



Sustained Excellence in Tertiary Teaching General Category

Peter Bier

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“I bring dynamism, energy and enthusiasm to my teaching, blending relevant real-world examples, live demonstrations, problem-solving, and active learning tasks to create an engaging learning environment.”

Peter Bier defines teaching excellence as “teaching dynamically” – inspiring students to learn by sharing his passion, energy and new ideas on engineering. He constantly strives to improve his teaching, learn from colleagues and share his experiences. He aims to engage and support all of his students, whatever their learning background or interest in the subject matter. To sustain energy and introduce humour into his teaching, he introduces the element of performance, using it to demonstrate abstract concepts and deepen understanding.

As a Professional Teaching Fellow in the Department of Engineering Science at the University of Auckland, Peter teaches engineering courses, including Mathematical Modelling 1 and 2 and Introduction to Engineering Computation and Software Development, which teach around 1,000 students difficult, but necessary, conceptual and technical content. He also teaches smaller classes, including Accelerated Mathematics, a stage one mathematics course aimed at very able secondary school students.

“I want to take students from ‘where they are’, to ‘where they need to be.’”

As coordinator of two large stage one courses, Peter puts considerable effort into smoothing the transition from secondary to tertiary study for his students. To gain more insight into the knowledge students bring to university, Peter volunteered to teach the year 13 calculus differentiation standard to students at Mt Albert Grammar in 2010. To keep in touch with what is happening in the secondary sector, he has also been a regular attendee and has presented at the biennial NZ Association of Maths Teachers secondary teachers’ conference.

Aware that New Zealand’s economy depends on a steady flow of engineering graduates, Peter’s role includes ongoing outreach to secondary schools. He helps promote secondary student interest in STEM (Science, Technology, Engineering, and Mathematics) subjects via the nationwide NZ Engineering Science Competition, which he has run for the last ten years. This competition attracts around 200 teams, giving students the chance to grapple with real-world mathematical modelling.

In order to identify gaps in first-year students’ knowledge during their first week of study, Peter moved the existing paper-based diagnostic test online to facilitate rapid feedback. To provide support for at-risk students, he led the development of a manual, which outlines practice problems, and video tutorial resources. As well as co-coordinating drop-in clinics for one-to-one assistance, he also uses multi-choice questions as a way of polling student understanding, enabling him to check and adjust his teaching.

Peter has a special interest in the success of Māori and Pasifika students, who represent around 10 percent of the student cohort, as many may have experienced barriers to entering engineering studies, such as lack of access to, or support with, the necessary subjects at school. He played a key role in the creation and delivery of his faculty's Genesis Programme, which identifies Māori and Pasifika students who would not normally be able to enter the engineering programme, but who show the potential to succeed. These students are offered an intensive academic programme to enhance their mathematical knowledge and learning skills.

"A good story can serve as a great introduction to a problem while also providing the motivation for why we care about a particular concept or topic."

Peter finds engaging students is easier when he shows enthusiasm for their learning and passion for the material taught. He uses body language and movement to supplement verbal and written communication. His teaching uses real-world stories, practical examples and live demonstrations to create memorable learning experiences. For example, he uses juggling to illustrate the mathematics of motion, climbing stairs to calculate slopes, and an umbrella to demonstrate an enclosed volume.

Another essential feature of Peter's teaching is modelling problem-solving, using relevant examples and clear explanations. As engineers do not solve problems by writing PowerPoint slides, Peter uses "messy" working, with hand drawn equations and diagrams, for modelling in class. For students who have difficulty working a problem live in lectures, Peter offers lecture recordings and is working on providing supplementary video material.

To make sure "things stick", Peter ensures students have plenty of active learning exercises - working on problems individually or via group discussions. Outside of lectures he designs weekly formative activities such as assignments, labs, quizzes, tests and tutorials, which often count towards students' final grades. He believes that well-designed assignments are excellent for practising skills, but need to be accompanied by fast feedback. He created weekly worksheets that are assessed by way of an associated online quiz. Immediate feedback is given, enabling students to fix misconceptions early before moving on to other areas. In 2011, he was one of the first New Zealanders to trial Piazza, a software tool dedicated to running class fora, which ensures a responsive and collaborative learning environment.

Group projects provide another way for students to practise large-scale, more complex problems and evaluate their solutions. In 2012 Peter trialled a day-long group project, the results of which were later presented at the Australasian Association of Engineering Education conference.

As a recognised advocate for the development of good teaching practices, Peter has presented at numerous training sessions, workshops and conferences and has participated in working groups and committees. To continue to be a dynamic teacher, he explores new ways to improve his teaching. For example, he enrolled in an advanced stage one physics course to experience a flipped-classroom environment, learning alongside other students. His insight into the students' perspective has convinced him to incorporate this model into his own teaching.

"Dynamic teachers do more than show and tell. They foster a love for the subject and a life-long love for learning."

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