A lack of maths just doesn't add up for a career in science

February 13 2014, by Trevor Hambley

Credit: AI-generated image (disclaimer)

Our future in science, technology and engineering relies on a foundation and understanding of mathematics.

And while it is pleasing to see a growth in interest in our advanced mathematics course at the University of Sydney, it is also worrying to

see an increase in the number of highly capable students who come from high school with a limited background in mathematics.

This seriously limits their ability to undertake university degrees in science, technology, engineering and mathematical (STEM) areas, even allowing for the availability of bridging courses.

How we support these students entering STEM degree programs with a lower level of mathematical knowledge than is needed is being addressed at a two-day national conference on Assumed Knowledge in Maths: Its Broad Impact on Tertiary STEM Programs, being hosted at the University of Sydney.

The event acknowledges ongoing concern from teachers and academics about the inadequate mathematical preparation of Australian school students, especially when compared to their international counterparts. The event will also look at what this means both for their career opportunities and the Australian economy.

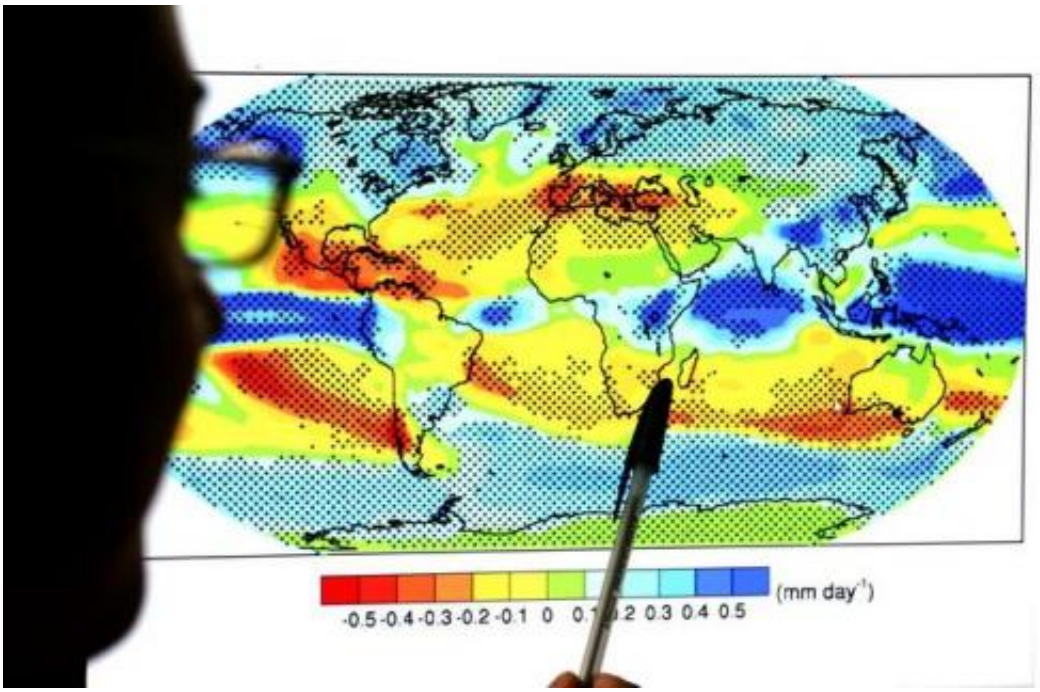
Critical in all science study

Maths is critical to STEM training and careers in these areas because of the way it develops our abilities to conceptualise and solve challenging problems.

It is an essential tool in almost every area of science. This is perhaps easy to understand in physics and chemistry which fundamentally rely on maths, and for psychology which is critically dependent on statistics. But mathematics is used extensively in all the sciences.

The genomic revolution, for example, has changed the nature of the biological sciences and resulted in the dramatic growth of the area of bioinformatics.

Vast amounts of data are now available and only mathematically based approaches are able to extract the patterns from this data. These patterns are informing our understanding of evolution and why different populations have different susceptibilities to diseases such as Type 2 Diabetes and Alzheimer's disease.



Generic shot of a climate change map. Credit: Neil Palmer (CIAT)

In almost every area of science, technology and engineering some computational modelling is now used to test theories and to develop predictions.

Climate modelling is being used to develop predictions on how the earth might respond to the vast amounts of extra energy being trapped in our environment.

The more we learn about cancers, the more we realise that computational models are likely to be the best chance we have of understanding how this complexity functions and how to treat it. This understanding will also inform personalised medicine which guides us in how best to treat an individual's cancer.

Scientists at our university analyse massive data sets to describe international trade relationships and supply chains in previously unattainable detail.

In everyday lives

We rely on mathematics in many other aspects of our everyday lives. Most of us use smartphones to exchange large amounts of data, some of it confidential. This depends on mathematics, and the field of cryptography, which allows accurate and private sharing of information is growing rapidly.

Quantum computing, which we hope will power future developments in these areas, will require even higher levels of mathematics than current systems.

Mathematical skills are needed from the beginning of any degree in the STEM areas and having to catch up makes the task more challenging than it should be. It takes time to absorb mathematical concepts so for most students it would be preferable to develop that knowledge over years rather than months.

Impact on careers

The growth in interest in STEM courses is not keeping pace with the growth in careers in these areas and this is further undermined by a lack

of proficiency in mathematics. Australia will suffer as a consequence if this disparity is not addressed soon.

Students who undertake sufficient mathematics study in their high school years will find it much easier to undertake STEM courses at university. They will then be able to contribute to, and benefit from, the opportunities that the increasing importance of STEM areas represent for the Australian economy.

What is needed are strategies that address the shortfall in the number of high school teachers actually trained to teach mathematics and science. We also need to address the reality of increasing numbers of underprepared students in STEM courses at university.

How universities contribute to the delivery of these strategies will be one of the topics at this national conference.

As a first step we're announcing today that Adam Spencer has agreed to serve as the University of Sydney's Mathematics and Science Ambassador.

He's a well known media personality with an Honours degree in pure mathematics. So it's hoped he will help us to inspire students to realise the enjoyment and possibilities that mathematics has to offer.

Source: The Conversation

https://phys.org/news/2014-02-lack-maths-doesnt-career-science.html