Learning Technologies Lab researchers have developed low-cost tools, a curriculum and teacher preparation program. The Fablab was the first program designed from the ground up to serve Grades 6 to 12.

Inside Fablabs you will find various tools and gadgets including laser cutters, 3D printers, vacuum formers, hand tools, soldering equipment and building materials. It is a fun and collaborative environment in which students can undertake hands-on problem solving activities in which they design, construct and revise products or artefacts.

The fabrication process improves spatial skills by giving students practice in creating two-dimensional plans and then visualising and building three-dimensional objects. It is important for girls to improve in the area of spatial skills for the study of mathematics and science, in particular, but for all subjects in general.

Fablab@School are located in Moscow, California and Bangkok, and arrangements are now finalised for Lauriston to be the first to introduce the project to Australia. Our participation includes taking part in Associate Professor Blikstein’s longitudinal research. Lauriston will also partner with a less advantaged school in Victoria to help it establish its own Fablab@School. I am very much looking forward to connecting with other Victorian schools in this way.

**Next steps**

We are using an existing space in our Science and Resource building to establish the Fablab. Our Lauriston Foundation and donations from School families and corporations are enabling us to set up the initial equipment requirements and infrastructure.

Our future goals include professional development for our staff, hosting visiting graduate students from Stanford University and working with teachers and students from the DSIL School in Bangkok.

MIT Professor Neil Gershenfeld believes that we have already won the digital revolution and what is coming now is the digital revolution in fabrication. It is an exciting prospect that we will be enabling our students to participate in that revolution. In the meantime, they will be engaging in meaningful interdisciplinary learning experiences that demand collaboration, persistence and the ability to learn from mistakes – all while transforming their great ideas into products and artefacts.

[SUSAN JUST]

**INTERDISCIPLINARY GARDEN**

Loreto College, Marryatville, SA

Loreto College is a day and boarding school for girls, with 840 students from early learning to Year 12. Principal: Mrs Rosalie Gleeson.

**TO GIVE** students the opportunity to experience first-hand the work of a ‘real’ scientist, Loreto College recently initiated a Scientist in Residence program. Thanks to generous funding from our Parents’ & Friends’ Association, the project to be undertaken during the residency was the establishment of an Indigenous garden in a cleared section of garden adjacent to the College’s science laboratories.

The College appointed Dolores Amos, an Environmental Resource Officer at Tatachilla Lutheran College, south of Adelaide, as the Scientist in Residence. Mrs Amos has expertise in natural resource management and a passion for natural landscapes and revegetation with a focus on traditional use of Australian plants and animals. She has studied the Kaurna language and worked with members of the Kaurna community over a number of years in the research, development and creation of food gardens.

**Focus on science**

Under the guidance of Mrs Amos, the project had a specific appeal to the science curriculum as it could involve Year 3, Year 6 and Year 9 science as well as Year 11 biology. As an engaging outdoor, inquiry-based project, it had the potential to appeal to all types of learners – from those who are practical problem solvers, through to those who are creative or artistic, and it involved group work as well as independent learning. It was a perfect fit for the College’s International Baccalaureate learning framework whilst also accommodating the Australian Curriculum’s Indigenous focus.

The Year 9 science classes took leadership of the project. As part of their ‘ecosystems’ topic, the girls enjoyed discovering the science behind...
WHY is a professor of chemistry advocating the study of mathematics? Because our future in all areas of science, technology and engineering relies on a strong foundation and understanding of maths.

Maths 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.

Only mathematically based approaches are able to extract the patterns from the vast amounts of data now available. 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.

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.

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

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 these highly complex systems of cells function and how to treat them. This understanding will also inform personalised medicine, which guides us in how best to treat an individual’s cancer.

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.

Maths is critical to STEM training and careers because of the way it develops our abilities to conceptualise and solve challenging problems, and the beginning...
Whole school involvement

The project engaged many other areas of the College. Food and technology staff have used quandong and other plants grown in the garden in their cooking. Humanities students have explored Aboriginal traditions and how this project fosters reconciliation. The English faculty plan to use the garden as inspiration for their studies of Indigenous writers. The Physical Education and Health faculty will tour members of the Outdoor Educators’ Association of South Australia through the garden.

The garden has also supported social justice initiatives. When the land was

of any degree in the STEM areas demands mathematical skills. But in universities we are seeing an increasing number of highly capable students who come from high school with a limited background in mathematics.

The problem is critical and multi-layered: it affects students’ study and career paths, it affects universities’ delivery of STEM courses and ultimately it will affect Australia’s capacity for innovation.

In February 2014 Sydney University’s Institute for Innovation in Science & Mathematics Education hosted a two-day forum to explore a range of issues, including: the broad impact that assumed knowledge, rather than hard prerequisites, has on tertiary programs; student enrolment; subject development; student progression/retention; and expectations across STEM disciplines and the consequent workload implications.

The shortfall in the number of secondary teachers sufficiently qualified to teach maths and science has been long recognised and governments have funded a number of different strategies to address this issue. These strategies need review.

The University is currently involved in the creation of a professional development program to strengthen the confidence of maths and science teachers across Australia. The STEM Academy, which is funded by a philanthropic donation, will include a hands-on program featuring experimentation and interactive learning, together with workshops by inspirational industry leaders in STEM professions.

At the same time, we need new strategies to address the reality of increasing numbers of underprepared students in STEM courses at university. It takes time to absorb mathematical concepts, so we need strategies that encompass all levels of schooling, not just the senior secondary years.

Australian Bureau of Statistics data show that about 18 per cent of Australia’s workforce, or 2.1 million people, have higher level STEM qualifications and that STEM areas are the most rapidly growing area of employment in the Australian economy.¹ New opportunities are opening up for exciting careers. To undertake the tertiary STEM courses that are the pathway to these opportunities, students must be encouraged to pursue mathematics study throughout their high school years.

I am aware of and appreciate the efforts made by AHISA members’ schools in promoting the study of mathematics and science. Your students can only benefit from our continued dialogue.

This article is adapted from an article, ‘A lack of maths just doesn’t add up for a career in science’, published by The Conversation, 13 February 2014; accessed at theconversation.com/a-lack-of-maths-just-doesnt-add-up-for-a-career-in-science-23065.

NOTE

¹ ABS 4250.0.55.005 - Perspectives on education and training: Australians with qualifications in science, technology, engineering and mathematics (STEM), 2010-11.