

Bored with science?

Cosmology and creative software may heal science education malaise

By Adrienne Jones

STUDENTS losing interest in science and mathematics? Increasingly disenchanted with school science, it seems, they are voting with their feet.

Highlighted again recently with the publication of *Re-Imagining Science Education*, the crisis in Australian science education does not auger well for the future of science. It's serious, but is it reversible?

If you can believe the hush in the labs of a 'space-age' science school

in Melbourne's northern suburbs, yes, it is. At Strathmore Secondary College the tide may already be turning.

Why? It may have something to do with the futuristic building that houses the science labs. Or the way they teach the science and maths inside – suiting up students and teachers like astronauts, shuttling them off to 'Mars', to an orbiting space station, or to the outer reaches of our galaxy.

Or it may be the way these students experience the relevance of complex mathematics. On another planet, light years beyond their comfort zone, they know their lives depend on a few mathematicians sitting behind computer screens getting their sums right.

It isn't real, of course – despite the airlock and in-flight sound effects – but the learning is. Students step from their simulated spaceship onto a cratered surface inside a huge translucent dome, eerily backlit to mimic the red atmosphere of Mars.

Then, under instructions from 'Mission Control' at Strathmore College, Melbourne, Planet Earth – the young 'astronauts' set up their video satellite link, survey the 'Martian' surface, deploy seismic monitors, and collect inter-planetary geological specimens.

Outside the dome, lights crackle, and radiation levels rise. Those IT students in Mission Control better get their heads around the maths, or these young astro-scientists and their teachers may be lost

forever! Kids' stuff? Maybe, if you don't know how far games technology has travelled. La Trobe University's Dr John Rankin categorises the space-age computer technology behind these cosmic fantasies as 'Serious Games' – the cutting-edge kind his computer science students design at the Bundoora-based Games Technology Laboratory, where the Mars and Mission Control software evolved.

In the multi-billion dollar internationally competitive games technology industry, the 'Serious Games' concept is anything but a game. It also provides high-tech solutions for problems like industry training in the use of heavy equipment and power plants. Or, as at Strathmore, to awaken jaded secondary school students to the rewards of real-world science.

Science education centres don't come much more fantastic than the \$6.4 million dollar Strathmore Victorian Space Science Education Centre (VSSEC).

Brainstorming new strategies to counteract stagnating maths and science enrolments, Strathmore biology and chemistry teacher, Michael Pakakis, decided a few years ago to introduce a group of secondary students to real space science.

He took them on a whirlwind tour of frontline US space facilities – including the National Aeronautics and Space Administration's (NASA) Space Camp at Huntsville, Alabama – and returned to Melbourne

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From left: La Trobe's Dr John Rankin, Strathmore science teacher Phillip Spencer, and the Director of the Victorian Space Science Education Centre, Mr Michael Pakakis in the Centre's space laboratory at Strathmore.



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convinced that space science was the way forward.

Pakakis and his colleagues sought the help of his alma mater, La Trobe University, and space physicist, Professor Peter Dyson, to design an educational space science program for Years 9 and 10 students.

‘Professor Dyson’s interest was the same as ours – to inspire the next generation of young scientists,’ Mr Pakakis recalls.

Their initial project, a low-key \$25,000 State Government-sponsored program, provided web-based resources and workshops for teachers. Mr Pakakis, however, had a wider vision. With the support of university educators and his Strathmore colleague and fellow science teacher Phillip Spencer, he presented the Victorian State Government with a grander proposition – Australia’s first, world-class, Space Science Education Centre.

In 2001, the Government announced it would build the multi-million VSSEC at Strathmore. A spaceship, international orbiting space station and a ‘Mission Control’ room required innovative software.

So Professor Dyson linked Mr Pakakis with his La Trobe colleague, Dr John Rankin, a senior lecturer in games technology with a research interest in computer graphics. What began as a novel concept in curricular design evolved into an educationally-rich odyssey in creative learning.

With the help of his top computer programmers, Dr Rankin developed the software for VSSEC’s three space mission programs: Mission to Mars and Mission to an Orbiting Space Laboratory, via virtual spaceships Viking and Mariner, and another cosmic voyage into inter-galactic space.

By 2006, Victorian secondary students had a world-class space science education centre, science and computer laboratories, a 12-dock Mission Control room, a space laboratory and a planetary surface room.

Now managing a cutting-edge facility he once only dared to dream, Mr Pakakis oversees a national teaching and educational resource with the educational imprimatur of three world space agencies



Professor Dyson, left, and Dr Rankin at ‘Mission Control’.

– NASA, the European Space Agency (ESA), and the Japanese Space Agency (JAXA).

All three provide access to real space data, satellite imagery and international education development networks.

The Centre also hosts a newly-completed design facility, inspired by ESA’s Massimo Room where the ESA finalises its space mission designs. This is powered by the fourth computer software project designed and developed for VSSEC at La Trobe’s Games Technology Laboratory.

It encourages student teams to design their own space missions and will soon also offer a world’s first do-it-yourself computerised curriculum design package for teachers.

‘We’re not competing with ESA,’ says Dr Rankin. ‘They already had the software, but theirs is very complicated and they wanted a simple version that is good for teaching high school students, to give them an appreciation of the real thing.’

Dr Rankin says the space missions and the Massimo Room software are considered unique – not only by NASA, ESA, and JAXA – but by a growing number of space education centres internationally on the lookout for innovative educational packages.

‘Our part was to provide the software that controls the whole operation. The software we’ve made more or less emulates what happens at Cape Canaveral Space Centre at NASA,’ he says.

‘They have offices with screens where they keep track of the astronauts’ heart rates and check on their health. That’s also what this software does, so when the students are up there in their astronauts’ suits, we’re communicating with them.’

The software has to simulate real experience without being overly complex: students in Mission Control and on Mars have to experience the tensions and triumphs of space missions, including breaks in oxygen supplies, near-misses with asteroids, and geo-magnetic storms.

Each software project initially involves up to 60 of La Trobe’s top third year computer programmers. They develop eight to 10 working prototypes to ESA design specifications. The best features are selected and form the specifications for the final prototype. A group selected from the original teams completes the project on VSSEC scholarships over the summer holidays.

‘Space science,’ says Mr Pakakis, ‘is the umbrella for teaching the other sciences. It’s not just physics, but ranges from molecular biology to chemistry, material science and optics.’

The Mars program, for example, includes soil sampling, which involves chemistry and microbiology. There’s remote sensing and satellite imagery, which involves geology, physics and maths.

Activities on the space station program are even more diverse.

‘Students are doing botany, robotics, earth science, material science, electronics, and optics. It’s a hands-on, technologically-rich environment in which students engage with real life science.’

It’s too early for formal evaluation, but anecdotal evidence – and the number of schools and teacher training institutes queuing to do the courses – suggests real potential to heal the science education malaise.

‘A key theme in *Re-Imagining Science Education*, is the mismatch of science as it is taught in schools and how it exists in the real world,’ Mr Pakakis says.

‘We must re-engage students with science for the sake of Australia’s future.’ ●

Re-Imagining Science Education, a report by Professor Russell Tytler, Australian Council for Educational Research, May 15, 2007.