



Nalini Joshi*

Opinions abound on the ATAR

Socrates was reported to have said ‘Education is the kindling of a flame, not the filling of a vessel.’ At its recent meeting, the National Committee for Mathematical Sciences discussed an issue close to the heart of each of us: mathematics education. The galvanising topic was the nationwide obsession with the Australian Tertiary Admission Rank (ATAR). It appears that, in Australia, the flame of mathematics education may be flickering because of our fixation on maximising every student’s ATAR.

The discussion was stimulated by two reports (see [1], [2]) highlighted at the NCMS meeting by the President of the Australian Association of Mathematics Teachers, Dr Mary Coupland. These reports focused on the situation in NSW¹, but the outcomes are of national interest.

The points highlighted in our discussion, and in this column, concern the mathematical education of the broader cohort of our future society, not just the high flyers. While the number of students undertaking the top-level mathematical courses (the combination of Higher School Certificate (HSC) Mathematics Extension 1 and 2 courses) has remained relatively small and stable, the number taking the calculus based mathematics course is declining in favour of the non-calculus general mathematics course. The reports [1], [2] point out a startling reason for this decline: the award of higher scaled scores in the ATAR to students studying the General Mathematics course.

The earlier report [1] by the Mathematical Association of NSW (MANSW) describes the results of a survey of teachers and analysis of students’ mathematics subject preferences in 2013. One of its many worrisome conclusions is that students are electing to undertake the non-calculus General Mathematics course in

*Chair, National Committee for Mathematical Sciences, School of Mathematics and Statistics F07, The University of Sydney, NSW 2006, Australia. Email: nalini.joshi@sydney.edu.au

¹It may be useful for overseas and out-of-state readers to know that in NSW there are four senior (Years 11 and 12) high school mathematics courses, which can be taken for the Higher School Certificate (HSC): General Mathematics (2 unit), Mathematics (2 unit), Mathematics Extension 1 (3 unit) and Mathematics Extension 2 (4 unit). General mathematics is the sole one that does not include any calculus topics. The HSC Mathematics (2 unit) course is designed for those who have been able to achieve most of the Year 7 to 10 mathematics outcomes as measured by the Year 10 School Certificate (SC) Mathematics test. The ATAR is a single figure between 0 and 99.95 with increments of 0.05 that is intended to measure performance in Year 12 relative to other students.

preference to the calculus based 2 unit Mathematics course due to a perception that the former choice leads to a higher ATAR score for less effort.

The more recent report [2] highlighted by Dr Coupland explores detailed empirical data to back up this conclusion. It compares the results for a cohort of students undertaking the 2011 School Certificate (SC) mathematics exam and estimates the scaled marks for their 2013 HSC mathematics exam. It shows that students with similar ability measured by SC exam can expect an advantage in scaling results arising from their choice of the General Mathematics course. We quote from p. 12 of the report ‘it is clear that the relative performance of students . . . improves about twice as often for students who take HSC general mathematics than for those who take HSC mathematics.’

The overall findings of both reports are very worrying:

- The number of students taking the Mathematics (2 unit) course declined by 18% between 2001 and 2013, while the combined numbers in the extension courses has remained stable. This leads to a decline in the total number of students undertaking calculus-based mathematics courses.
- The most frequent reason given for choosing a mathematics course below the capability of a student is ‘a desire to optimise HSC and ATAR results’ ([1, p. 10]).
- In 2013, a General Mathematics student on the 90th percentile scored a higher ATAR contribution than the median Mathematics (2 unit) student ([1, p. 13]).
- The results of a comparison between the relative performance of students in the Year 10 SC Mathematics test in 2011 and their estimated scaled examination results in the HSC General Mathematics or HSC Mathematics (2 unit) course in 2013 show that ‘on average, the study of HSC general mathematics leads to materially higher scaled scores, relative to the performance on the SC mathematics test, than does the study of HSC mathematics’ ([2, p. 16]).

There are also sharp differences in outcomes between metropolitan and regional schools: ‘49% of Year 12 students in metropolitan Sydney and 24% in NSW regional schools are enrolled in a calculus course’ ([1, p. 2]). Why should this matter? The MANSW report answers ([1, p. 4]): ‘Lower student numbers in the calculus courses will have short and long term negative impact on the teaching population and Australia’s global competitiveness.’

How can we respond to these findings? What should we do to manage the distorting influence of gaming the ATAR? Should we reintroduce prerequisites for entry into University mathematics courses? Should Universities introduce their own entrance examinations? What do you think? I look forward to hearing from you.

References

- [1] Report on the MANSW 2013 Secondary Mathematics Teacher Survey. <http://www.mansw.nsw.edu.au/resources/public-resources/2013-secondary-mathematics-teacher-survey-report>. Accessed 2 June 2015.
- [2] Pitt, D.G.W. (2015). On the scaling of NSW HSC marks in mathematics and encouraging higher participation in calculus based courses. *Australian Journal of Education* 0004944115571943.



Nalini Joshi is an ARC Georgina Sweet Laureate Fellow and the Chair of Applied Mathematics at The University of Sydney. She was the President of the Australian Mathematical Society during 2008–2010, elected a Fellow of the Australian Academy of Science in 2008, became the Chair of the National Committee of Mathematical Sciences in 2011, and is a member of the Commonwealth Science Council of Australia.