

## Cannon-Brookes, Willox add voices to alarm over STEM skills



Teacher Matt Serres with Tucker Road Bentleigh Primary School students. Picture: David Geraghty

STEFANIE BALOGH THE AUSTRALIAN 12:00AM December 3, 2016

As one of Australia's most successful tech entrepreneurs, Mike Cannon-Brookes finds himself attending a fair few computer coding camps. "You go to an eight-year-old and you say, 'This is how Minecraft works. This is how Scratch works.' You see those kids light up. Boys and girls, they think it's fantastic," says the co-founder of multi-billion-dollar enterprise software company Atlassian.

"It's just not a part of their schooling. It's just not in the curriculum," Cannon-Brookes says. "It's not that kids don't want to do this stuff."

Australia is at an academic crossroads; young children can grasp technology before they can walk, then graduate to tailor-making their own virtual worlds in Minecraft or creating interactive stories, but they're struggling to compete internationally in basic maths and science skills.

This week's wake-up call was delivered via the four-yearly Trends in International Mathematics and Science Study for years 4 and 8.

It reveals that about seven kids in a typical-sized Australian class of 24 lack the knowledge

to navigate the world around them. They are not developing the skills they will need for the hi-tech jobs of the future. They're in danger of being left behind, and so is Australia.

Thirty per cent of Year 4 Australian maths students fall below the intermediate international benchmark. They can add and subtract but are nowhere near being able to understand fractions and decimals, unlike their higher-achieving peers. By Year 8 maths the gap widens, with 36 per cent of Australian students at or below the low end of the scale.

“These kids now who are in the study, they're the 30-year-olds in 2030,” says Janine McIntosh, the Australian Maths and Science Institute's schools program manager and director of Choose Maths. “Employers are going to look at them and look at their skills, and they are going to shake their heads and say, ‘What's happened?’ ”

Cannon-Brookes is among those calling on Australia to step up its investment in science, technology, engineering and maths skills and act to feed the imaginations of students by delivering the type of classes that build on the technological skills they develop when they're young.

“My one-year-old can request new videos on YouTube when she wants. She can barely even speak but she knows how to say ‘Belle, Belle, Belle’ and eventually it gives her *Beauty and the Beast*,” he tells Inquirer.

But as Cannon-Brookes, who is an adjunct professor in the faculty of computer science at the University of NSW, acknowledges, even the best computer science school in the country struggles to keep its curriculum updated because computer science moves at such a pace.

“Keeping up to date at that level of sophistication is challenging, doing it in a school curriculum with teachers and teacher training, and getting the right teachers in place is really hard.

“I understand it's a big challenge but that doesn't mean it's not the right thing to do. Sometimes the most challenging things are the right things to do — you've just got to figure out how to do them.”

It is not that Australia has gone a long way backwards, he says, it's just that everyone else has gone forward a lot faster.

“We certainly have not been investing in STEM as much as we should have been in the last five to 10 years on the education side of things, specifically in primary and high schools, and you see other countries that are making much heavier and more aggressive investments in these areas.”

Complacency in Australia about the value of innovation contributes to the problem, Cannon-Brookes says. “(It's like) this whole thing that innovation doesn't get votes.

“Broadly, everybody has to understand that investing in education is important. We have to be dispassionate, factual about where we currently sit in education and how we move forward and what changes we need to make to move forward.”

The TIMSS results make for disturbing reading. They highlight that the Asian academic powerhouse of Singapore has accelerated its achievements, while nations such as Kazakhstan, Lithuania and Slovenia are outperforming Australia.

In Year 4 maths, Australian students slumped by 10 places to be ranked 28 out of 49 countries. Students in Year 4 science were unchanged in 25th place. But in Year 8 maths and science, the nation fell five places from 2011 to last year, to be ranked 17th.

Only 9 per cent of Australian Year 4 students and 7 per cent of Year 8 students reached the advanced international benchmark, compared with 50 per cent of Year 4 and 54 per cent of Year 8 students in Singapore.

The release next week of the 2015 outcomes of the OECD's Program for International Student Assessment, which tests 15-year-olds in science, reading and mathematics in 72 countries and economies, are expected to reinforce the impression of Australia's slide.

"In short, Australia needs an attitude readjustment when it comes to maths. It's perfectly acceptable to say you don't like maths, but you wouldn't say that about swimming or cricket," McIntosh says.

"We need a bit of an attitude change which we're not getting, and it's because we've been very lucky in the past, we've had very high employment and it's been in areas that haven't necessarily required a substantial amount of mathematics, but that's changing," she adds.

McIntosh is the program director of Choose Maths, a five-year, \$22 million partnership between AMSI and the BHP Billiton Foundation to strengthen maths teaching, encourage students to study maths, and educate girls about the importance of taking on maths to prepare them for future careers. McIntosh believes it is crunch time for Australia, and the nation is not valuing the people who have maths and science skills.

"We're busy talking about agility and innovation, and we're not being agile and innovative in our teaching, so we're just throwing someone in the classroom without the skills," she says.

AMSI is calling for a shift from focusing on marks and endgame results such as tertiary entrance scores, and suggests incentives be built into schools to encourage students to try their hand at higher-level calculus-based maths subjects. It also is continuing its push for the phased reintroduction of university prerequisites for entry into science and engineering - degrees.

Innes Willox from the Australian Industry Group is alarmed at this week's maths and science results, and has stepped up calls from business for education reform. One-third of employers, he stresses, are expressing significant dissatisfaction with the level of basic numeracy of school-leavers.

"The Australian economy increasingly needs people with STEM skills," Willox says. "These TIMSS results indicate we are moving further away, and not closer to this. There needs to be an urgent focus in the schooling system to turn this around. Reform of the way

our schools are funded is a critical step to addressing this.”

The soul-searching over Australia’s academic stagnation comes as federal and state education ministers prepare to meet in Melbourne on December 16 to continue haggling over a new funding deal.

Federal Education Minister Simon Birmingham wants to replace the so-called fifth and six years of the Gonski needs-based funding arrangements with a nationally consistent model, arguing the 27 deals between Canberra, the states and various education sectors have produced an uneven patchwork of special deals and side arrangements.

All the states and territories with the exception of Western Australia, which is being short-changed, want to stick with the Gonski agreements.

Malcolm Turnbull argues Australia is spending more on education every single year. “The reality is this: that we cannot keep on managing school education in the same way that we have in the past. We need to change the way the money is spent. The reality is that we are spending more but we are getting worse outcomes.”

Many of the states have started the journey to improve the teaching of STEM subjects but reforms take time to filter through.

Victoria has set a target to increase the number of students excelling in scientific literacy by 33 per cent and maths by 25 per cent across the next 10 years.

Its STEM in the Education State policy, unwrapped in September, includes \$128m to build 10 new tech schools during the next two years, using leading-edge technology to deliver applied STEM open education, as well as critical employment skills.

Victorian Education Minister James Merlino says, “We’re also building new tech schools to use leading technology to deliver applied STEM education, training new primary maths and science specialists, and training teachers to lead and mentor other STEM educators.”

Tom Alegounarias, president of the Board of Studies, Teaching and Educational Standards NSW, says his state’s starting point is to build on a foundation of strong primary teaching.

NSW has overhauled its requirements for those studying initial teacher education at university, including content changes to ensure teachers not only know maths but also know how to teach the subject.

“Maths is a confidence game; maths teachers will tell you that,” Alegounarias says. “You lose confidence, you fall behind. So they need to be confident in their own mathematical ability to build the confidence in their students.”

He says that until the reforms in NSW, teachers could get through their practicums without having to demonstrate a maths lesson.

“We’ve made it mandatory that you cannot get through your practicum without actually part of your repertoire that you’ve shown is teaching mathematics, so you can be judged to be

good at it.”

NSW is also producing primary teachers specialising in maths and science.

“Teachers cover everything now in NSW, it’s mandatory. The whole idea of mastery is seen as old-fashioned, but in fact it is necessary in maths,” Alegounarias says.

“The rush of work over the past couple of years is enormous and will have impact; whether the impact is high enough, we shouldn’t be resting on our laurels — but it is a really substantial slab of work that has occurred.”

At Melbourne’s Tucker Road Bentleigh Primary School, some of the Year 1 students took part in a pilot study on whether apps such as memory games used in the classroom could influence maths ability in young children.

It’s the type of innovative thinking that could bridge the gulf between the iPad generation and times tables.

Megan Spencer-Smith, the lead researcher from the Monash Institute of Cognitive and Clinical Neurosciences, presented the preliminary results this week, describing them as promising.

“Children learn when they are motivated and interested, so we need to provide opportunities that encourage students to be interested in learning maths — so I think that’s also what these types of maths apps can do and cognitive training can do,” she says.

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