



## The Cooperative Education for Enterprise Development – connecting students with industry

by Jeremy Leggoe, Director, Cooperative Education for Enterprise Development, School of Mechanical & Chemical Engineering, Faculty of Engineering, Computing and Mathematics, The University of Western Australia

In recent times the minerals and resources industries have experienced unprecedented growth, placing enormous demand on universities to deliver graduates who are ready to contribute. Technology is changing rapidly, creating new roles for graduates at a pace that the conventional curriculum struggles to keep up with. As a result industry is looking for ways to engage in university education that go beyond the conventional practicum placements.

The Cooperative Education for Enterprise Development (CEED) concept is one proven way to develop future graduates. The CEED program at the University of Western Australia (UWA) seeks to create industry sponsored research projects for students, typically at the Honours or Masters levels.

A CEED project involves more than a simple sponsorship: the industry partner defines the research topic, often hosts the student on site during the summer vacation and provides mentors from its own staff to help the student deliver useful operational outcomes.

CEED projects differ from conventional student projects in that the students are given real projects with real

deliverables to achieve. By building a team that includes the student, an academic supervisor and a mentor from the client, CEED projects combine the research capabilities of the university with the in-house expertise of the client. The result is projects that deliver findings that can and usually do find use within the operations of the client.

The potential benefits to the partners go well beyond the findings or recommendations of the research. Universities must prepare students for careers in all industries and vocations – which naturally makes it difficult to address the specialist needs of each employer in the general curriculum.

CEED projects offer a rapidly responsive method for training students in specific issues and technologies so that they are better prepared as potential graduate recruits for our clients. CEED projects can be initiated on a few months or even weeks lead-time – it is one of the most agile methods there is for providing specialist preparation for potential recruits in a rapidly changing environment.

For the students the impact of CEED projects can be profound. All UWA CEED

students participate in an induction program that focuses on communication, project execution and the realities of working in a professional environment. They then have the opportunity to be immersed in the client's operations, giving them practical experience in communicating and networking in the professional environment. Regular progress and budget reporting prepares them for the reporting requirements they will experience in major projects and/or operations.



*CEED student Matt Avent studies sand transport in stratified and open-channel flows.*



Exit surveys have shown that most CEED students believe that the experience leaves them better prepared to start their careers. In many cases, students credit their CEED experience with helping them through the interview processes that ultimately secure their graduate positions. Many students go on to work for their client – and perhaps most pleasingly – many alumni go on to sponsor and mentor CEED projects themselves.

### History and format

In 2014, the CEED Program at UWA will celebrate its 25th anniversary. Since 1989 more than 400 students have completed projects at UWA.

The CEED concept originated at the Royal Melbourne Institute of Technology (RMIT) in 1984 and in 1989, with federal government support, spread to UWA and Edith Cowan University (ECU). Programs soon emerged at several universities and those that became self-sustaining continue to this day.

In addition to the programs at UWA and ECU, CEED Program Queensland manages programs for students at Queensland University of Technology, The University of Queensland, The University of South Queensland and The University of Sydney. While the project models vary between programs, the CEED concept connects more than one hundred students with industry across the nation each year.

At UWA, projects can be offered in any discipline across the campus. The project initiation process is streamlined by the use of standard project agreements so that projects can be established on a lead-time as short as a few weeks.

Once a proposal is confirmed, the project is advertised to students who submit applications to the CEED program office.

Shortlisted students are interviewed by the academic supervisor and the client mentor and appointments are made by considering student preferences and the interview rankings.

In the standard project format the students work on site for eight weeks over the summer vacation. The location of the site work varies according to the needs of the project, ranging from the client's head office to 'fly-in, fly-out' rotations on remote sites.

Early in the project the student compiles a project brief that sets out the final deliverables. The project brief is then signed off by the student, supervisor, client mentor and the CEED office, ensuring that the needs of all parties are being met.

Students then continue to work on the project during the subsequent academic year, meeting regularly with the client mentor throughout. Each year in September/October, students present their results at the CEED seminar that brings together representatives of a broad spectrum of industries in the audience.

The students receive a studentship, included within the project fee, in return for undertaking the project. Students in engineering who complete a standard project are awarded full credit for their professional practicum requirements.

Alternative project models that do not include the summer site component have been developed to accommodate disciplines that require the project to be completed solely during the academic year, making CEED accessible to clients who are unable to host students.

### Working with industry

The UWA has developed strong relationships with the minerals sector in Western Australia, building off the existing (and continually developing) alignments between the university's programs and the sector. The CEED program both benefits from and plays its part in supporting the broader efforts of the University's Energy and Minerals Institute to develop those relationships.

### Projects with the Centre for Safety

Safety is a focus of many CEED projects and it has been recognised by UWA and industry that a resilient safety culture and a reduction of incidents and accidents is key to the continuing growth of the resources sector.

To support the efforts of the Australian resource sector, UWA has recently established a Centre for Safety. The Centre brings together research leaders in psychology, business, law, engineering, medicine and health to provide a multidisciplinary approach to research, education and policy development to address major safety systems problems.

The Centre for Safety will enable Western Australian resource operations to become more easily involved in research and pilot testing. CEED projects offer one means to generate research outcomes in health and safety that are immediately relevant to local industries as well as training future staff.

Centre Director and Winthrop Professor Mark Griffin recently supervised a CEED project undertaken by psychology student, Martin Bertuleit for BHP Billiton Iron Ore. The project focused on improving workplace safety at BHP Billiton Iron Ore through increased engagement with an initial task management strategy (the 'Take-5' process).





The project considered the factors that influence the development of initial task management strategies, and by identifying the most important factors provided a focus for future development of such programs.

### Asset management projects

#### Data collection

Operators in the mineral industry often face the challenge of executing both safety and asset management programs across 'blended' organisations, comprised of in-house staff, contract staff and even sub-contract staff.

Under the joint supervision of Kerrie Unsworth of the UWA Business School's management and organisations group and Mechanical Engineering's Melinda Hodkiewicz, CEED student Roger Molina sought to understand the motivations of staff when they are collecting data for asset management purposes.

He explored the factors affecting the quality of the data provided and the options available for ensuring data quality. The project recommendations are of interest to a broad spectrum of operations and – as has often been the case for CEED projects at UWA – the findings have been published in a peer-reviewed journal (*Reliability Engineering and System Safety* volume 119, pages 26-34).

#### Wear rates

Asset management is a particular strength in the Faculty of Engineering, Computing and Mathematics. Under the leadership of Melinda Hodkiewicz (co-supervisor for Roger Molina's project) it will form one of the pillars of the 'engineering for remote operations' focus that the faculty is developing.

In 2013 Professor Hodkiewicz supervised CEED student Callum Webb's investigation into approaches to modeling conveyor belt wear life for

BHP Billiton Iron Ore. Callum's analysis has shown that wear rates are best modeled as a function of throughput, providing the basis for novel models that capture the effects of the different loading rates at different sites, as well as capturing the effect of downtime.

The initial predictive models resulting from the work are to be refined further in a second-phase CEED project funded by BHP Billiton Iron Ore in 2014. Callum will start work with BHP Billiton Iron Ore in 2014.

#### Brake procedure optimisation

Nicola Lazaroo's project with Rio Tinto in 2012 dealt with both safety and asset management considerations. The focus of the project was optimising the brake procedure for stationary iron ore trains with the objective of improving both safety and production by revising the rules and procedures regarding the application of handbrakes.



Theoretical modelling indicated that reductions could be achieved in both the number of occasions handbrakes need to be applied and the number of handbrakes that are required for application.

The estimates were successfully verified through field trial work and changes to operating rules and procedures were proposed that would both reduce personnel exposure to potential safety hazards during handbrake applications and reduce delays in the transportation of iron ore from mine to port. On graduation, Nicola went on to work for Rio Tinto's rail division.

### Range of research

In recent years the CEED program has executed projects across a broad range of disciplines and it is common to engage supervisors from multiple disciplines to support individual projects. Academics and students from all engineering disciplines, mathematics and statistics, computer science, management and organisations, economics, chemistry and psychology have participated in recent years.

In 2013 student David Ho undertook a project under the supervision of Michael Burton of the School of

Agricultural and Resource Economics. The project established a methodology for estimating the value of native forests and bush land and provided a basis for governments and private companies to make decisions on investment planning. This project in particular highlights the range of research areas at UWA available to support the minerals sector.

### The future

The CEED program at UWA will evolve in the coming years as the university's 3/2 course models cycle into full operation but expanding engagement with the minerals sector will remain a continuing goal of the university.

In particular the CEED program is working to establish relationships with mining and mining services companies to ensure that our project models evolve to help deliver graduates who are ready to both contribute immediately and continue their development when they join the industry.

Visit the CEED website at [www.ceed.uwa.edu.au](http://www.ceed.uwa.edu.au) for further information on the CEED program. Papers from recent CEED seminars, detailing the objectives and initial findings of projects, can be viewed at [www.ceed.uwa.edu.au/ceed\\_seminar\\_proceedings](http://www.ceed.uwa.edu.au/ceed_seminar_proceedings).



CEED student Shruti Gupta investigating the effect of site operations on buried pipe integrity.