Executive Summary

This report examines the characteristics of mathematics teaching in Australian secondary schools – the demographics and qualifications of the teachers involved, their teaching responsibilities, and the issues for schools with regard to teacher supply and quality. The objective is to determine the current status of mathematics teaching in order to inform the decision-making processes of governments, universities and education authorities with regard to mathematics education and teacher training.

The project's findings draw upon a nationwide survey of mathematics teachers and heads of mathematics departments in secondary schools conducted in late 2005. All mainstream secondary schools were included in the survey, with the permission of the relevant education authorities. Responses were received from 2924 teachers of mathematics and 612 heads of mathematics, representing 30 per cent of the nation's secondary schools. The resulting dataset is representative in terms of state/territory, school sector and country/metropolitan regions.

The results of this study highlight the urgent need to prepare more people for mathematics teaching in schools. Three in four schools currently experience difficulty recruiting suitably qualified teachers for mathematics classes, and the impending retirement of the 'baby-boomers' is set to exacerbate this situation. In addition, many younger teachers are unsure of their career plans and so may also be lost from the system in the next few years.

Preparation for mathematics teaching needs to be highly discipline-specific. Mathematics teachers typically cover a broad range of mathematics subjects, with limited involvement in teaching non-mathematics subjects. They therefore require a strong tertiary grounding in mathematics knowledge, skills, and teaching methods specific to mathematics. Teachers tell us this themselves – those with the highest levels of attainment in tertiary mathematics are the most satisfied with their qualifications.

Mathematics, unlike science, is a subject studied by virtually all students throughout their school years. Schools therefore need to staff a large number of mathematics classes. As teachers teaching 'out-of-field' are not well equipped to teach mathematics, the challenge for schools lies in recruiting and retaining suitably qualified and motivated mathematics teachers. The challenge for universities, governments and education authorities is to ensure the supply of such teachers – teachers with the strong, mathematics-specific grounding necessary to teach mathematics well.

Tertiary qualifications of mathematics teachers

- Ninety per cent of teachers held a teaching-related qualification, ranging from teaching certificates to diplomas and bachelor degrees in education. The most common qualification combination was a bachelor degree in science with a Diploma of Education.
- Teachers with science-based degrees had, on average, studied more discipline-based mathematics than teachers holding a bachelor degree in education.
- Seventy-five per cent of teachers of senior school mathematics held a mathematics major.
- Mathematics teachers with the highest levels of mathematics-related tertiary study were the most satisfied with their tertiary preparation. Forty per cent of teachers were not satisfied with their tertiary background as preparation for their current teaching roles.
- Eight per cent of mathematics teachers had studied no mathematics at university. One in five teachers had not studied mathematics beyond first year, including 23 per cent of junior school teachers.
- Many teachers had studied no mathematics teaching methods, including one third of those who taught only junior/middle school.
- Teachers under 30 years of age were significantly less likely than their older colleagues to hold a mathematics major or to have studied mathematics teaching methods.

- Heads of mathematics expressed lower levels of satisfaction with their schools' junior school teaching than with teaching at other year levels. While the specified level varied, most heads expected teachers of junior school to have studied some mathematics at university. Ten per cent of junior school teachers had not. Seventeen per cent of junior school teachers had not studied mathematics teaching methods, yet this was deemed essential by nearly all heads.
- The expectations of most heads of mathematics for middle school mathematics teachers to have studied to second year university were met by 83 per cent of teachers.
- Heads of mathematics' expectations of tertiary study were highest for teachers of senior school mathematics, and this was the most highly qualified group of teachers. A major in mathematics was the minimum required by 60 per cent of heads, and another 20 per cent expected senior teachers to have studied mathematics at higher levels. However, one in four senior school teachers lacked a mathematics major, including 17 per cent of teachers of intermediate and advanced senior school mathematics.

Recruiting and retaining suitably qualified mathematics teachers

- Three in four schools reported difficulties recruiting suitably qualified mathematics teachers. Schools received numerous applications for advertised positions but few applicants had the necessary mathematics background to teach mathematics, particularly at senior school level.
- Schools in more remote regions reported the greatest difficulty. Among the large eastern states, recruitment was a particular challenge for Queensland schools.
- The shortage of available mathematics teachers was seen as a relatively recent and growing problem, predicted to worsen as experienced teachers retire in coming years.
- Early career teachers were more likely than their colleagues to have been employed elsewhere prior to taking a teaching position, suggesting this is an increasingly common career pathway for mathematics teachers. Half the teachers with less than 5 years of teaching experience had taken such a path. These teachers were more confident that they would continue teaching, than were their 'first profession', early career peers.

Demographics and teaching experience of mathematics teachers

- The average age of mathematics teachers was 44 years, with a median age of 46 years. Thirty-eight per cent of teachers were at least 50 of age, and 15 per cent were 55 or older.
- Male teachers were older and had more years of teaching experience than their female colleagues.
- Mathematics teachers from government schools were older than their colleagues in the non-government sector. Teachers in Catholic schools were youngest, with a median age of 43 years.
- Teaching was the first profession for three in four mathematics teachers.
- Two thirds of the teachers had more than ten years experience, and 18 per cent had been teaching for more than 30 years. There were also a large number of early career teachers – 17 per cent of teachers had been teaching for fewer than five years.
- Teachers of junior school mathematics were, on average, younger and less experienced than their colleagues.
- Teachers of advanced senior mathematics are most likely to be male, highly experienced and among the least likely to teach non-mathematics subjects.

Career plans of mathematics teachers

- Fewer than half the teachers surveyed were confident that they would be teaching mathematics in five years time. Sixteen per cent stated that they would be leaving teaching, and another 39 per cent were undecided.
- Most of the teachers committed to continue teaching had at least ten years teaching experience, and 40 per cent had been teaching for at least twenty

years. This group included nearly equal numbers of men and women, and 40 per cent were between the ages of 40 and 50 years.

- Of the 452 teachers committed to leaving teaching within five years, the majority were at least 50 years of age, experienced teachers and male. More than half stated they were retiring, and another seven per cent explained that they were moving to another profession.
- The youngest teachers expressed the greatest levels of uncertainty about their plans for five years time.

Attracting new people to mathematics teaching

- Three in five teachers gave the 'rewarding nature of the profession' as motivation for choosing a teaching career. Nearly half cited their 'love of mathematics', with far fewer teachers reporting 'salary' as a motivation.
- Male teachers were less motivated by enthusiasm for the discipline, and more by issues of salary and job security, than their female colleagues.
- While salary was not a major factor in their own decision to become teachers, half the teachers surveyed stated that salary improvements were needed in order to attract new people to mathematics teaching as a career. This was a view shared by heads of mathematics departments.
- Raising the profile and status of mathematics teaching was also seen as a priority.
- Scholarships for trainee teachers were suggested by many teachers, while heads called for improved pre-service training and mentoring for early-career teachers.