

Chemical education: where to from here for the RACI?

The term 'ChemEd' is now widely purported by many in the chemistry community, but what should be the role of the RACI in this pursuit? The NSW Branch recently held a forum to discuss this question and develop proposals for future ChemEd initiatives.

In February, 35 RACI members and other interested parties met at the Ranch Hotel at Epping, NSW, for the annual NSW Branch Office Bearers Workshop. This year's theme of chemical education generated significant interest, with representatives from early childhood, secondary science educators, TAFE and several universities.

Not so long ago, research in chemical education was deemed to be something that a chemist may do if he or she were not up to the task of 'bench level' chemistry. Nowadays, chemical education research is considered by many peers to provide significant academic stimulus to the manner in which chemistry is taught, none more so than providing quantitative evidence of the benefits and/or limitations of traditional and novel teaching methods. Chemical education, from the RACI's point of view, is about much more than research into teaching, however. It encompasses assistance for primary and secondary teaching, accreditation of tertiary

chemistry courses, and the communication of chemistry to the public.

To begin the workshop, several novel initiatives were presented relating to secondary chemistry education.

Associate Professor Charles Fogliani discussed the development of the Australian National Chemistry Quiz (ANCQ) over the past 25 years. The ANCQ now represents the largest single entity of the RACI, reaching more than 110 000 students annually in 15 countries throughout the Asia-Pacific region. The exposure that the RACI gains from the ANCQ cannot be understated and has enabled Charles to value-add to the program by introducing online teaching resources, including web-based excursions to sites otherwise inaccessible to large school groups, such as gold mines and forensic laboratories. For more information on the ANCQ, or to contact Charles, visit www.ancq.com.



Associate Professor Charles Fogliani (left) and Joseph King present background to the Australian National Chemistry Quiz (ANCQ) - 25 years strong and the largest RACI endorsed initiative. Charles was awarded a citation from the RACI NSW Branch at the Annual President's Dinner for his pioneering efforts in chemical education.

The evolving nature of the ANCQ program for ChemEd has also produced a chemistry education evaluation program. Joseph King of Horizon Interactive Technologies presented promising results of a trial for a recently launched software support program that brings a new meaning to 'plain language reporting' in terms of chemistry education. The Millennium platform moves away from expensive software package designs to an inexpensive web support tool that enables teachers and, more importantly, parents to identify specific areas of strength and weakness within any state-based curriculum. The interactive strength of this tool lies in the targeted feedback that it provides



Dr Jennie Jones discusses the conceptualisation barrier that many students find when learning the fundamentals of chemistry and how this can be reduced with teaching 'Captivating chemistry'.

to student, teacher and parents in terms of learning requirements, for example the specific set of pages or paragraphs to be revised from a nominated source. Overall, the time requirements for student evaluation and subsequent administration are dramatically reduced for teachers so that they can get on with what they are paid to do - teach! For further information on the Millennium chemistry education evaluation project contact Joseph <jking@horizoninteractive.com.au>.

WebCT (course tools) will undoubtedly play a greater role in chemical education in the future. Julie Haeusler from the NSW Department of Education and Training presented IT developments that are designed to enhance the learning experience. Projects that the RACI NSW Branch were involved with in 2007 include 'Chemistry solutions' - a web streamed class activity consisting of an expert panel providing demonstrations of curriculum based experiments and relating them to 'real world' chemistry. In addition, the Science Talk <www.cli.nsw.edu.au/cli/sciencetalk/index.htm> initiative is a web-based program that takes classes into interesting laboratory environments while providing profiles of the featured chemists. Future projects will focus on providing virtual online experiments to students and teachers for supplementary learning. For further information on the use of WebCT in chemical education contact Julie <Julie.Haeusler@det.nsw.edu.au>.

Dr Jennie Jones from the NSW Branch Committee and NSW Chemical Education Group discussed teaching chemistry for a deeper understanding. The need for such a topic stems from the teaching of the NSW year 9 science syllabus without

first providing students with an understanding of particle theory in years 7 and 8. This disconnect is believed to be responsible for learning barriers associated with fundamental chemical concepts, reinforcing the perception that chemistry is 'too hard' when students select their elective subjects for year 11 and 12 and therefore reducing the number of potential university graduates trained in chemistry. The teaching of particle theory in a meaningful and interesting manner is not trivial, and Jennie has developed a hands-on course for teachers called 'Captivating chemistry'. The course includes demonstrations of practical exercises to illustrate concepts associated with particle theory and hence

bridge the secondary learning divide. NSW teachers interested in attending the courses should contact Jennie <jjones@edfac.usyd.edu.au>.

Dr Chris Fellows (Secretary of the New England Section) from the University of New England, Armidale, presented an overview of 'Science in the bush'. This project aims to engage secondary students in science demonstrations and has shown considerable success over the past five years. Further information can be found at the website <www.scienceinthebush.net> or by contacting Chris <cfellows@une.edu.au>.

On the chemical education research front, there is evidence of the benefits that translation of initiatives such as the Australasian Chemistry Enhanced Laboratory Learning (ACELL) project has for teaching in chemistry. Dr Ian Jamie illustrated how the eagerness of teachers to improve the quality of laboratory exercises can result in more positive attitudes of students towards the learning of chemistry. The success of the ACELL project at the tertiary level has the potential to be applied more broadly to science education in secondary schools with what Ian termed Australasian Science Enhanced Laboratory Learning (ASELL). Secondary teachers interested in participating in a pilot ASELL program aimed at improving school science experiments can contact Ian <ian.jamie@mq.edu.au>.

There is considerable interest for improving transitions from secondary to tertiary chemistry education. Dr Sigggi Schmid presented improvements, in conjunction with the ACELL project, that have been made in the 'first-year experience' for



Associate Professor Joanne Jamie presents the successful implementation of the Indigenous Outreach Program.

chemistry students at the University of Sydney, leading to an increase in the retention of students to undertake chemistry majors in third-year undergraduate studies and subsequent fourth-year honours followed by postgraduate research. In his capacity as chair of the RACI Chemical Education Division, Siggì is also interested in addressing the nexus between academics involved in chemical education research and members who are secondary science teachers. Members who have ideas on how the RACI can better serve both facets of chemical education in the future should contact Siggì <s.schmid@chem.usyd.edu.au>.

Associate Professor Joanne Jamie discussed the results of a unique program for tertiary transition based on improving secondary retention. The Indigenous Bioresources Research Group (IRBG), co-directed by Joanne, was established in 2001 to work in partnership with Aboriginal communities on bush medicine research. Three years later, elders from 12 Local Aboriginal land councils of Yaegl and Bundjalung country in northern NSW, came together to discuss the low completion rate of Indigenous high school students. They made a request to the IRBG for assistance in encouraging Indigenous students to complete high school and consider further education. Since this request, the IRBG has established a number of science and technology-based educational schemes, in collaboration with Local Aboriginal land councils, schools and Rotary of Northern NSW. These include Indigenous participation in science shows at schools, the Siemens Science Experience (SSE), Macquarie University open day and a digital video editing course and training of Indigenous students as SSE leaders.

The real outcomes of the program were witnessed when these trained students, then in year 10, became the mentors for year 9 students by developing and presenting a science show with the help of Macquarie University postdoctoral students. With National Science Week funding in 2006, this was expanded to include year 7 and year 8 students at two school open days. The mentors performed the activities to the audience of younger students, explained the science behind each of the activities and were responsible for answering the audience questions. The idea is then for the year 9 students to adopt the mentoring role when they enter year 10. The responsibility shown by these students was one of the key outcomes of the program. They effectively

developed five science shows, including setting up the equipment and making the solutions. This was important to ensure that they weren't just involved in the fun bit; they provided a lot of the hard work as well.

This year the students participating in the program had the opportunity to meet and have lunch with the Macquarie University Vice-Chancellor. The teachers, parents and Aboriginal education assistants have reported a positive change in confidence in the students and a 'buzz' around the school following the program. The students are much more engaged in their educational activities. The last two groups of students who have participated in the National Science Week and SSE activities are adamant that they are going onto years 11 and 12. There was no longer any question that they could obtain their HSC. The science teachers and Aboriginal education assistants have become closer to the students and are seen as mentors. Because the younger students see Indigenous students demonstrate and explain activities, while achieving praise for their efforts via the media, these demonstrators have become excellent role models and mentors.

The Aboriginal land councils, Rotary and parents are also playing a major role in motivating students. Career opportunities have been highlighted, especially through school visits where the IRBG has spoken directly to many students while providing information on study programs. Through likely expansion of this program to work experience placements, career opportunities will become an even greater focus. People interested in finding out more information about the

IRBG outreach program should contact Joanne <jjamie@cbms.mq.edu.au>.

The third 'pillar' of chemical education for the RACI is communication of chemistry. Traditionally, this has been viewed separately to the more focused secondary and tertiary education strategies. Relating chemistry to students and teachers has much in common with relating it to the public at large. So what limits our impact in this endeavour? A fashionable view today espouses that our society does not appreciate the true value of science, that it does not accord Australian scientists with the status or recognition they deserve. Yet there is evidence to suggest the contrary, with community surveys repeatedly finding that Australians have high interest in science and technology.¹ A confounding theory has taken shape, however, that in order to sell ideas to people it is necessary to 'spin' the scientific detail. We tend to tell people what we believe they want to hear and simply repeat what others are already saying.

Associate Professor Roger Read from the NSW Branch Committee presented a new way of thinking for the RACI to communicate chemistry. Primarily this involves being proactive in our communication by anticipating issues, developing information packages, media engagement through editorial articles and hosting of public debates and hypotheticals. Too often the RACI is found to be reactive in terms of informing a public debate on a scientific issue. It is not the mission of the RACI to adopt any one position; the RACI should be presenting all relevant positions of a scientific argument for the public to make their own decisions. Putting this methodology into practice, Dr Joseph Bevitt

(Chair, NSW Young Chemists Group) presented an insight into geothermal energy and how chemistry behind the technology could be communicated to students, teachers and/or the public in shopping malls!

One area not covered in any detail during the forum was primary education. This represents a serious deficiency for the RACI in terms of understanding, due in most part to a lack of relevant membership. This issue will only be arrested by engaging primary school teachers through extra-curricular activities such as the state-based crystal competitions and the 'Cool chemistry' national special project currently under way.

Looking to the future, the RACI NSW Branch is keen to demonstrate the value of academic-industry linkages in chemical education. Indeed, in terms of retaining talented and/or interested students, work experience and intern programs can be the best mechanism to take chemistry out of the classroom or lecture theatre and into the real world. Many of the best self-styled educators will admit to being deficient in their awareness of current career paths in chemistry, a critical component to inspiring future chemists. The RACI needs to show leadership by providing career advice to teachers and students with the help of industry members.

REFERENCE

- 1 Barlow T. *Chem. Aust.* 2006, **73**(4), 3-4.

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