School science earns an F

A local scientist's research shows the state of the nation's science teaching is antiquated and inadequate.

SCIENTIST Michael Fenton has been pleasantly surprised and desperately disappointed, heartened and then heavy-hearted. Now he feels powerless.

This range of emotions stem straight from his year-long Ministry of Education E-Learning Teacher Fellowship.

The conclusions in his 111-page academic report about his research, which took him out of Inglewood High School for a little more than half the year, are grim, with glimmers of hope. Summing up the year, verbally, Fenton holds nothing back.

"We're in trouble," he says. "We're in trouble as an education system for science and I think it's going to take a crisis before we invest the money or the training or the resources in high schools

Image Caption:

Inadequate funding: Michael Fenton's research shows that most secondary school science labs look like something you'd find in 1905.

Big investment is needed in equipment and teacher training. He wants science teachers to think and act like scientists again.

"It would be more fun and there would be more interesting discussions in the staff room."

The Fellowship involved taking a year out to investigate an area aimed at transforming the recipients' teacher practices.

"The research was for us as teachers rather than government policy. My individual goal was trying to make maths and science more meaningful for my students - more connected with the real world."

His e-learning concept wasn't just about sitting children in front of computers and sending them into cyberspace. Instead, he equipped them with a computer device that put them into the real world. Using his record-all education tool, the Real-world Interactive Games and Electronics Link (RIGEL) system, Fenton got four Year 13 Calculus students and a Primary School class to devise their own science experiments.

It wasn't so much about how helpful the RIGEL system was, but how the students used it in their studies.

"It was transforming - it changed the way they learnt."

The Calculus students used the sensor box for a CSI project about time of death and others designed Martian rovers. The younger students used the sensor for an Olympic project, setting up their own games. One of the eight groups hid the sensor and created a tracking device to find it.

They had been running all over the school. Fenton says and Primary students showed an astonishing amount of hidden knowledge about science and technology.

"They may not be able to say the right terms, but they clearly understood the scientific principle behind it."

"I think we are in trouble as a nation for not recognising the huge hidden potential of our students, both boys, girls and those who have so-called lower ability."

He experienced the latter first hand, finding himself astonished at the knowledge of one youngster had about the difference between land-line phones and mobile phones. That same child followed a whole line of thought akin to a *Mission: Impossible* plot.

"The ideas came from the students – just rich ideas"

Perhaps the most exciting outcome was seeing everyone engaged in learning, even students who weren't interested in computers. Survey and interview results showed that 100% of the class enjoyed the RIGEL-based science lessons, 85% changed their views on the way scientists worked, and 85% said they were more interested in science than before.

"They were learning the true nature of science, using investigating and inventing."

Fenton says the youngsters were involved in authentic research, a phrase he brings up again and again.

"My Year 7 and 8's were far better scientists than the majority of the High school students in any school."

He put that down to having the time and being fully engaged in creative learning and problem solving.

"Assessment wasn't the focus".

Having said that, Fenton did test them and was surprised to find out how much they knew.

"I interviewed them and verbally asked them questions that I knew come up in tests at High school. They scored very highly and yet I had not done one single lesson on sensors or circuitry. That shows that with authentic activities, they learn and absorb and will do really well in exams."

Fenton would love to see that replicated in Secondary schools.

"It seems one of the basic tenets of science- to question and test ideas - has been ignored and replaced with rote learning of facts and concepts for exams" he says in his report.

However, Fenton says the new Science curriculum does encourage authentic research and going deeper into an area of inquiry. This is not reflected in the stringent assessment regime of NCEA. There needs to be a way to bridge that gap.

"It is disappointing that as much as I know and as enthusiastic as I am, you feel powerless to do anything about it, especially when you have a love of the subject."

"I'm just lucky that I've taught all the sciences and I'm glad I've got my shed, because I've got all sorts of fun things I can do and test on my own."

Despite sounding glum and even a touch defeatist, Fenton hasn't given up in his science-minded pursuits, though he may have passed at least one baton to his daughters. Jamie, 15, and Mikaela, 12, both now at Inglewood Hg School, are going to revive and run Nexus, a student science group that does research for real. The group has been in a five-year recess.

The Nexus Research Group has been involved in "do it for real" research, and has even studied AIDS. NASA scientist Sir William Pickering, who has since died, was the group's patron.

This year, Nexus will engage students from other schools through a computer games design competition and probably a Robot Wars project. In the meantime, Fenton will be back in the classroom full time teaching Maths and Calculus with a definite "real life" twist.

"I don't have a problem with truancy in my classes."

Also, he will be setting up a new modular-type course for next year involving game design and robotics, in which students will get NCEA credits for maths and electronic technology.

“It's a course that will follow the intention of the new curriculum.”

And Fenton's passionate push for real science and inspiring young people to think for themselves.

Report Link Box:

Michael Fenton's full report can be found at:

http://MikeFentonNZ.github.io/files/michael-fenton-elearning-report.pdf

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Freaky Fact 1:

During the 17th-century, as part of an explosion of interest and discovery in the physical sciences, the English scientist Sir Isaac Newton and the German mathematician Gottfried Leibniz, working independently, both discovered Calculus, the branch of mathematics that studies continuously changing quantities.

Freaky Fact 2:

Using a calculator in class took on a new meaning for some of Michael Fenton's Calculus students last this year. They programmed the mathematical device to operate a wee robot nicknamed Casi.

Freaky Fact 3:

Calculus is deeply integrated into every branch of the physical sciences, such as physics and biology. It is found in computer science, statistics, and engineering, in economics, business and medicine. Modern developments such as architecture, aviation, and other technologies all make use of what Calculus can offer.

Freaky Fact 4:

Here's a mind-boggling idea: Did you know that it's possible to cut a solid ball into finite pieces and, by re-assembling them using rigid motions only, form two solid balls, each the same size and shape as the original? This theorem is known as the Banach-Tarski paradox.

Freaky Fact 5:

Michael Fenton is intrigued by the Banach-Tarski paradox. Another take on the theorem theory says it is possible to take a solid ball the size of a pea and, by cutting it a finite number of pieces, re-assemble it to form a solid ball the size of the sun.

SCIENCE & TECHNOLOGY

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Fenton believes most secondary school science laboratories look like something dating back to 1960. Big investment is needed in equipment and teacher training. He wants science teachers to think and act like scientists again.

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VIRGINIA WINDER

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Inadequate funding: Michael Fenton's research shows that most secondary school science labs look like something you'd find in 1925. Photo: FAIRFAX

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■ Michael Fenton's full report can be found at: http://www.nexus researchgroup.com/downloads/MichaelFenton-eFellow2008Report.pdf

freaky facts

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3 During the 17th century, as a period of exploration of interest and discovery in the physical sciences, the English scientist Isaac Newton and the German mathematician Gottfried Wilhelm, working independently, both discovered calculus, the branch of mathematics that is obviously changing countries.

4 Here's a mind-boggling idea: Did you know it is possible to cut a solid ball into finite pieces and, by re-assembling them using rigid motions only, form two solid balls, each the same size and shape as the original? This theorem is known as the Banach-Tarski paradox.

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