The 2014 IUPAC International Conference for Chemistry Educators was held in Toronto July 13-18. With the help of the CEA and my school, University High School, I was lucky enough to be able to attend for my first time. The conference showcases a mix of current research into chemistry education, talks from experts in chemistry education, workshops about technology utilised in chemistry education, and even just presentations on new ideas, developments, and pedagogical approaches. In this report, I'll focus mainly on what I learnt in the context of what would be helpful to a high school chemistry teacher as well as try and touch on some of the more interesting research and ideas that were shared.

The first lecture was run by the one and only Bassam Shakhashiri whose books of chemistry demonstrations and experiments have inspired many a student (and teacher). From the use of indicators to the explosions of hydrogen and oxygen filled balloons, he had the audience enthralled, which was sort of his message about chemistry teaching. To paraphrase, we’re often able to create the ‘teachable moment’ and engage students through demonstration. To miss that opportunity through lack of resource, lack of knowledge, or lack of organisation, is a tragedy that can be remedied (particularly lack of knowledge and/or organisation). In fact, I was able to present on behalf of Seamus Delaney and the rest of the ECCN the Chemistry demonstrations we’ve been filming and writing instructions for on YouTube. They were very well received by the high school teaching community present and can be found on YouTube on the ECCN videos channel (https://www.youtube.com/user/ECCNvideos).

The following day started with a talk from the Nobel Prize winning chemist John Polanyi. He talked about how scientific discoveries are made and why they are important. He likened the life of a research chemist to the life of a toddler learning to speak. Both make and then test generalisations using limited information. He argued that both go through the stages of imitation of others, verbalisation of both old and (rarely) new ideas, and play. His comments on the ‘play’ that chemists are able to do, led to him to say that the best research is done by people that are able to ask the right questions, design good experiments and then get lucky. It hit me while he was speaking, that the high school students I have access to, have the opportunity to practise the first two steps in the process mentioned, imitation and verbalisation, but rarely get the opportunity to ‘play’. This left a bit of hollow in me as a teacher, which I was keen to fill during the weeks presentations. If we, as teachers, are training future researchers, how do we give them the opportunity to practice ‘playing’ in this chemical research sense?

There were, fortunately, a few things that were being endorsed by a community of chemistry educators. Firstly, one that I’d heard about, but for some reason never implemented to any great extent, was chemistry simulations. PhET and create.nyu.edu had two very different approaches, yet both products are very helpful and free. These small web applications are designed to simulate certain chemistry concepts and by searching through their databases you’ll find many and varied areas of chemistry covered. PhET (now with HTML5) was really promoting the idea of having information ‘hidden’ so that it was easy to find if the student needed it, so that they were not initially bombarded with too many representations, graphics, and words. With 5-10 minutes of students manipulating the simulations, meaningful discussions could be had about the concepts that we explore every year in chemistry. This not only tied in with the ‘play’ concept and allowing a bit of freedom for students to generalise, but it also linked nicely with another of the much talked about ideas of the conference, the flipped classroom.

The flipped classroom is a developing idea and it was fascinating to have tertiary level researchers and high school teachers in the same room for the discussion. For those that haven’t come across it, the flipped classroom has students go through a resource, usually video, audio, or some sort of interactive unit, to learn a bit about a concept before coming to class. This allows richer discussion in class and less time introducing concepts and terminology. At a research level, there aren’t many reliable sets of data published that would outright encourage the flipped classroom, however there is a lot of evidence to suggest that it does no harm. Proponents of the technique say their classes are more interesting than they have been formerly and allows deeper coverage of core material. Also, depending what pre-class homework has been set, some initial misconceptions can be identified through multiple choice quizzes. Detractors talk about the time taken to set up the resources to be used outside of class, and also how it leaves some of the less motivated students behind even more than they already are. There was much discussion throughout the week, however, at least at an undergraduate level the flipped classroom is occurring more often.
One of the last big discussion topics at the conference was technology in Chemistry education. As I’ve already mentioned, animated simulations are readily available and highly recommended. Below is an outline of some of the more interesting ideas I was exposed to at the conference.

For secondary school teachers

bestchoice.net.nz: while not free, this provides a large database of chemistry questions relevant to VCE and includes functionality that gives students instant feedback and teachers a set of comprehensive data that can track the progress of their class

RSC: The royal society of chemistry has a great website with a lot of valuable teaching tools. Two of the more interesting ones are SpectraSchool which provides a chance to build molecules and get NMR (1H and 13C) graphs for them. Also, Chemspider search engine which is built to be a reliable and valid chemical search engine. Visit rsc.org and navigate your way through their education section.

QR codes: Students access information differently now than ever before. With smartphones being more prevalent, a lot of educators are using QR codes to make information readily accessible in new spaces. From Chemistry treasure hunts, to providing video instruction in a prac book, consider QR codes as a way of putting virtual information in a physical location.

NYSP2I: The New York State Pollution Prevention Institute has developed a series of Green Chemistry experiments that cover a range of topics relevant to VCE Units 1-4. Go to the website to see samples and the prac manuals can be yours for free by emailing the organisation. www.rit.edu/affiliate/nysp2i/academic-programs. Most of these could also be run at a Year 10 level.

beSocratic: Online assessment system that has playback functionality and screen capture to better record student understanding. www.besocratic.com

ConfChem: An online Chemistry education conference that has research papers freely available. Yearly conferences run with participants discussing ideas in an online environment. The 2014 Confchem main topic was the flipped classroom. Current research on the topic is available here.

Lastly, if you’d like to know more about the many other presentations and what sort of research was being presented, the website for the conference is www.icce2014.org

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