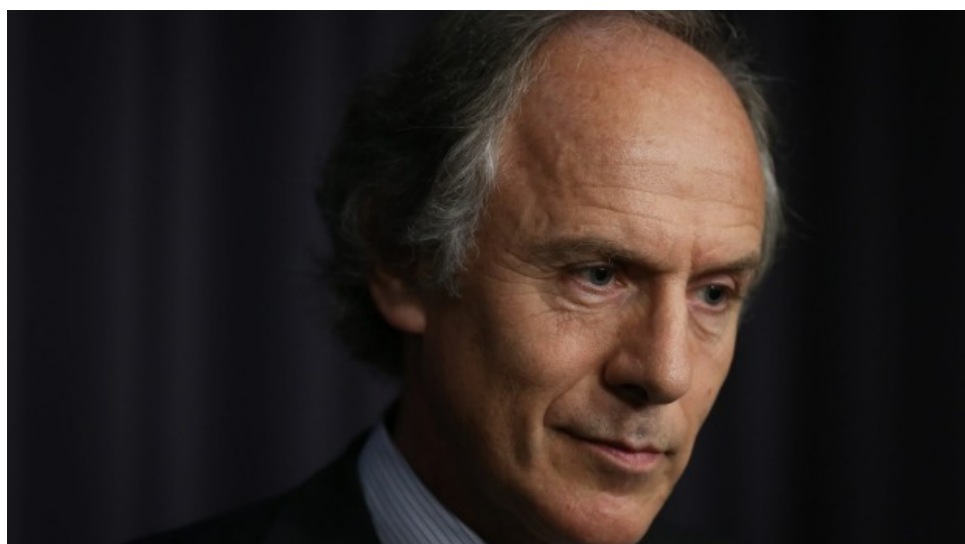


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Universities to blame for the maths crisis among high school students



Chief scientist Alan Finkel says it's a market failure by universities to drop prerequisites for maths and science courses. **Alex Ellinghausen**

by **Tim Dodd**

Universities have been blamed for the maths crisis in high schools after they cut the maths prerequisite for many university courses, sending the message that maths was not important.

Professor Geoff Prince, director of the Australian Mathematical Sciences Institute said the rot set in 20 years ago when universities began easing the compulsory maths prerequisite for students entering university. He said it began with engineering.

Already, at that time, [the proportion of students doing advanced maths in year 12 was falling](#) and engineering deans at top universities were concerned that the the pool of high-performing school students who were eligible to apply for engineering courses, was shrinking.

The deans knew that if they continued to insist on advanced maths as a prerequisite

for students entering engineering, then the entry standards would fall and their courses would lose prestige, he said.

"Especially at the Group of Eight [universities] that was something the deans couldn't do. So they dropped the advance maths prerequisites and used the intermediate maths prerequisite instead," Professor Prince said.

"That way they opened up to a much bigger cohort of students and in some cases, could actually raise the entry scores."

But what was the result?

"Within a pretty short time almost all advanced maths prerequisites had been removed for engineering degrees," he said. .

CATCH-UP COURSES

That meant students could enter an engineering course with little or no mathematical knowledge and rely on catch-up courses to understand the material.

With the dam breached, other faculties which taught subjects based on mathematics followed suit. In the late 1990s universities began to drop the maths prerequisite for science degrees. Then most universities required students enrolling in science to have done intermediate maths in year 12. But soon, most of them removed the maths prerequisite for science altogether.

In a study last year AMSI found only 14 per cent of Australian universities required science students to have studied maths to intermediate level in year 12. Only 13 per cent of universities required the same of commerce students. The picture was better for engineering, with 41 per cent of universities requiring intermediate year-12 maths to enter an engineering degree, but AMSI could not find any Australian university which continued to require advanced year-12 maths to enrol in engineering.

Because of that students were suffering. Professor Prince said university studies had shown students who did not have sound knowledge of calculus (gained in advance year-12 maths) struggled in a science or engineering degree.

"They are failing at a much higher rate than those who do," he said.

"Universities need to let everyone know that if you do go into a science degree without calculus-based mathematics, you are at a considerable risk of failure."

PRESSURE TO CHANGE

Even though universities lowered their maths entry standards well over a decade ago it is only now - as awareness dawns that the highest paid jobs in the future will be in STEM (science, technology, engineering and maths) - that universities are coming under pressure to change.

Incoming chief scientist Alan Finkel, who has a strong record as a technology

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entrepreneur, said [in an article](#) published by AMSI last year, that mathematics and physics were "the essential nutrition and language of science and engineering".

He said it represented "a market failure" that most universities had dropped maths prerequisites for engineering and science.

"The fact that prerequisites in mathematics and physics are rarely imposed is related to overstretched university finances, necessitating a competitive approach to recruiting students," he wrote in AMSI's newsletter *The Update*. He said government intervention was likely the only way to fix the problem.

One consequence of universities lowering their maths entrance requirements was that students had even less reason to study maths in senior high school, and participation in both advanced maths and intermediate maths continued to fall. In 2005 22.7 per cent of year-12 students around Australia took intermediate maths. That was down to 19.3 per cent by 2014, and the proportion studying advanced maths fell from 11.2 per cent in 2005 to 10.0 per cent in 2014.

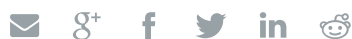
The picture is worse for girls than boys with 18.2 per cent of girls studying intermediate maths and only 6.8 per cent of girls studying advanced maths in year 12 in 2014.

MESSAGE TO STUDENTS

Universities were sending students the message that maths was not important, Professor Prince said. And now there was a severe shortage of qualified high-school maths teachers with 40 per cent of year-7 to year-10 maths classes being taught by teachers not qualified in maths.

Professor Prince said the shortage affected middle and lower socio economic schools more than those in wealthier suburbs. But while higher income students were better served with maths teachers, it was not them who generally chose teaching as a profession. It meant the next generation of teachers was coming from high schools where there was a maths teacher shortage.

"In that demographic there's an enormous amount of out-of-field teaching in maths, and advanced maths is not offered in many schools. It's an insidious impact," Professor Prince said.



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