural etc.

Much more attention should be paid to rewarding excellent teachers who are prepared to move to underperforming schools. This should include a higher level of remuneration and a reduced teaching load to enable them to mentor other staff. This is likely to be both effective and less divisive than some other models that have been suggested.

Are there non-remuneration conditions of employment that, if changed, would enhance teacher quality and student outcomes? Is there sufficient recognition of the work associated with the delivery of extra-curricular programs?
The opportunity for study leave, including industry experience, should be widely available. This should not discriminate against teachers in disciplines in short supply. There was one occasion where 'tired and worn out' teachers were being offered generous redundancy packages but mathematics teachers weren't allowed to apply. This is discrimination.

What makes a quality teacher? How should teacher performance be measured? To what extent can computable performance metrics indicate the 'value added 'by a teacher?
If a well-designed performance-based pay scheme could be implemented, would it significantly enhance teacher quality and student outcomes? What risks and costs are associated with performance-based pay?
Schools are too different. I think there are too many variables for any performance-based pay scheme to work. Any measure that enables good teachers to be better teachers, e.g. study leave, is more likely to enhance students outcomes and help other teachers in the school.

Separate from whether financial rewards should be attached, are there ways to enhance performance appraisal processes for school workers?

School leadership
Principals need to be the ones to respond to these questions but if they are going to have more administrative tasks then they must have more administrative assistance so they are still readily available to staff, students and parents. School leadership is important:

1. The famed teacher in '*Stand and Delivery*' was successful because the school got a Principal who made it possible to teach[26].
2. I would expect that the Principal at the Cohuna is very much behind the turn around in mathematics at that school[27]. She is well known for her passion for science education and involvement in organisations such as Gender And Science And Technology (GASAT) Association[28].

School autonomy
What are the advantages and disadvantages of increasing school autonomy? To what extent can currently centralised responsibilities be sensibly devolved to the school level? What lessons can be learned from approaches in Victoria and other countries, as well as

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26 Mathews, J. (1988). Escalante: The best teacher in America. New York: Henry Holt and Co.
27 http://www.theage.com.au/victoria/country-students-learn-the-benefits-of-numbers-on-the-hoof-20110816-1iwf6.html
28 http://www.gasat-international.org/

from experiences in independent schools?
What specific governance and regulatory arrangements are needed to support greater school autonomy?
What other checks and balances are required to ensure individual schools do not advance their interests at the expense of outcomes across the whole system?
Specifically, could schools serving disadvantaged communities be left worse off by the competition for resources that might result from decentralisation? To what extent could such outcomes be ameliorated by concomitant increases in the flexibility of remuneration arrangements?
Is a 'one size fits all' approach to school autonomy appropriate, or should the degree of autonomy enjoyed by schools vary according to their performance?

The major problem of increasing school autonomy is that disadvantage is increased when there are critical shortages in appropriately qualified staff. This has certainly happened in Victoria in mathematics. The better independent schools cherry pick the best teachers. The better government schools take the good teachers who want to stay in the state system and the other schools take whoever they can get. Big secondary schools in quite affluent areas of Melbourne no longer offer the advanced Year 12 course. I was once visiting a Western suburbs school where the one qualified VCE mathematics teacher was about eight months pregnant and the school still hadn't been able to find a replacement. The Education Department was trying to persuade the school to take another science teacher but they wanted to have at least one mathematics specialist.

Meeting the needs of particular student populations
Mellin-Olsen (1987) noted that what a nation bases it economy on will be reflected in the kinds of mathematical knowledge its citizens will require to be part of that society. He saw mathematics as an essential thinking tool for young people, enabling them to deal with life's problems in constructive and creative ways[29]. In America former civil rights campaigners see access to algebra[30] as the new civil rights concern[31].

In mathematics Australia is not just failing to meet the needs of particular student populations, the needs of ordinary students in middle-class suburbia aren't being met. And it just gets worse for those with special needs. What chance does an indigenous student in the NT have when the NT is totally dependent on the rest of Australia for its secondary mathematics teachers because CDU no longer teachers mathematics to even a skeleton third year?

Teachers of the disadvantage must understand what 'normal' students can achieve and have similar expectations for other groups. Only a small percentage of young people have serious intellectual difficulties but Australia's performance in mathematics does not reflect that. Australia has got to stop believing that many students can't do mathematics or that it doesn't matter. It does.

I won't comment on the questions—I think I have already made my opinions clear. And I despair of the low expectations of key Ministers:

> *PETER GARRETT: Well you know one of the most important things kids do at school is learn to read and write and to add up and that's literacy and numeracy[32].*

I would add that the term 'numeracy' is also a problem as, for most people, it implies a grasp of a few basics. It lowers expectations and takes the focus off mathematics and its

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29 Mellin-Olsen, S. (1987). The Politics of Mathematics Education. Dordrecht: D. Reidel.
30 In America, this means the higher level courses.
31 Moses, R. P., & Cobb, C. E. (2001).Radical equations: Math literacy and civil rights. Boston: Beacon Press
32 http://www.deewr.gov.au/Ministers/Garrett/Media/Transcripts/Pages/Article_110810_165429.aspx

role in the modern world.

How effective is the current suite of workforce-related initiatives to address educational disadvantage? Should the goal of such policies be greater equality in education outcomes or greater equality of opportunity for all students to realise their educational potential? Does the choice between these two alternatives have implications for the nature of the schools workforce policies that should be employed to address educational disadvantage?

Are all student groups that are experiencing significant educational disadvantage being given suitable recognition in the current workforce policy framework? Are current measures of socioeconomic status adequate?

Are school workers sufficiently trained to deal with special needs students, students from cultural and language backgrounds other than English, and students with any other specific educational requirements?

Are there particular qualities that are especially important in teaching Indigenous students? Do existing teaching courses place sufficient emphasis on the development of these qualities? How might the number of Indigenous Australians training to enter the schools workforce be increased?

Are there workforce changes that would assist disadvantaged students make a successful transition from school to work or further education?

What are the main factors that influence the choice of teachers and other professionals to work in areas of educational disadvantage or with students with specific educational needs?

The surrounding institutional framework

I have made a number of comments already that comment on these areas. In mathematics education and teacher training there is not enough interaction between the discipline departments and education faculties. Most educational faculties are huge compared with the discipline departments. The international reviewers who came to Australia in 2006[33] used the term 'polyversities' when meeting with the Working Party. They saw silos rather than cooperation.

Meeting the needs of senior secondary teachers in regard to the national curriculum could be an opportunity to address this. More broadly, making funding for professional development, retraining and initial teacher education programs dependent on involvement of appropriate mathematical expertise (as was done in California for e.g.) to ensure the mathematical integrity of these programs could be considered.

Teachers' opinions about what would help them be better teachers need to be heeded. The classroom teacher is too often at the bottom of a long chain of command and being judged on implementation of those commands whether they are appropriate for their class or not.

In the preparation of teachers and their on-going professional development, there needs to be constructive dialogue between teachers, mathematics educators and mathematical scientists. AMSI is one body that has done this successfully.

[33] http://www.review.ms.unimelb.edu.au/

There is a need to develop appropriate content knowledge and skills required for graduating as a teacher of mathematics especially for primary and junior secondary, and ensure that education faculties meet these standards. It cannot be done without mathematicians and statisticians to ensure the integrity of courses.

There is a constant call for relevance in mathematics teaching by people who have little appreciation of just how dynamic modern mathematics is. Education faculties, State and federal bureaucracies have got to stop excluding the people who understand this and can help ensure courses are both relevant and have mathematical integrity.

How responsive is the overall institutional regime to changing circumstances? Is the established culture and practice within education departments and related regulatory agencies, as well as in government and non-government schools, an impediment to workforce reform?

Are industrial relations arrangements in the schools sector sufficiently flexible? Are there particular regulatory or institutional factors that may impede the recruitment and retention of high quality school workers? How can these be addressed?

Does the policy interface between the Australian Government and State and Territory Governments pose challenges for effective schools workforce reform? What effect will initiatives such as national accreditation and registration requirements, and the introduction of a national curriculum, have on the schools workforce and its capacity to meet the needs of students, parents and the community?

Is there sufficient engagement between the government and non-government school sectors on workforce-related issues?

How effective is the interaction with parents and the community on matters relating to student progress and school policy? How engaged are parents in school governance processes, in classroom support, and in other aspects of school activity?

Is there sufficient interaction and coordination between the schools, ECD and VET sectors?

Is there an adequate focus on the evaluation of programs (including the dissemination of evaluation results), and a readiness to adjust programs if evidence indicates that improvements can be achieved?

Are there particular information and data gaps, either in collection or dissemination, that impede good decision making in education policy? Are the current institutional arrangements for undertaking research on schools workforce policy, and on education policy more generally, adequate? If not, how might they be improved?

Appendix 1

Summary Results — ACHMS Meeting February 2010 Survey

Background

The questionnaire attached (Appendix 1) was circulated to the Head of Mathematical Sciences at all Australian Universities. It sought to provide a snapshot of how the mathematical sciences were faring in the university sector. Concerns had also been raised on the apparent increase in the use of casual staff and so this was also explored.

Completed questionnaires were received from 32 separate departments. Questionnaires were not returned from Victoria University, University of Southern Queensland, University of Tasmania, Australian Catholic University, Curtin University, University of Canberra, University of Ballarat and ANU Statistics.

Responses

Over the last 3 years (2007—2009) in your department/school:

1. **Undergraduate M&S subject enrolments* have**
16 reported an increase, only one reported a decrease

2. **M&S majors have**
Of those offering a major 4 reported an increase, 3 a decrease

3. **Honours (or equivalent) student numbers have**
5 reported an increase, 5 a decrease

4. **Domestic research student numbers have**
6 reported an increase, 7 a decrease

5. **International research student numbers have**
11 reported an increase, 2 a decrease

6. **Total research student numbers have**
10 reported an increase, 4 a decrease

7. **Use of casuals as tutors/demonstrators/markers has**
20 reported an increase, 2 a decrease

8. **Use of casuals as lecturers has**
17 reported an increase, 4 a decrease (in 3 of these, continuing staff had increased)

9. **Continuing staff numbers have**
9 reported an increase, 15 a decrease

10. **Fixed term, research only, staff numbers have**
8 reported an increase, 2 a decrease

11. **Fixed term teaching staff numbers have**
4 reported an increase, 1 a decrease

12. **Overall research income from all sources has**
12 reported an increase, 7 a decrease

13. I am concerned about the increasing number of casual tutors: 8 Yes / 21 No / 3 NA

14. I am concerned about the increasing numbers of casual lecturers: 15 Yes / 11 No / 6 NA

15. I have had difficulties finding appropriately qualified casual staff: 20 Yes / 10 No / 2 NA

16. Compared to 2009 our 2010 discretionary budget is
5 reported an increase, 2 a decrease, 17 about the same,

17. In 2010 are you offering:

(i) A major in mathematics: Yes 25, No 7
(ii) A major in statistics: Yes 15, No 16, ? 1
(iii) A major with a mix of mathematics and statistics Yes 20, No 10, ? 2

Comments added by Heads

Q1 *Our system makes it difficult to track whether a student actually obtains a mathematics major.*

Q13 *No. This helps support our honours and PhD students*
No, we need to train students to teach as well

Q14 *Yes. But on the positive side, we have been using post docs and have been able to extend their contracts as they teach. Also helps their CVs.*
No, post docs need lecturing experience

Other Comments
'*…we have gone from a full-three year mathematics and statistics degree program plus service teaching at the turn of the century to offering only those mathematics courses that core to any non-mathematics university program(this is effectively a small number of service courses…but perhaps it is time to begin again – a new VC has injected a much needed boost to morale…'*

'We have vacant positions, but were unable to fill some in 2009 due to low quality of applicants'

'…we are only allowed to spend our agreed Expenditure, which is $1.3m less than our income…Maths, Stats and…are now bankrolling the Science Faculty. I have managed for the first time to have 100% continuing lecturing staff'

'We have more service teaching in first year due to increases in engineering and aviation enrolments. No new staff…I just keep being told the sessional budget needs to be cut. There seems to be no relationship between student numbers, sessional budget and staff numbers. Last year we taught 160EFTSU with 4 full-time staff.'

'Staffing numbers continue to decline, as other disciplines use their non-specialist staff to do their 'maths'. Maths education is terrible in our Ed degree, and all discipline specific staff tend to be excluded… Applied science degree has reintroduced a compulsory maths subject, but it's only high school level. The specific needs of dominant disciplines like engineering help to support the maths standard, but also deny the opportunity to do maths with broader reach than the narrow engineering focus.'

'Difficult to find/attract staff to full-time, on-going appointments and statistics remains a major problem…moves to reduce the number of combined/double degrees on offer is adversely impacting on maths majors and hence potentially staffing. Admission of a greater number of inadequately prepared (in maths) students to B.Eng and other degrees has led to a demand (and need) for enhanced tutorial programs in first and higher years but we lack resources (financial and qualified people) to effectively offer this.'

'The current and recent situation has been dire…A mathematics regeneration is planned…The new appointments, even if funded, may prove difficult to fill!'

'Our School has suffered by a reduction in statistics lecturers (one resignation and one long-term sick leave). It has therefore been challenging to find suitable replacements (both for tutoring duties as well as lecturing).'

'In 2009, we had a 45% increase (over 2008 figures) of enrolments, entirely due to service teaching requirements…These numbers produced an increased funding allocation to the Faculty of Science for 2010, none of which was passed to the Department and so we have not been able to make any extra appointments to improve the staffing situation.'

'Currently the University has a recruitment pause. Aim o advertise further continuing positions later in 2010.'

'The slight increase in budget has not been sufficient to cover the reasonably large increase in enrolments.'

One Head noted that domestic research student numbers have been stable *'due to lack of scholarship funding'.*

'We are still experiencing some growth in staffing numbers.'

'Research activity in Applied Mathematics continues grow at…and our staff have recently secured significant funding from the government, CSIRO and industry. On the education front, … is planning to run an Applied Mathematics co-major in its science degree next year and we have also expanded our advanced mathematics offerings to Engineering students (offered as electives).'

'We have no maths…'

' Mathematics Discipline underwent change management in 2006 reducing the number of FTE staff from 4.5 on-going plus one contract staff to 1.5 on-going and 1 contract staff… now we have 2 ongoing staff and 1 contract staff. At the same time our student numbers started to grow from 78 EFTSUs in 2006 to 142 EFTSUs in 2009…Because of the staffing situation, 3 of the first year classes were taught by casuals, increasing the coordination load on the few full time mathematicians. Tutors were recruited from postgraduate students, but as we do not have very many of them, this puts also pressure on things…In 2010, our Head of School has decided to change the way units are taught to effectively abolish tutorials in first year classes in favour of larger workshop-type classes… In addition there has been a decree to reduce the number of lecture hours in the subjects from 3 to 2. There is no money for marking in this model, leading to the lecturers having to do all the marking themselves … The effect is a severe intensification of work with student staff ratios of well over 100. I have two young colleagues who are hardest hit in that they have only been in their jobs for less than 2 years, so not only have they got to cope with high teaching loads, but also with unit

development and the need to establish a research niche. All in all, a very bad position to be in.'

'I am the sole remaining statistician and am over 60. I am expected to teach 10 units/year to encompass STAT100 (a glorified high school unit) and MSc… (A regional University) *has accepted OS students and now finds that these students want to study maths. This does not translate to new appointments. There is no lessening in the demand for statistics at all levels.'*

'I coordinate and teach six courses a year. For three years I have pushed for another maths lecturer as my workload is too high…I am continually told that we do not have the resources to appoint another lecturer, but I seriously doubt this, considering that enrolment numbers are very high. There is absolutely no move to appoint another lecturer. The main statistics lecturer left last year…we train maths-teachers, engineers and scientists!'

'While it is somewhat positive that we have not lost further ground locally during the survey period, this is coming off a preceding period in which there had been substantial attrition in staffing and funding.'

Comments – Jan Thomas

Two years ago a questionnaire was sent Heads of Mathematical Sciences in the universities. The questionnaire sought to identify the extent of the flow of new money to mathematics and statistics and responses to the KPIs in the Strategic Review (2006) that were linked to this funding. I noted at the time that 'the lack of progress in implementing the Review recommendations is clear.'

In 2008 there were 34 responses and this year it was 32. It is clear that in 2010 the majority of Departments have a greater student load with the same or less on-going staff. The on-going lack of progress in implementing the Review continues.

This is possibly one reason why the issue of casual staff was raised during 2009 and addressed in the 2010 survey. It would be wonderful if it was possible to extract concrete data on student numbers, staffing etc and some of us have tried. I believe what we do have from both 2008 and 2010 is evidence of continued decline with the exception of a handful of departments.

In regard to the use of casuals, the current issue of Australian Universities Review has a useful article on casual employment in higher education (see http://www.aur.org.au/). The authors conclude:

> *The realities of the labour market where employers use casual employment as a cost-saving measure undermine the argument that casual employees gain flexibility and work/life balance and suggest that they are jobs rather than careers. A major outcome for people in long term casual employment is frustrated careers.*

Relating this to the survey, few Heads were concerned about the use of casuals for tutoring as it provides income and experience for their post-graduate students. However once these students want careers, their on-going appointment as casuals probably does become a matter for concern. And if they are in high-demand areas they will not stay in casual employment in the universities if they can get career positions elsewhere. Hence the concern about finding appropriately qualified casual staff. Most mathematical sciences graduates with higher degrees have other options. They will go to other employment or overseas if on-going positions are not available in Australian universities. At the same time it is clear the mathematical sciences departments are under-staffed and many more positions should be available.

Nowhere is this more apparent than in the number of universities that cannot offer majors. The 2008 and 2010 figures cannot be compared directly as in 2008 a question regarding a major that was a mix of mathematics and statistics was not asked. However, it would appear that there has been small decrease in the number of universities offering a major in mathematics and a larger drop in those offering a major in statistics.

Given the importance of statistics and many areas of mathematics to the research capability of any university, it must be concluded that their capability is less than optimal and declining. As is the readiness for research degrees of many graduates who are getting less than optimal mathematical and statistical preparation from understaffed and poorly supported mathematical sciences departments.

One final comment, the opportunity to complete a PhD in a strong department has become concentrated in a few institutions. To quote Barlow from his review of research in Australian universities (2009):

> *Investment in mathematical sciences R&D appears to have tracked with growth in the university sector as a whole over the past decade. But investment growth has also become increasingly concentrated, with a diminishing number of institutions active in the field. Four institutions now account over half of all Australian university R&D expenditures in mathematics and statistics and for nearly two thirds of national competitive grant income in the field. At the same time, research in mathematics and statistics is essentially non-existent in around half of all Australian universities.*

ACHMS Meeting February 2010 – Survey (Appendix 1)

Name:
Department/School:
Institution:

Please circle your response.

Over the last 3 years (2007—2009) in your department/school:

1. Undergraduate M&S subject enrolments* have
   Increased / decreased / been stable / don't know

2. M&S majors have
   Increased / decreased / been stable / don't know / NA

3. Honours (or equivalent) student numbers have
   Increased / decreased / been stable / don't know / NA

4. Domestic research students numbers have
   Increased / decreased / been stable / don't know / NA

5. International research students numbers have
   Increased / decreased / been stable / don't know / NA

6. Total research students numbers have
   Increased / decreased / been stable / don't know / NA

7. Use of casuals as tutors/demonstrators/markers has
   Increased / decreased / been stable / don't know / NA

8. Use of casuals as lecturers has
   Increased / decreased / been stable / don't know/ / NA

9. Continuing staff numbers have
   Increased / decreased / been stable / don't know

10. Fixed term, research only, staff numbers have
    Increased / decreased / been stable / don't know / NA

11. Fixed term teaching staff numbers have
    Increased / decreased / been stable / don't know / NA

12. Overall research income from all sources has
    Increased / decreased / been stable / don't know / NA

13. I am concerned about the increasing number of casual tutors: Yes / No / NA

14. I am concerned about the increasing numbers of casual lecturers: Yes / No / NA

15. I have had difficulties finding appropriately qualified casual staff: Yes / No / NA

16. Compared to 2009 our 2010 discretionary budget is bigger / smaller / about the same / NA

17. In 2010 are you offering:
    (iv) A major in mathematics: Yes / No
    (v) A major in statistics: Yes / No
    (vi) A major with a mix of mathematics and statistics Yes / No

Other comments about the staffing situation in your department/school? Use the reverse side.

* across all degree enrolments and including service subjects