

# TEACHING & LEARNING REPORT 2018

Repurposing the Scholarship  
of Teaching and Learning  
at CPUT



Cape Peninsula  
University of Technology

creating futures







# 4

## INNOVATIVE CASES OF TEACHING AT CPUT

### BACKGROUND

The subject Project 2 is a module within the National Diploma: Electrical Engineering programme that has as its focus the development of a number of sector-driven skills. These include simple electronic design techniques, printed circuit board (PCB) design, electronic system diagnosis as well as cross-field outcomes such as group participation, report writing and presentation skills (the so-called soft skills).

The general lack of effective soft skills amongst higher education students is not a uniquely South African or developing country problem, with many studies confirming the lack of communication skills (amongst others) as a major problem amongst new engineering employees. This problem is exacerbated in highly segregated and multicultural societies such as South Africa. The lack of these skills is most evident within project-based courses, where students are required to work in groups, time-manage their own activities and provide verbal and written reports on findings and results.

### OBJECTIVES

The objectives of the initiative were multifold; with the main objective being the need to bring about effective learning and application of the soft skills that are acknowledged as critical for incumbents in the functioning workplace. The legacy of South Africa's past continues to be a major factor in student participation at the higher education and economic levels, despite the inherent potential exhibited by many.

### INTERVENTION DESIGN

The following skill sets were identified as target areas for intervention; effective communication, project management, presentation skills, effective group participation (particularly in the context of different backgrounds and gender), working with and applying multidisciplinary skills, social entrepreneurship and the environment. A technical platform that would include all of the aforementioned competencies was developed so that the technical requirements of the module would be satisfied whilst keeping the overall project relevant and exciting. This was achieved by addressing environmental (renewable energy and waste recycling) and entrepreneurial (waste to wealth) opportunities. The Outdoor Solar Charging project was identified as the technology platform to address the identified target areas with the key technical specifications developed by Prof. Wilfred Fritz and Deon Kallis.

For the major project, students were tasked with designing the electrical system and mechanical structure that would facilitate a community solar charging hub, in addition to giving consideration to the aesthetic and ergonomic requirements of the design. They were also tasked with implementing, where possible, the upcycling of suitable waste material for their structure.

### IMPLEMENTATION

The team identified a number of interventions that we hoped would address the problem areas, resulting in a number of interactive workshops that were developed

and presented by Andrea von Gleichenstein (TDC) during 2015. These included Project Management, Teamwork, and Meeting Strategies for Effective Teams. Given their international experience in multicultural group dynamics, TDC was the ideal partner in fulfilling these needs. During her intervention visit to our department, Ms Von Gleichenstein also ran similar workshops for students on the Design Project 3 course, and for final year students within the Department of Information Technology on the District Six campus.

Prof. Peter Naumann, Dean of the Faculty of Industrial Design at the University of Applied Sciences, Munich (MUAS), collaborated in the transdisciplinary intervention. A group of 5 industrial design students, accompanied by Prof. Naumann, spent a week (5 – 13 May 2016) interacting with our students on the aesthetics and ergonomic design issues of the project. Each design student was allocated a CPUT group to discuss and facilitate concepts relating to the overall design.



Workshop with German industrial design students



Workshop with German industrial design students

Prior to the visit, the German students attended a workshop in Munich on multicultural aspects as preparation for their interaction with the South Africans, also developed by Andrea von Gleichenstein of TDC. In addition to the interaction with CPUT electrical engineering students, the visitors were also introduced to a large cross-section of South African society including a visit to an informal settlement, meeting upcycling practitioners and artists, and a visit to the Department of Industrial Design, where they were cordially hosted by Johan van Niekerk and Prof. Johannes Cronje. The first outputs of the Projects 2 course were demonstrated on 17 June 2016.

## IMPACT

The project has had a direct impact on over 200 students, covering the sectors of information technology, industrial design and electrical engineering.



One of the workshops delivered by TDC

The workshops were designed to take students away from the usual talk and chalk methodology that they are most accustomed to, and challenged them to be active participants in their learning activities. The results of these workshops were evident in the assertiveness in their final presentations as well as with the interaction within the groups – for many this was the first time that they had worked with individuals from different backgrounds. The workshops highlighted the need to understand and appreciate the differences amongst team members brought about through cultural influences. The students were also introduced to aspects of project design not usually emphasised within traditional engineering programmes, such as the interaction with industrial design practitioners and the consideration of upcycling techniques as viable options toward sustainable product development.

The German exchange students also benefitted through their interaction with South African engineering and industrial design students, lecturers, professional artists

and designers, all used as inputs toward the realisation of their final year project.

All the workshops were evaluated by way of individual surveys. The overall experience as determined by the survey was highly complementary and positive. From initial observations, discussions with students and actual mark assessment of the individual group outputs, the project, with its attendant support modules (workshops, interaction with German exchange students) was a positive experience for the majority of the student cohort. Summarised class statistics are shown below.

	2014	2015	2016
Pass Rate (%)	49	68	79
Average Mark (%)	50	52	57

Final output for one of the Projects 2 groups

As an acknowledgement of project impact, we have had senior students volunteering, with no expectation of payment, to assist with the overall project development, since they see this as involvement beyond the normal curriculum.

## TRANSFERABILITY

The project can easily be applied to different educational sectors. Since pertinent societal issues such as energy, waste recycling and social entrepreneurship were addressed, this application is not restricted to developing countries.



**Exhibition of final artefact of the German students.**

Prof Wilfried Fritz, Deon Kallis (CPU), Andrea von Gleichenstein (TDC) and Prof Peter Naumann (MUAS)

The overall concept is based on a suitable technology platform (outdoor solar charging unit) that is relevant within the situational educational and/or social context, and although one can easily use the same technology platform in the realisation of a similar project elsewhere, it is possible to identify a number of suitable platforms that can form the basis of a project-based subject outcome, with the attendant critical cross-field outcomes contributing to the overall objectives of the curriculum.

As an example, an off-grid, vendor-based wi-fi spot could be identified as a suitable technology platform that would meet the technical design requirements of an electrical engineering curriculum. The project specification can be written so as to involve the multidisciplinary inputs of IT, accounting, mechanical and design students. A social entrepreneurial output could be realised by making the design requirements such that the overall product can

be easily made and managed by prospective community entrepreneurs.

Group work was used in this project to reinforce the need for participatory skills at the workplace, with emphasis on working with people with different backgrounds. So by creating an environment that best replicates the conditions at the workplace, and by providing suitable support in dealing with this largely unfamiliar scenario, the students will be better equipped to play an active role at the workplace.

Once a suitable technology platform has been identified and specified to realise the intended curriculum outcomes, the necessary educational and funding support should be pursued for project success.

The current project implementation has two disciplinary evaluation outputs, in that both German and South African students are assessed according to their own assessment criteria. The project can easily incorporate other appropriate disciplines, each with their own assessment criteria, but one common development output objective.