

# Don't SMiS out on this

**Annie Facchinetti** on a CSIRO program which brings perspective to maths and science

They say good things come to those to wait, and that seems an apt description of the partnership that the teachers and students of Our Lady Help of Christians Primary School in Melbourne are forging with our Scientist and Mathematician in Schools partner, Katherine Russell.

Established in 2007, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Scientists and Mathematicians in Schools program (SMiS) is the brainchild of Australia's then Chief Scientist Dr Jim Peacock, who according to the SMiS National Office, "was concerned by issues in school science education which included little science being taught in the primary schools and secondary students expressing boredom and lack of ability to see how science affected their lives."

It is a sentiment that is echoed by current Chief Scientist Professor Ian Chubb. In a recent News Corp interview, Prof Chubb declared, "You've got to ensure science is taught like it is practised, so you have people who are turned on by the awesomeness of science and can explain why it is important and relevant in everyday lives." (News Corp Australia, 2013).

The SMiS initiative achieves just that. Funded by the Australian Government Department of Education and the CSIRO, the program is open to any primary or secondary school across Australia, regardless of sector. Registered schools are matched with a scientist or mathematician with whom they can then develop a partnership that is mutually agreeable.

Although Our Lady's was on the waiting list for quite some time, the partner chosen for us exemplifies the thought that is put into the matching process. The CSIRO National Office asserts that, "Part of the success [of SMiS] is due to the care and consideration of the requests from participants by SMiS project officers, which takes into account expectations of both parties to provide a carefully crafted match."

I first meet our partner Katherine Russell when she makes a preliminary visit to become familiar with our school and to allow us to discuss how best we might use her talents and knowledge. An Advisor – Metallurgy, Technology and Innovation with Rio Tinto, both of her parents are secondary teachers who have had visits from CSIRO partnerships in their school roles. We are lucky that Katherine has both a maths and a science background, and is willing to work with us in both those fields.

Much of our early interaction is guided by documentation provided by the SMiS program. Once a school and a scientist/mathematician are



## ***Engineer Katherine Russell speaks about various aspects of her job, highlighting the links to mathematics***

matched, one of the local project officers sends both parties an email recommending the next steps. The first action suggested is to complete a short questionnaire provided in an email link that can be exchanged to establish contact and provide both school and partner with a bit of context about each other. It's a good way to break the ice. Program participants also have access to a range of online materials and resource ideas to help get the process off to a productive start.

Katherine's first visit is timed in the lead-up to our junior school 100 Days of School celebration, and we decide that this might be an appropriate event through which she can be introduced to the school community. The fact that Katherine couldn't be far more removed from the stereotypical 'Albert Einstein' perception of a mathematician or scientist has the students enthralled from the beginning. Year 1/2 teacher Lindy Chaplin-Holmes recalls, "Prior to her visit we had the children draw what a mathematician looked like. So there were big surprises when she looked so 'normal' and was a girl!"

Katherine speaks about various aspects of her job to the children, highlighting the links to mathematics in activities such as counting the

number of rocks that are processed and working out averages sizes – tasks that the students can easily relate to. She also brings along some samples, including a piece of fluoride in rock form, which the audience finds particularly intriguing.

Katherine's reflection on that first visit highlights the value of having an ongoing partnership that can evolve over time, rather than a one-off incursion that only has a short-term impact: "I was invited to the Prep's 100 Days of School, where I spoke about life as an engineer. I was surprised a few weeks later by the school's newsletter, when I found that the kids believed my take-home message was 'toothpaste is made out of rocks.' I have a bit of work to do there..." The opportunity for the children to connect with someone who actually uses maths and science skills and knowledge on a daily basis is something that we plan to build on as our partnership develops.

On her second student visit, Katherine spends time with our Prep to Year 2 students who are learning about materials and their properties, and with the Year 3, 4 and 5 students who are investigating weathering and erosion. Before Katherine arrives, the junior school students have been involved in a sorting activity during which they group different materials they have brought in from home according to their properties, and this sets the scene for her interaction with them.

My initial fears that we would be matched



## Case studies

A CSIRO scientist who works in Sensor Web Enablement in the CSIRO ICT centre in Hobart is partnered with two teachers from The Hutchins School in Sandy Bay, Tas. The school wanted to look at how they can reduce the school's ecological footprint by reducing water use. Year 8 students initially set up a mini Sensor Web in a small plot at the school with the scientist's help. This network measures soil water tension and a mobile phone sensor networking application (developed by the students) reads the water meters. The Year 11/12 Environmental Science students use the Sensor Web to monitor water use: e.g. looking at how plants react to different soil moisture conditions and irrigation treatments in near real-time. The Environmental Science teacher mentions that he sees this as an invaluable opportunity to engage students in real-world science and capture their imagination by using emerging technology. This small plot is a pilot and the Head of Science would like to see the Sensor Web grow to cover the entire school.

Two immunologists from Qld enjoy showing students that a successful experiment does not always produce the results that supported the original hypothesis! The scientists from James Cook University are involved in a partnership with a teacher from Townsville Grammar School that has been running since 2007. The students carry out a three-week Body@War program annually with help from the scientists. The students are guided through methods of experimental design in preparation for developing their own investigations. Many topics have been

researched by the students including "The effectiveness of Dettol as a hand wash". Following these investigations, the students analyse the results and determine their findings.

A scientist from the Department of Environment and Conservation is partnered with a teacher from Flinders Park Primary School in WA. Activities carried out by this partnership were inspired by the 2012 International Year of the Farmer. Contemporary world issues of food production and good human health through sustainable farming were discussed with the students and highlighted areas such as the balancing act that farmers face when making decisions about soil fertility for good crop production. The Year 7 students designed an experiment about the effect of fertiliser on cereal crops and undertook a yearlong project that highlighted the issues faced by local farmers. Initially, the students designed an experiment about the effect of fertiliser on cereal crops. After stating their hypothesis, students measured crop biomass to test results. The project created connections to their family farms and local community farmers.

The scientist reflects on the benefit of being part of Scientists in Schools. "It's a fun experience and has two way benefits... it's invaluable to me to keep in touch with young people and learn about the issues important to them. ...students learn about someone working in the field, using scientific methodology to collect data in order to measure the environment. They get to hear stories about what kinds of activities we do as a scientist."

with a scientist who had difficulty relating to younger children quickly dissipate as I see Katherine engage the students in a discussion of the properties of different rock samples she has brought with her. The session culminates in a demonstration of how corn flour and water, which appears runny and wet, feels hard and unyielding when you try and punch it. The use of a teacher in the initial experiment has the students watching with wide-eyed amazement.

For the older students, Katherine has prepared a PowerPoint presentation linking the work she does in the mining industry with soil types and how rocks are formed. Again, samples are passed around, giving the students a chance to compare, for example, iron ore from Australia with some from China so that they can see the differences firsthand. The depth of Katherine's knowledge and her passion for the subject matter brings to life aspects of the inquiry unit that students have up to that point only read about. Her willingness to stay in touch via email ensures that students and teachers can also draw on her expertise as they encounter other questions and issues.

Our SMiS partnership was only established mid-2013 so is still in its infancy. A total of 1341 science partnerships and 208 maths partnerships are currently operating across the country. Many of these have been running for several years.

An evaluation of the SMiS program was conducted during 2011 and 2012, and the resultant report highlights the many benefits to schools, scientist and mathematician partners, and most importantly to students. According to the study, "For students, perceived benefits include the opportunity to see practicing scientists and mathematicians as real people, to experience science with them, and to increase their own knowledge of contemporary science/mathematics. Other benefits were perceived

to be students having fun, increasing their awareness of the nature of scientific investigation and of science/mathematics-related careers, and increasing their ability to recognise and ask questions about related issues in the world around them” (Rennie, 2012).

There is a clear connection between these outcomes and the new Australian Curriculum for science, which aims to “develop an understanding of important science concepts and processes, the practices used to develop scientific knowledge, of science’s contribution to our culture and society, and its applications in our lives.” (ACARA, 2013). An SMiS partnership also offers a real-life connection with the ‘Science as a Human Endeavour’ strand which runs through the Australian Curriculum from Foundation to Year 10.

The need to increase students’ interest in maths and science subjects is well established. Recent University of Sydney research indicates that despite the overall number of students completing the Higher School Certificate in NSW rising, significantly fewer candidates are choosing to study both maths and science through to the end of Year 12 (University of Sydney, 2013). Finding sufficiently qualified people to teach these subjects at senior secondary levels is also proving challenging. The Scientists and Mathematicians in Schools program therefore provides an important alternative channel through which students can access knowledgeable professionals.

But it’s not just the students and teachers who benefit. The program evaluation found that both scientists and mathematicians involved in SMiS partnerships ranked “inspiring and engaging students”, “sharing their passion for science or maths”, and “raising the profile of science or maths in schools” as the three top reasons for their participation. Katherine Russell’s rationale for joining up is similar: “It is common for students to believe science and maths are ‘hard’, but these skills are both so important to our everyday lives. I saw SMiS as an opportunity to share my love of maths and science with students, and hopefully encourage the students to see these subjects as part of their futures.”

A key element to the success of the program is the support provided by the employers of SMiS partners. Katherine explains, “I’m lucky to work for Rio Tinto, where we value community involvement. My manager is particularly supportive of the program, as it may encourage more people to choose science as a career... my geologist colleagues have also become used to me asking to borrow their rock collections.” She is available to visit us on site once a term, in addition to corresponding with students or teachers in an ongoing capacity as required.

The main obstacle that Katherine has experienced has been developing an understanding of the students’ needs. “My biggest challenge is definitely gauging the



*Celebrating 100 days of school*

#### Facts and figures:

As at 31 October 2013

Current partnerships:

**1549 (Science: 1341 Maths: 208)**

Total partnerships: since July 2007:

**3609 (Science: 3204 Maths: 405)**

Current Schools : **1131 (12% of schools)**

60% primary, 40% secondary

audience, as I don’t know where each year level is at. The teachers have been great at having a chat with me before the session, so we can better tailor the content,” she says.

Perhaps one of the most attractive features of the program for schools is that it costs nothing. The project evaluation identified that benefits for teachers included, “opportunities to communicate with scientists/mathematicians and to increase engagement of their students in science/mathematics. They enjoyed working with a scientist/mathematician and for teachers of science, especially in primary schools, enhancing the profile of the subject in their school and the ability to update their knowledge and practice were important benefits” (Rennie, 2012). Confidence levels in teaching science also increased.

On a national level, demand for the SMiS program has been high, which means there are often more schools than scientists and mathematicians registered to participate – hence the wait I referred to earlier. Industry partners come from different sectors including federal and

state government, research institutes, universities, private enterprise/companies and retirees. The CSIRO actively works to identify organisations that might be interested in being involved, and lets them know about the benefits that the program can bring. Scientists and mathematicians don’t always have a reputation for their ability to easily relate to others so enhanced communication skills is one big plus the program can bring to organisations. As one SMiS scientist often called to testify in court commented, “If you can explain it to a Year 4 student, you can explain it to a jury.” (Rennie, 2012).

#### Further reading

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