

CASE STUDY

Scientists
in Schools



Since forming our partnership in September 2007 we have enjoyed a number of activities together with the Middle College and Senior students of Concordia Lutheran College.

From the time that we received news of our match we were keen to meet and talk about how the program could benefit the students. At our initial meeting we discussed how best to plan our activities to integrate with our individual work commitments and how they could fit around both the school terms and university calendar. The teacher and scientist introduction sheets were a great way to start to get to know each other, about our work place and our career paths. At this initial meeting we agreed to meet about once per term and to do activities with students that related to the planned school work program. An email from either one of us at the commencement of the year/term usually starts our conversations of what potential activities might be done which complement the current plans for the term. We then negotiate a time for the activity that is mutually convenient and continue email discussions around how the visit might extend or relate the topic to a context.

Some activities done to date

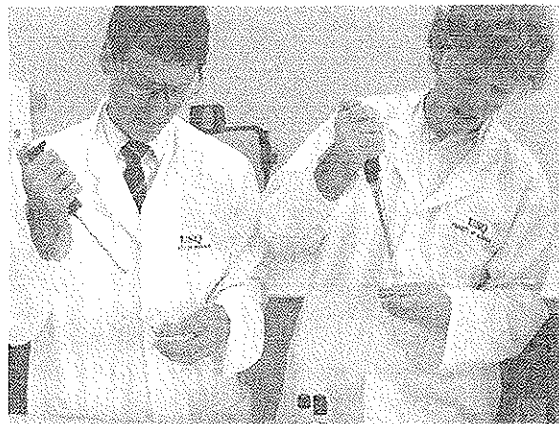
The partnership was kick started with a visit to a Year 11 Biology class at the school in October 2007. At that time the students were isolating microorganisms from the

Bernadette McCabe discussing different colonies isolated on a nutrient agar plate with Year 11 students

environment. Hellen had heard that microbial colonies on a Petri dish can be described morphologically, so I mentioned that I could come and show the students how we do this as microbiologists. I also used the session to describe the many ways microbiologists isolate microorganisms from various environments and how different types of media work to isolate and identify microorganisms.

After returning from maternity leave in June 2008 I resumed my SiS partnership with Concordia and gave a guest presentation to Year 12 students in Term 3 of that year on genetic engineering and insulin production using microorganisms.

Access to specialised scientific equipment for school experiments can be difficult. To facilitate this and also give students an exposure to some microbiological methods I hosted Year 12 Biology students at the USQ teaching labs. In this session we modelled an Extended Experimental Investigation of microbe numbers in pasteurised and raw milk samples, demonstrating serial dilution and other important microbiological techniques. Students felt particularly capable and appreciated the fact when I mentioned that



Year 12 Biology students at the USQ teaching labs investigating milk microbiology

this was a practical that I carry out with undergraduate students. Students enjoyed using the automatic pipettes and this activity gave them an insight into scientific work in laboratories.

When Hellen mentioned in one of her emails last year that Year 9 were studying monogastric and ruminant animals, I was keen to pay a visit to the school and chat to them. As part of the presentation we discussed the important roles that various microorganisms and enzymes play in digestion and concluded the session with a brief talk about the rumen microbiology research I had previously conducted whilst at the CSIRO and its applications in real life. Hellen then got the students to do some posters about an aspect of the presentation and I went around the classroom discussing the content with them. This was an extension on the unit topic 'Body Systems' and the study of the calves in the 'Cows Create Careers' project.

Many students are not aware of the various career opportunities available in science and the particular study paths that one takes to become a scientist. As part of my visit to discuss careers in science to Yr 11 Biology students I invited a third year USQ Bachelor Biomedical Science student to give a student's

perspective of studying science at undergraduate level. A former Concordia student himself (2006 Dux of School), he shared his university experience with them and what his plans were in science after graduating.

My visit earlier this year involved Year 9 students who were enthusiastically undertaking an exploration of the most effective antacid to relieve heartburn at the time. Most groups argued that sodium bicarbonate was the best based on the pH or speed of reaction data obtained in their experiments. In this session we discussed some of the unfavourable consequences to ingesting sodium bicarbonate and related it to the context of the elderly using it to treat heart burn. The thought of inflating stomachs with trapped carbon dioxide stirred a few imaginations!

From the scientist's perspective

Being involved in the Scientist in Schools program enables me to connect with students on a continuing basis and I have come to appreciate the benefits of this ongoing approach as I start to recognise a few students from year to year. The partnership has also established a relationship between Hellen and me where we can exchange different ways of teaching. I've been able to receive an inside

view of assessment and expectations in a senior school which has helped me to understand the learning contexts of first year students who have come directly from high school. Connecting with the students has also provided an insight into how they perceive my work and has allowed me to put my work as a scientist under the 'microscope'; often seeing it at a new angle.

From the teacher's & students' perspective

For me and the students in my classes, Bernadette has been an invaluable source of application of knowledge and the techniques of science. She is an accessible and approachable scientist both for myself and students; possibly the only one with whom some of my students actually will have contact. This makes our three way relationship extremely important for the students' subject choices and career pathways in later school years. For students who choose science pathways at university, this will be valuable preparation for their tertiary studies. Yr 12 Biology students saw the operation of a university teaching laboratory, so they hopefully will not find the transition from school to university to be so much of a challenge.

As a teacher in the Senior College, my relationship with Bernadette has given me an insight into contemporary university classes and expectations so that I am able to assist students in the preparation of this transition. For students who move into alternative pathways, some knowledge of the work of scientists and their approach to problems could demystify the role that they play in the making of global decisions such as those of climate change which is an important contemporary issue. I also have gained knowledge of areas of science such as ruminants and more techniques of

microbiology during the activities and from our discussions. Our relationship is extending my knowledge and applying it to contexts. Bernadette is able to suggest the science that is sometimes hidden in contexts.

In the students' minds the stereotypical scientist that they often draw when requested to depict the appearance and characteristics of a scientist hopefully disappears and is replaced by a more realistic image. Bernadette, being a female scientist may challenge the stereotype that some students still hold of scientists being male.

Bernadette's role changes as per the needs of the particular class or topic so her visit has been best organised at the beginning of term. However, at other times her role has become clear as the unit of work progresses. In planning the sequence of work for the term, we examined where Bernadette's expertise could be of most use. For example, with protein synthesis which is part of the work program for Yr 12 Biology, Bernadette has experience with genetic engineering and insulin production so it was organised that she provided that part of the program. On the other hand, with Yr 9 Science and discussion of the most effective antacid her input was most valuable toward the end of the analysis of the data based on chemical reactions.

In a unit of work students or classes arrive at questions which we would need to research. One of the choices is to ask Bernadette by email or ask her to visit so that she may discuss these questions. Bernadette's organised visit has not simply been tacked onto a unit of work but has been a result of our explorations of topics or she has actually presented part of the curriculum. Bernadette is able to present material to classes effectively at all the levels required in my classes so this

is able to be carried out with confidence. As time has passed, we have gained an idea of each other's expertise and this then assists with planning. In the case of the Extended Experimental Investigation for Biology, students were given permission to email Bernadette with their questions. In replying, Bernadette copied the email to me so that I was aware of the nature of the interaction. Previously, Bernadette had been given guidelines as to the nature of advice that the students could receive.

The interactions in this relationship have renewed my enthusiasm for the teaching of science after 28 years. The possibilities seem to be only limited by our vision of how we are able to work as a team. Not only has it been valuable for student learning pathways, it has made me consider my own learning pathway for the future. If the curiosity and wonder that one can feel in exploring science contexts can be modelled or even passed on to students by Bernadette's and my interactions in activities then one of my major objectives will have been reached.

The future direction of the partnership

We both agree that the value of the relationship is in the three way interaction of the scientist with students and teacher and that maintaining this would form the basis of any future direction.

From the teacher's perspective, we need to keep examining the work program to determine where the scientists could have valuable input. Any determination of a future direction could place restrictions on what we do, therefore it is important to leave this open to possibilities. In introducing science to younger students, Bernadette could have an important role. One possibility that comes to mind is an activity for younger students in the

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Middle College which is focussed on their perception of the appearance and work of a scientist. The pathway to becoming a scientist could be built into this. By way of drawing, words and other means of communication, students could show their idea of a scientist. These could be examined by the class and Bernadette when she then visited. There could be a question and answer session where Bernadette answers the students' questions about her work, what a scientist does and how she became one.

We have also given thought to conducting a science fair where we would both act as supervisors to help educate parents and the community about the value of science. The students themselves may be able to suggest other possible activities that are meaningful to them. To date we have not formally evaluated the activities to assess the response of the students to the SiS program. Only 'off the cuff' and student offered responses have been noted. Now that we are both comfortable in our relationship, it is timely that we extend the partnership to the students and ask them for their feedback.

At the moment we are both on leave from our respective workplaces but plan on resuming our activities early in 2011– it has coincided well with Bernadette on sabbatical leave over Semester 2 and Hellen on leave since Term 2. We may be on leave; however our interactions and emails have certainly not stopped as evidence by the writing of this article. We are looking forward to a productive and fun year ahead with the students of Concordia.

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