Sustained Excellence in Tertiary Teaching General Category

David McMorran

Senior Teaching Fellow
Department of Chemistry
Division of Sciences
University of Otago

"My job as a teacher of chemistry is to show students how to master the language of atoms and chemical reactions so that something new and beautiful and important can result."

Finding new and better ways to do things is central to David McMorran's approach to teaching. As chemistry is fundamentally about finding new ways to assemble atoms, the building blocks of the universe, he finds it an intensely creative subject, much like art or poetry. He is passionate about his subject; and continually brings creativity to his teaching with new stories, new experiments and new uses of technology.

David has been a teacher for much of his life. He started teaching as a teenager, coaching swimming at his local swimming club. His first year at university confirmed his fascination and love for chemistry; and he soon found teaching even more enjoyable than being in the lab doing research. He now runs the largest chemistry course in New Zealand, with over 2,000 students enrolled each year, and often more than 500 students in each lecture. He also teaches 'bridging' courses, which fill in the gaps for students with limited backgrounds in chemistry, and is the 'go-to' person within the department and across the university. David has received two Otago University Students' Association awards – the Division of Sciences Senior Teacher of the Year Award in 2016, and an Otago University Excellence in Teaching Award in 2019.

Years of research experience and teaching in chemistry have given David a deep understanding of the subject and an ability to relate the scientific concepts to students' lives and interests. He enjoys 'lightbulb moments', when students suddenly understand an idea – or 'OMG moments', when students realise that something, they thought they understood, actually cannot be right after all. David describes his teaching of first-year students as metaphorically holding them by the hand and helping them out of the box within which high school chemistry confined them, and into the big wide world of actual chemistry.

David has developed better ways to teach a core paper in Otago's Health Science's First Year (HSFY) programme, which is rigorous, highly competitive and, for many students, stressful because of their varied backgrounds and abilities. He has also been involved in the provision of specific tutorial programmes for Māori and Pasifika students, as well as mature students and students with limited backgrounds in chemistry. He revises these bridging courses, rewriting their content and has now made them web-based, thus more accessible to students. The courses, which teach high-school level chemistry, are vital if such students are to attain the content knowledge and confidence they will need to succeed in chemistry.

"Chemistry goes on around us all the time – the trick is to try to find ways to connect students' experience of this to the underlying science being taught."

The key focus of David's teaching philosophy is to teach understanding and the ability to apply that understanding. He connects new concepts with students' existing worldviews and finds multiple ways to connect with different learners. Being accessible is important to him. To relax students before a lecture starts, David arrives early and has jazz playing while they come in. He welcomes them, chats and answers questions, finding out more about their learning needs and background knowledge.

During lectures, David focuses on students gaining an understanding of concepts, rather than learning merely how to get to an answer. He uses analogies, video, animations, music, practical demonstrations, and interpretive dance – anything that will engage the students and enhance understanding. As chemistry can often be seen as a very abstract subject, David tries to make it more relevant by telling stories about the societal context and the chemists responsible for the ideas he is teaching.

David has developed many resources to help students better understand content and practise solving problems, such as Lecture Summary Notes booklets, weekly problem sheets (with worked answers), and worked answers for final exams. He has also created a series of 30 videos of lectures and experiments for the distance-taught courses and was the first in the Division of Sciences to use iPads in teaching. This won him a national award for tertiary teaching in 2012. David also arranges field trips to Dunedin's Mt Grand water treatment facility and Ravensdown Fertilizer works, so students can see first-hand the application of chemical principles taught in class and learn about potential careers in Chemistry.

David considers practical classes a vital part of teaching chemistry and give students the opportunity to learn how to 'do' chemistry. For many students, this is the real appeal of the subject and it is also a part of chemistry that has become increasingly difficult to offer in high schools, due to costs and Health and Safety concerns. David has developed new and innovative ways to assist and assess his lab classes, such as on-line exercises to help students prepare for labs, and he has worked with an app designer to develop the ChemTest app, which allows the students to do their end-of-lab exit tests on an iPad. For smaller classes, he uses lab reports to assess and give feedback.

As well as teaching students, David is a mentor to other academic staff and senior students in the Department of Chemistry and beyond the campus. Since 2010 he has produced 183 shows and podcasts on Science Notes on Dunedin's community radio station, Otago Access Radio, in which postgraduate science students talk about their research work, and themselves. He has taught as part of Otago University's Science Wānanga programme, teaching Māori students and living on the marae with them. Since 2004 he has taught at Hands-On at Otago (previously Hands-On Science), a residential science camp for Year 12 and 13 students. He judges at the Otago Science Fair and initiated, and has run, the Otago Southland High School Chemistry Quiz, now in its 16th year.

David also sits on numerous committees promoting chemical education. For his teaching and community engagement, he has been recognised by the New Zealand Institute of Chemistry, being made a Fellow in 2016, and awarded the Denis Hogan Prize for Chemical Education in 2017. In 2018 he was invited to join the Executive Board of the New Zealand International Science Festival.

"I am extremely lucky to be able teach chemistry, a field of science which is crucial to all aspects of our lives, and a subject that I love."

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Ako Aotearoa National Office
PO Box 756
Wellington 6140
P: 0800 692 5669
info@ako.ac.nz
www.ako.ac.nz