Central University of Technology, Free State

11

COMMUNITY ENGAGEMENT AT CUT

November 2015

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OVERVIEW

Central University of Technology, Free State (CUT) acknowledges the important role of the third mission of universities, namely Community Engagement. Community Engagement is commonly known as the active interaction between the university and its communities. The basis of this interaction is the university's expert knowledge, practice and innovation.

At CUT this mission is driven through three key values:

- Community Engagement must be rolled out via the curriculum - both at undergraduate and postgraduate level and innovation and incubation programmes;
- Service Learning and Work-integrated Learning are powerful curriculum strategies to deliver on community engagement;
- Community Engagement projects should be rolled out via quadruple helix approach (university/business industry/government/social communities) to enrich applicable opportunities.

These key values are informed by a draft CUT Community Engagement policy, philosophy and strategy that are currently being discussed by the University's community. CUT's Community Engagement framework is based on the University's Vision 2020 statement.

This brochure reflects on CUT's community engagement projects for 2015. Since Community Engagement activities are ongoing, dynamic in contents and shaped according to available needs and expertise, the agenda on community engagement can never be closed.

We invite you to be part of this exciting CUT mission driver!

Professor Laetus O K Lategan

Dean: Research and Innovation

COMMUNITY ENGAGEMENT PHILOSOPHY

CONTEXT: THE THREE MISSIONS OF A UNIVERSITY

Community engagement forms the intersection between teaching and learning and research and innovation. It is an imperative for universities to provide the knowledge, skills and dispositions that are essential in developing critical thinkers and engaged citizens amongst students and staff. It runs parallel to teaching and learning and research and innovation. The engagement mission is known by different names based on institutional objectives and strategies. Four concepts are important in this regard:

- Community service or civic responsibility;
- Technology transfer and innovation;
- Curriculum engagement; and
- Enterprise development.

The university subscribes to a strategy in which CE will be rolled-out via the curriculum in association with other universities, government, business and industry, and social communities (quadruple-helix partnerships). "Community" is therefore not limited to "social communities". Quadruple-helix partnerships constitute the university's communities. Essentially, CE is based on an integration of the university with the community (via the quadruple-helix approach). The university's Vision 2020 statement places emphasis on social and technological innovations and socio-economic development, with the aim of creating jobs (innovative and entrepreneurial spirit), and community engagement (broader than merely social communities). CE is an integral part of students' development. However, the trend of universities in CE is engaged scholarship: a form of scholarship that cuts across teaching, research and engagement. It involves generating, transmitting, applying and preserving knowledge for the direct benefit of external audiences in ways that are consistent with university and unit missions. Scholarship means it is "at the heart" and that the interaction is about "extending knowledge resources". Community engagement is not an activity that academics engage in as citizens, but it is essential or pivotal to their teaching and learning and research commitments. Therefore, academics should not regard CE as an "add-on" to "normal" academic work, as it "cuts across" teaching, research and services in an integrated manner. Furthermore, CE should not be driven solely by external demand, whether from markets, government or communities. Community engagement by academics transforms from being a charitable donation of time to becoming an integral part of intellectual discovery and national and/or regional development. In terms of engagement, universities

are expected to contribute consciously towards the national or regional development of their immediate communities, whichever the case may be.

COMMUNITY ENGAGEMENT AND ITS BENEFITS

From the above-mentioned, it is clear that CE benefits communities. Communities gain a wide range of benefits through their interactions with universities. The benefits to the university include: It enhances teaching and learning with regard to work-integrated learning (WIL) and service learning (SL), and provides a source of third-stream income. Furthermore, the students' development, knowledge economy, learning outcomes and research opportunities are maximised. The benefits are stipulated below in the following categories: Community, university and students.

COMMUNITY AND THE BENEFITS OF CE

The benefits include enhanced human and social capital development; accelerated economic growth; and improved professional and intellectual infrastructure. The byproducts include progress towards sustainability and research outcomes that can benefit the social, economic, environmental and cultural dimensions of society. The knowledgeable, active citizenry that is achieved through CE can deliver greater results in terms of development. This development creates improved social cohesion, social change and social justice, thus improving the quality of life.

UNIVERSITIES AND THE BENEFITS OF CE

Universities also benefit from effective CE. Students' learning outcomes are enhanced through curricula that are relevant to community issues and priorities. This engagement also promotes opportunities for research, partnerships, funding and the development of the university. The knowledge results in a coherent, purposeful sequence of activities that yields pieces of public and intellectual good. Simultaneously, the process adds value in terms of teaching outputs to the academic staff responsible for leading the CE project; thus the transfer of knowledge and knowledge production is enhanced.

STUDENTS AND THE BENEFITS OF CE

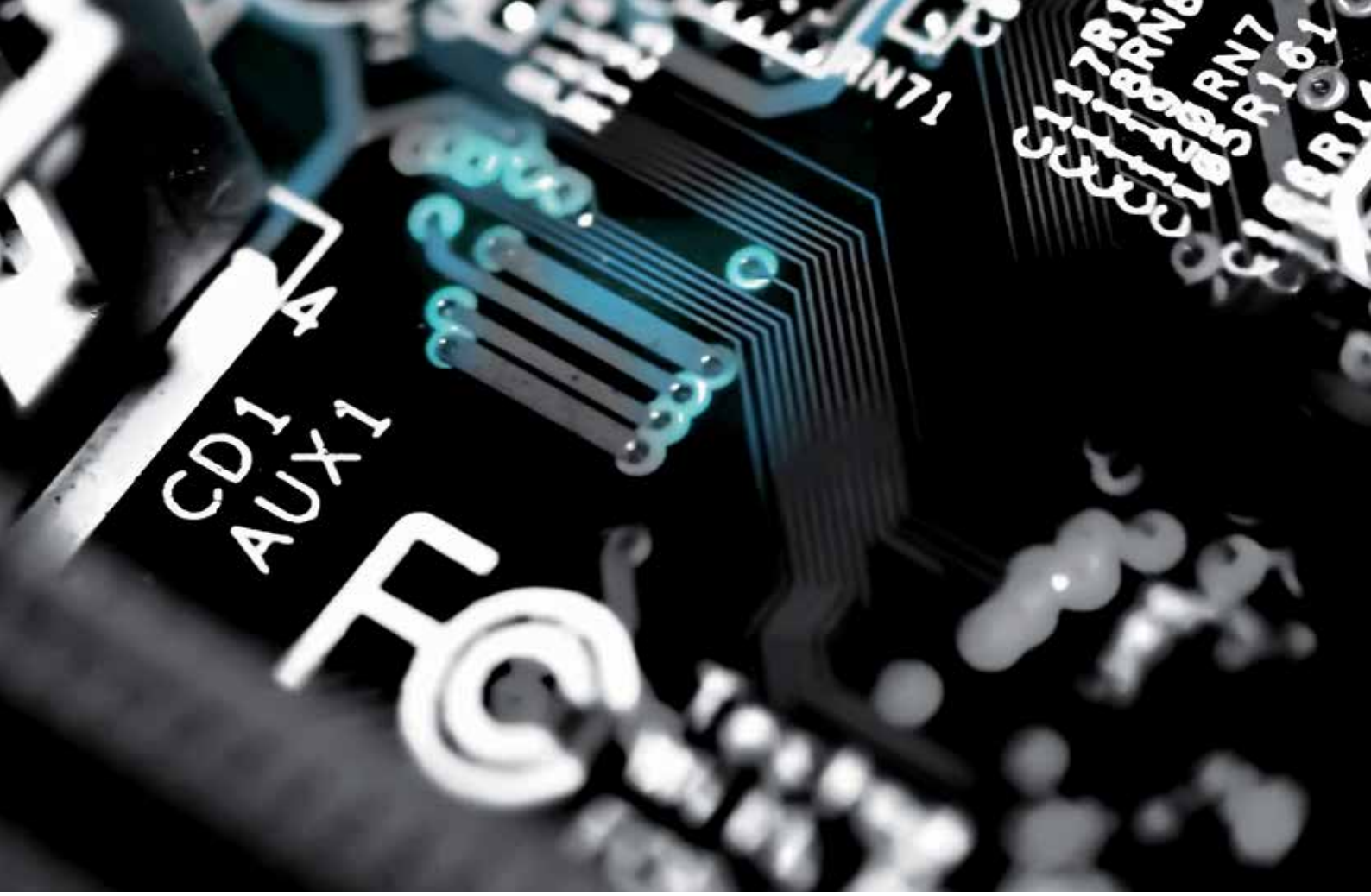
During the learning process of engagement, students create meaning to knowledge that is unique to them. Thereafter, the knowledge is assimilated via the cognitive, emotional and physical zones of learning. The learning process encompasses different forms of knowledge creation that is about, for, and especially with, diverse communities. In light of these statements, universities should strive more vigorously to search for answers to social,

economic, civic and moral problems. The process of CE is one of life-long (and life-wide) learning for students at universities.

STRATEGY

The CE Strategy supported by the university has specific consequences for the academic project. These include:

- Staff and students should have an entrepreneurial and innovative mindset, coupled with a service-delivery spirit.
- Academics should consider what and how they are teaching and reaching – who the end-users of their academic endeavors are.
- The focus has to shift from life-long learning to life-long employability and sustained job creation.
- Enterprise development and entrepreneurial skills should form part of the academic value chain.
- Incorporation into the curriculum via CE activities and outputs from the curriculum to quadruple-helix partners should be core to the academic project.
- CE requires changed behaviour at institutional and academic level.



FACULTY OF ENGINEERING AND INFORMATION TECHNOLOGY

ANNUAL CAREER WINTER SCHOOL PROJECT

The Annual Career Winter School is a faculty-specific programme during which Engineering-related information is provided to Grade 10 to 12 learners over three days during the June recess period.

Visits are undertaken to the different laboratories of Electrical, Electronic and Computer Engineering; Civil Engineering; Mechanical and Mechatronic Engineering; Built Environment; and Information Technology. General information on courses and demonstrations were provided by lecturers and student assistants. Learners visit the Centre for Rapid Prototyping and Manufacturing (CRPM) as well as the Product Development Technology Station (PDTS). Learners also undertook site visits to the Fabrication Laboratory (FabLab), Second Line, the School of Armour (Tempe), and Coca-Cola Fortune.

The Annual Career Winter School catered for 70 Grade 10 to 12 learners from the following schools:

- Calculus College, Bloemfontein;
- HTS Louis Botha, Bloemfontein;
- Ladybrand Hoërskool, Ladybrand;
- Christian Brothers College, Bloemfontein;
- Senakangwedi Senior Secondary School, Botshabelo;
- Kgorathuto Secondary, Botshabelo;
- Unicom Agricultural Secondary School, Tweespruit; and
- St. Andrew's School, Bloemfontein.

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CISCO TRAINING

Networking classes are presented to industry employees to improve their networking knowledge and skills. This training improves the networking skills of members from industry. Networking skills such as routing and switching are added, and trainees work on real equipment. Extra skills in basic configuration, routing, switching and wide area networks (WANs) are added. These skills enable people to apply for better jobs and to further their studies.

Students are offered free online training modules in Entrepreneurship (which supplements the skills gained through the core NetAcad ICT curricula); An Introduction to Cyber Security (which covers trends in cyber security and provides examples of the need for cyber security skills in various industries); An Introduction to Cisco Data Centre; and Getting Connected (which focuses on getting students physically connected to desktop and mobile devices and the internet). Students who have completed the course have access to other members of LinkedIn, Facebook and alumni on the Cisco site. This assists students to prepare for new career opportunities.

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CONTRACTOR DEVELOPMENT PROGRAMME (CCC TRAINING)

Construction management skills are offered to emerging small- and medium-size construction enterprises. Internal staff participants are from different departments of the faculty. The external partner is the Department of Police, Roads and Transport, Free State. 107 learner contractors also participate in this project.

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DUTCH REFORMED CHURCH (KLIPKERK)

Seven presenters (trainers) made a positive impact on the lives of the community participants by teaching computer literacy.

The participants included receptionists, a therapist (currently busy with her PhD), telephone operators, a caterer, unemployed people, a retired teacher, small business entrepreneurs, etc.

Positive feedback was received.

The training contributed to the following:

- Improved skills (participants are now better equipped for their current jobs, applying for new jobs or getting a promotion);
- The ability to manage businesses (the small farm, catering company, etc.);
- The ability to continue with further studies (the PhD student); and
- Self-enrichment (the retired teacher).

Classes are conducted throughout the week, either during the mornings (9:00-12:00) or afternoons (17:00-18:00) at the computer lab of the church.

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CLOUD SAMS: A COMMUNITY CLOUD SOLUTION FOR UNDER-RESOURCED SCHOOLS IN THE FREE STATE

This project involved the development and implementation of a cloud-based school administration and management system for under-resourced schools in Free State, entitled 'Cloud SAMS'. The under-resourced schools fall in Quintiles 1 and 2, and account for over 80% of all schools in the Free State. A dire need for accessibility to an affordable and reliable student system for this category of schools was identified. In the existing system, managed by the Department of Education, each school is expected to run a stand-alone copy of a system called SA-SAMS, which is installed on a computer in the school. This places under-resourced schools at a disadvantage, because they lack the resources for this. In contrast, Cloud SAMS allows all schools to securely and privately share one copy of the system maintained in the cloud. Apart from the fact that Cloud SAMS supports all the functions currently supported by SA-SAMS, it brings on board the benefits of being in the cloud (low cost, faster implementation and resilience to failures). Furthermore, Cloud SAMS is fully accessible anywhere and at any time, provided that a school has an internet connection. Although Cloud SAMS has only been implemented in five schools, plans are in place with the Department of Education, the IT Hub and private organisations to ensure that more schools come on board.

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FACUTLY OF HEALTH AND ENVIRONMENTAL SCIENCES

WHEELS OF HOPE PROJECT

Grade 10 to12 learners in schools situated in Bloemfontein, Welkom, Bethlehem and Kimberley are screened for Rheumatic Heart Disease (RHD). During each visit, the following data is recorded: Anthropometric measurements, echocardiography results, blood pressure, and O2 saturation.

A total of 1 015 learners between the ages of 16 and 18 years old were screened. Normal echocardiograms were observed in 943 learners, while 72 echocardiographic images with suspected abnormalities were referred to a pediatric cardiologist for review. The cardiologist identified 42, abnormalities and referred 22 learners to the Universitas Hospital for follow-up examinations. The 22 learners were referred for hospital follow-up for the following conditions: Seven of the learners were examined for RHD, seven for tricuspid/pulmonary incompetence, two for pericardial effusion, two for mitral valve prolapse, two for left ventricular hypertrophy and hypertension, one for sub-aortic stenosis, and one for dysrhythmias (tachycardia).

The seven RHD cases that were detected translate to an RHD prevalence rate of approximately 6.9 per 1000 learners. The team screened 413 learners at 12 schools in Bloemfontein; 191 learners at four schools in Kimberley; and 216 learners at five schools in Welkom. At the time of this report, the programme had screened 191 learners at a single school in Brandfort. The proportion of learners with abnormalities, out of all the learners that were screened in that specific town and its surrounding areas, is higher in Brandfort than in the other three regions (Figure 3). The proportion of learners with abnormalities was below 2% in Bloemfontein, Welkom and Kimberley, in contrast to 5% in Brandfort. However, it is important to note that, to date, only one school has been screened in Brandfort.

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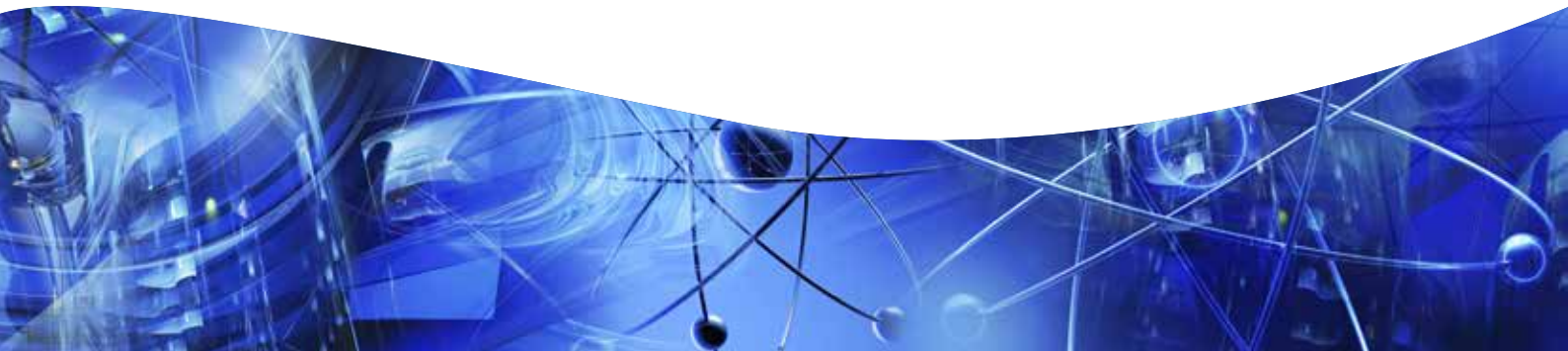

LUCKHOFF FARMERS' MENTORING PROGRAMME

The objective of this project is to mentor young Participatory Development Initiative (PDI) farmers on a farm in the Luckhoff area towards sustainable sheep and cattle production that will ensure financial rewards for them over the long term. Areas of intervention include:

- Sheep breeding and selection;
- Cattle breeding and selection;
- Animal health monitoring and control;
- Feeding management;
- Financial management and control;
- Acquisition of inputs and selling of products;
- Pasture establishment and management;
- Water reticulation and maintenance;
- Effective fencing against predators; and
- Job creation.

The beneficiaries were trained to care for the animals (supplementary feeding, camp/ grazing management, dosing, inoculation, etc.), and high fertility and low mortality levels (lambing/calving and weaning percentages) were reached. Animals are marketed in a good condition and at the correct time in order to get the best grade and price from the abattoir and from buyers of weaner calves. The farm experienced a scarcity of water, and as a result, watering points in each camp were established. Secured fences were constructed at strategic places to control predators. Several people (12) have also been employed; thus jobs were created and people's living standards were improved. The PDI beneficiaries also gained sufficient confidence, knowledge and experience to be promoted from upcoming farmers to commercial farmers.

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LIFE SCIENCES STUDENT ORGANISATION

LISSO's membership is extended to students studying in the field of Health Technology at CUT. This organisation focuses on hygiene-related issues. The strategy is on empowering communities through education. Topics of discussion include environmental hygiene, clean-up campaigns, anti-littering, household hygiene, etc.

Project leader: Mr RT Phekonyane

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LERATONG SMALL FARM

The beneficiary of the project is a group of women who do not possess a formal qualification in agriculture. All products produced from the project are retained for family consumption, and excess is sold to the open market at the Botshabelo Civic Centre. A feasibility study was conducted by the agricultural students. The objective is to assist the previously disadvantaged women to successfully manage a smallholder farm. With the information in hand, students assisted with the compilation of a production plan for cucumbers, tomatoes and Swiss chard; marketing; and a business plan. Furthermore, with this information compiled on the farm, during our last visit, we provided the farmer with a list of equipment and materials required to convert the farm into a successful hydroponic farm.

Project leader: Mr Z Khetsha

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RADIOGRAPHY – MEDICAL IMAGING AND RADIATION PROTECTION

This project is aimed at improving public health awareness in relation to the diagnostic modalities available in the Bloemfontein area. The topics include breast cancer, osteoporosis, motivation, stress management, obstetrics, employability, and radiography as a career. The purpose of the project is to expose CUT students to communities and their needs. The project was part of Dr Botha's PhD study. The research project is now completed. An article was submitted and three presentations at national and international congresses were delivered on the results of the project.

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DENTAL ASSISTING

Dental Assisting students are co-operating with external and internal communities, crèches, pre-primary schools and CUT to provide oral health education to pre-primary school children, their parents and their caregivers. Part-time students work in dental practices all over the country. Oral Hygiene students offer education and dental screenings as part of their service learning module, and celebrate Oral Health Month annually during September. Additionally, they also offer their services to CUT students and staff annually.

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SOMATOLOGY

Somatology students provide treatments to patients in the Pediatric Oncology ward at Universitas Hospital. As somatologists, they are well aware of the detrimental effects that cancer and the treatment thereof has on a person's body. Due to the holistic nature and approach within this field of study, students on different levels are equipped with the necessary knowledge and skills to provide a variety of treatments to patients who receive chemotherapy and/or radiation therapy.

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HEALTH AND AWARENESS: HEALTH-RELATED ASPECTS

This is a service learning project that focuses on high school learners and a prison. Drug/ substance abuse is rife in many of these areas. This project focuses on educating learners and inmates on the effects of drugs on their health. Communities are empowered with knowledge on the causes, spreading, control and prevention of different diseases. Rubrics are handed out to audiences that attend the presentation. They evaluate the value and impact of the message conveyed by the presentations. The number childhood pregnancies at schools are reduced, personal hygiene at schools and in the prison is improved, and the high extent of adherence to HIV and TB treatment at prison and in the communities (HIV and TB) are ways to measure the impact of the project.

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DRINKING WATER QUALITY OF DAIRY FARMS IN THE MANGAUNG DISTRICT

CUT, in partnership with the Mangaung Metro Municipality, assessed the suitability of groundwater for domestic use in the rural farming district of Mangaung. A report and feedback session regarding the findings will inform the water consumers of the water quality and the possible health effects thereof. Recommendations to prevent groundwater pollution were also provided. Knowledge and skills in field work and sampling techniques are some of the experiences gained by the students. They engage with the farmers, and provide them with feedback and recommendations to prevent groundwater pollution. They interact with local farmers, gain fieldwork skills and learn sampling techniques.

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WATER QUALITY OF THE BLOEMSPRUIT

CUT is researching the water quality of the Bloemspruit. Industrial pollution is excessive, causing aquatic life to deteriorate. The water and ecological quality of the Bloemspruit were analysed at 12 points along its flow from central Bloemfontein to Kopano Nokeng. This has provided interesting insights into the health status of the stream, particularly the anthropogenic effects thereof.

Project leader: Prof. A Fossey

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WASTE MANAGEMENT IN COMMUNITY ENVIRONMENTS

Waste management studies include the waste provision services and identification of a lack of services provided to residents. Attention is drawn to the shortcomings of the services, which ultimately lead to improved waste services, such as the removal and disposal of waste. Improved waste services will lead to less illegal dumping, which is usually in the immediate environment of the residential areas and informal settlements.

In studies that include improving healthcare risk disposal strategies as well as the development of more economical and environmental friendly equipment, the risk of environmental contamination is decreased and improved health services are provided at rural and small town clinics.

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FACULTY OF HUMANITIES

MAHUU NURSERY SCHOOL

Mahuu is a small village situated in the West of Lesotho. Most residents live in mud houses with cow dung floors. They produce food sufficient for their families.

The problems/needs are many, such as:

- The teacher is under-qualified for formal teaching;
- No running water;
- Improper ablution facilities;
- No hot water;
- The community is poor, and as a result school fees are not paid;
- It is an under-resourced community that only has a small shop and a church; and
- Learners are accommodated at the church.

The following services are to be rendered:

- Empowerment of the teachers at Mahuu;
- Building of a school; and
- Community upliftment.

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BLOEMFONTEIN CRÈCHE WALL MURAL

The Extended Curriculum Programme (ECP) Art and Design students engage with the Bloemfontein Crèche community by designing and painting mural artworks on the school's inner walls. The project aims to repaint existing walls to create a stimulating and positive environment for the children at the Bloemfontein Crèche. The ECP students engage with the community and apply the skills acquired in the Object and Figure Drawing and Printmaking and Painting modules of the curriculum.

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FACULTY OF MANAGEMENT SCIENCES

NATIONAL SCHOOL OF GOVERNMENT EXECUTIVE DEVELOPMENT PROGRAMME (EDP)

The Department of Government Management has been a partner in all three consortia involved in the presentation of the Executive Development Programme (EDP) in different centres in South Africa since 2009. The EDP is one of the high-profile management development programmes of the Presidential Strategic Leadership Portfolio (PSLDP), targeting, for instance, new and aspiring Directors and Chief Directors in the South African public sector. The three consortia are the North-West University, the Vaal University of Technology and Nelson Mandela Metropolitan University. Other individual members of the various consortia include the University of Johannesburg, the University of Witwatersrand, the University of the Free State, Durban University of Technology, and the University of KwaZulu-Natal.

Project leaders: Prof. T van Niekerk and Dr CD Olivier

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STRONGBOW PROJECT

This project is aimed at building capacity within the higher education sector in Ethiopia, particularly in the fields of tourism, eco-tourism and natural resources management. In partnership with the Horn of Africa Regional Environmental Centre and Network (HoAREC) in Ethiopia, training is provided by means of workshops as well as educational and site visits.

Project leader: Dr R Haarhoff

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ENACTUS/RECYCLING PROJECT

ENACTUS is a global, non-profit organisation in partnership with higher education at more than 1 500 universities in over 40 countries. In preparing university students to make a meaningful contribution towards a better world as entrepreneurs and business leaders, ENACTUS challenges students to address real-world economic, social and environmental issues in their communities. As catalyst for the development of leaders who will create a better world through business, ENACTUS provides students with the most relevant and rewarding opportunities to use their leadership abilities to improve the world in which we live.

Assistance was offered as follows:

- Registration of seven small businesses as sole proprieties, with the help of the Small Enterprise Development Agency (SEDA);
- Financial literacy;
- Business management;
- A clean-up daily routine to ensure that the place is environmentally friendly;
- Buy-in of external stakeholders;
- Securing land from Matjhabeng Municipality: Drafting of the plan, concept township plan; and infrastructure design and standards;
- Concept design of the proposed Super Structure;
- Cost estimates,
- Finalisation and approval of the township; and
- Super Structure designs, linking with the Department of Trade and Industry (DTI) in Pretoria.

The following achievements are noted:

- Skills development on the part of the beneficiaries (some owners were trained in tyre handling and repair).
- One beneficiary that works with glass managed to obtain credit worth R5 000 from his supplier, Glass South Africa. In addition to that, his business was registered as one of Harmony Gold Mine's vendors, and he has acquired contracts worth R43 878.42 to supply glass to Harmony Gold Mine.

- Training resulted in the effective empowerment of beneficiaries' understanding of how to cost their businesses' products and services. The life quality and standard of living of some of the project's beneficiaries have changed since the project commenced.
- The Entrepreneurial Day resulted in the creation of business relationships amongst the participants. This resulted in one small business owner from Thabong Industrial Site being awarded a contract worth R13 700 000 from Human Settlement to build 100 houses in Rouxville, with 40 employees working on the project.
- Business has grown as a result the marketing exhibition and activities.

Project leader: Prof. C Chipunza

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MACCAUVLEI LEARNING ACADEMY PARTNERSHIP

CUT, in partnership with the Maccauvlei Learning Academy, offers the BTech: Human Resources Management programme to qualified delegates. These delegates obtained an NQF 5 qualification from the Maccauvlei Learning Academy, as well as recognition of prior learning (RPL), NQF level 6 assessments. The delegates are Middle and Senior Managers from commerce and industry, predominantly in the Vereeniging area. The offering occurs via study schools, block release placement and Blackboard 9.1 online support. Thus far, 166 students graduated since the beginning of the project.

Project leader: Prof. MN Naong

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COURSE IN ACCOUNTING TECHNICIANS (CERTIFICATE AND FURTHER EDUCATION AND TRAINING (FET) ADVANCED)

CUT, in partnership with the Association of Accounting Technicians (AAT), provides learners with basic to complex finance and accounting skills. This partnership addresses the accounting scarce-skill shortage. AAT South Africa offers a practical qualification targeted at all staff levels, from administration to professional accounting positions. The focus of the AAT Certificate and Further Education and Training (FET) Advanced Certificate is to address business needs in terms of basic finance and bookkeeping. Candidates are empowered to perform basic financial and accounting functions.

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SERVICE LEARNING IN RESTAURANT SERVICE

This is a service learning project during which senior students of CUT's Hotel School train learners from selected schools in Bloemfontein and Reddersburg in all aspects of 'waitering' (restaurant service). The schools are Petunia High School, Navalsig High School, Heatherdale High School, Staatspresident Swart High School and Hendrick Potgieter High School. The training takes place under the supervision of a lecturer of the Hotel School. Learners are trained in all aspects of restaurant service, which empower them to work as part-time waiters.

The module has motivated some learners to enroll for the National Diploma in Hospitality Management. In partnership with Protea Hotels, selected learners are granted the opportunity to participate in the Protea Hotels' in-house training programme to start their career in the hospitality industry. This is an amazing opportunity for the learners, as most of them do not have the financial means to study at a higher education institution.

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THABISO SKILLS TRAINING CENTRE (IN PARTNERSHIP WITH CUT)

The centre's aim is to provide the large number of unemployed people in the Goldfields with a sense of self-worth and independence. The project provides skills training for previously disadvantaged people from the Goldfields district, in order to empower them to become self-reliant citizens. The Sector Education and Training Authority (SETA)-approved courses, which take place over four to twelve weeks on average, are presented by trained instructors, moderators and facilitators. More than 300 people are trained in skills such as carpentry, bricklaying, welding, plumbing, computer courses, catering and life skills on an annual basis.

Project leaders: Mr EMB de Freitas and Mr J Swanepoel

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FREE STATE TECHNICAL VOCATIONAL EDUCATION AND TRAINING (TVET) COLLEGES

CUT, in partnership with the Department of Education in the Free State, offers the BTech: Human Resources (HR) Management programme to qualified TVET college delegates. These delegates possess qualifications that are either relevant or irrelevant to their HR position. Some students with qualifications do not have direct admission to the BTech: HR programme. Therefore, they are accredited through RPL to address this gap. The delegates are Middle and Senior Managers from the various TVET colleges in the Free State. The course is offered via study schools, block release placement and Blackboard 9.1 online support (a blended approach).

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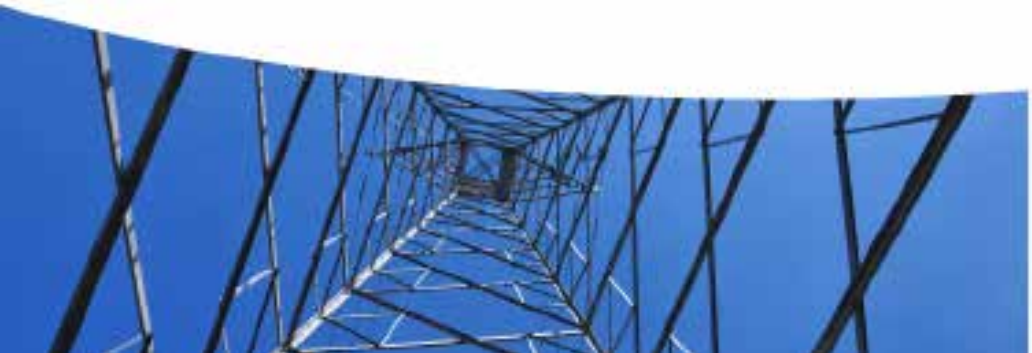

SCHOOLS ADVANCEMENT ACADEMY (SAA)

SATURDAY SCHOOL PROJECT AT THE BLOEMFONTEIN CAMPUS

The SAA offers supplementary tuition to Grade 11 and 12 learners on Saturdays. The main objectives of the project are to:

- Provide content, study skills and examination preparation support in Mathematics (Algebra and Geometry are offered separately), Physical Sciences (Physics and Chemistry are offered separately), Life Sciences, and English;
- Improve learner grades in the above-mentioned subjects;
- Enhance learners' chances of enrollment to Science, Engineering and Technology (SET)-related fields of study; and
- Enhance learners' chances for admission to reputable institutions of higher education, which would otherwise not have been possible.

Extra tuition was offered in the following subjects:

- Grade 11: English, Mathematics (Algebra and Geometry were offered separately), Life Sciences, and Physical Sciences (Physics and Chemistry were offered separately).
- Grade 12: English, Mathematics (Algebra and Geometry were offered separately), Life Sciences, and Physical Sciences (Physics and Chemistry were offered separately).

The successes of the Saturday School project are as follows:-

Learners are better prepared; learners achieve better marks for admission to Science, Technology, and Engineering and Mathematics (STEM)-related courses at higher education institutions; and are also exposed to Engineering-related courses at CUT. A significant number of the learners who participated in the Saturday School project are currently enrolled for SET-related courses at CUT and other higher education institutions in South Africa.

For this initiative, the focus remains on providing content, study skills and examination preparation support in Mathematics (Work of Paper 1 and Paper 2 separately), Physical Sciences (Physics and Chemistry separately), Life Sciences, English, Accounting, and Engineering Graphics and Design. The latter two subjects were introduced in the last


two years due to the large demand identified among the learners, teachers and school principals, who expressed their need for additional support in these subjects.

During the first year of the implementation of the CAPS curriculum, the number of subject distinctions attained was lower than in the preceding years, but generally the learners reached acceptable grades in all the subjects being offered.

Project leaders: Mr GVN de Villiers and Mr BW Jeremiah

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EDUCATOR MENTORSHIP DEVELOPMENT PROGRAMME (EMDP)

This project is aimed at addressing the skills shortage among primary school educators, specifically in the areas of Science, Technology, Engineering and Mathematics (STEM). The focus is on foundation and intermediate phase education. The intention is to develop, empower and mentor educators in the required skills.

The first phase of the EMDP was a two-year pilot project that commenced in 2012-2013, and that was successfully implemented and concluded. The three primary schools that participated in the project were Grassland Primary School, Bainsvlei Combined School and Kamohelo Primary School. The second phase of the project started in 2014, and will be concluded at the end of 2015. Four primary schools form part of this phase, namely Heide Primary, Karabello Primary, Monyatsi Primary and Kgotsofalo Intermediate Farm School.

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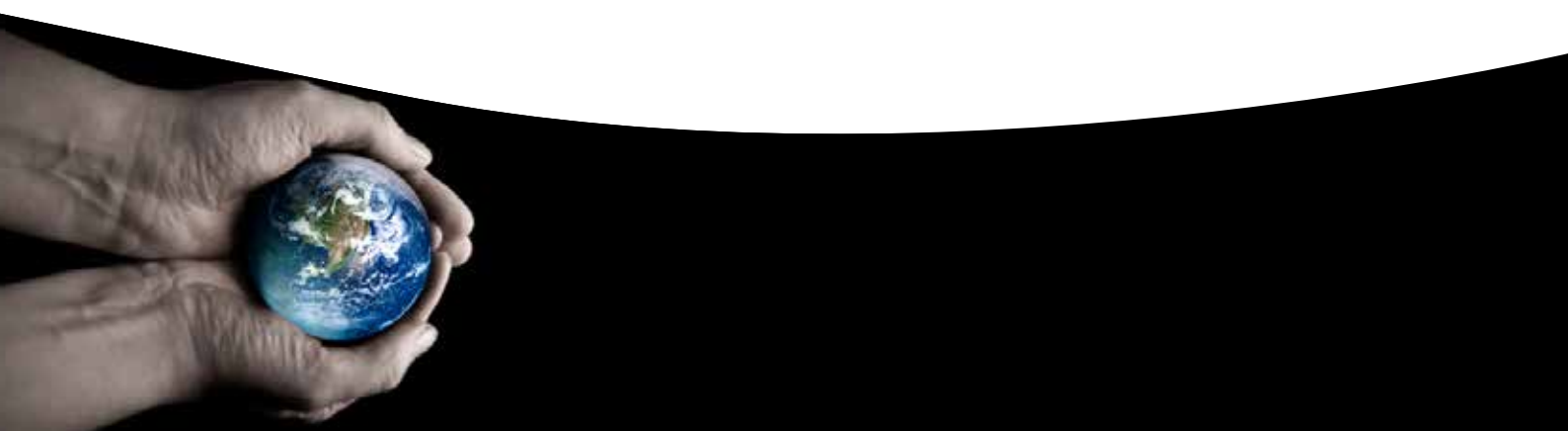

ANNUAL WINTER SCHOOL

The beneficiaries of this project are Grade 12 learners. The purpose of the Winter School project is to assist these learners with the preparation for their final examination. The following subjects are presented in both English and Afrikaans:

- Mathematics;
- Physical Sciences;
- Life Sciences;
- Geography;
- Accounting;
- Economics;
- Business Studies; and
- Engineering Graphics and Design.

The 2013 Winter School was attended by 1 380 learners, while the 2014 Winter School was attended by 1 284 learners from different schools and districts. In 2015, the Winter School was attended by 1 030 learners, which means that there was a decrease in attendance.

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SATURDAY SCIENCE SCHOOL, WELKOM CAMPUS

Third-year Biology Education students are offering extra classes to Grade 10-11 learners. The aim is to enhance the performance of the learners in the following subjects:

- Mathematics;
- Life Sciences; and
- Physical Sciences.

Since the beginning of the project, approximately 600 learners have registered. Due to the success and the positive impact of this project on the learners, the project was extended to Grade11 learners.

Project leader: Mr J Jacob

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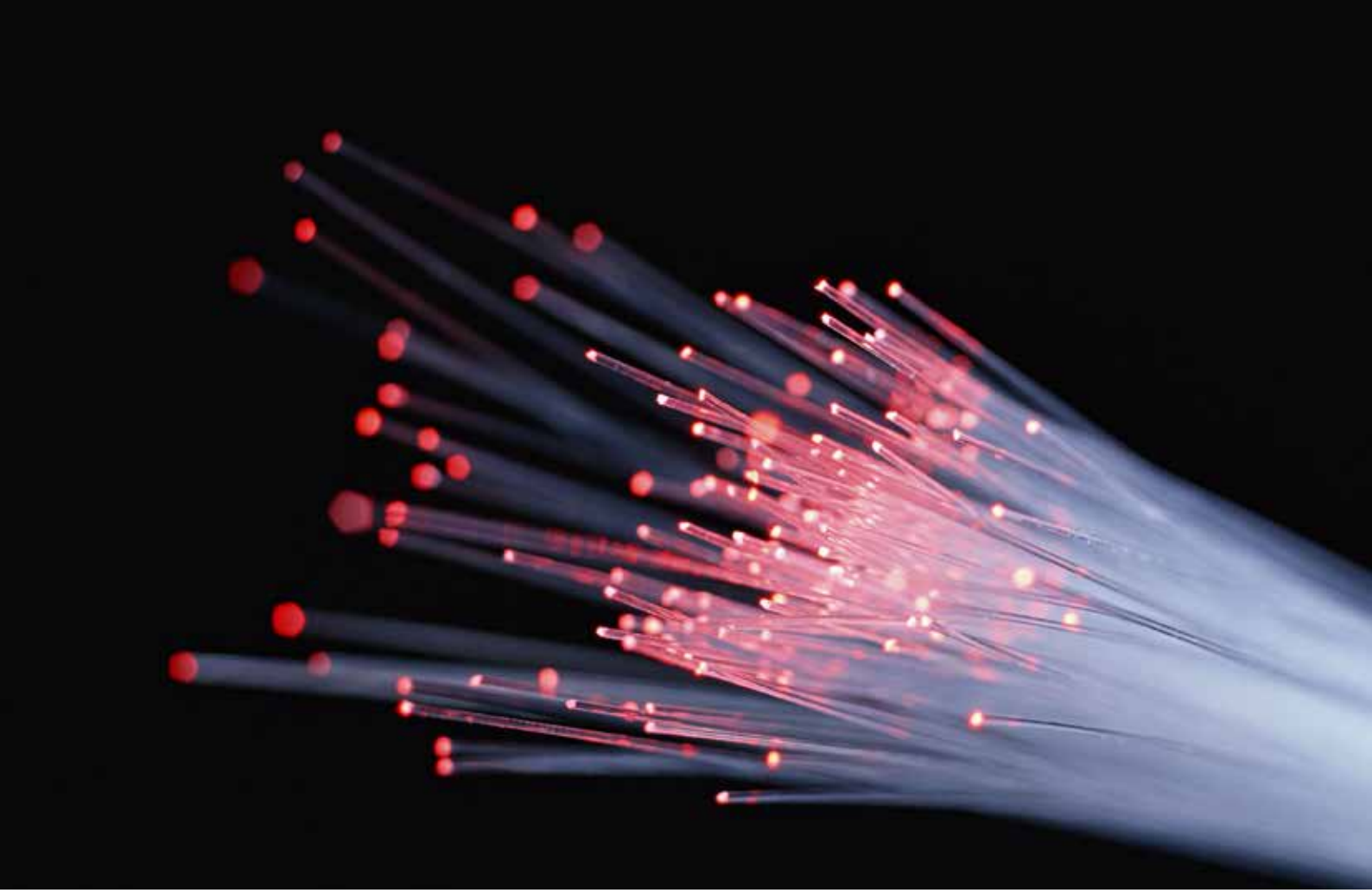

INNOVATION

INNOVATION ACTIVITIES

Most innovation activities currently take place via the Product Development Technology Station (PDTS). Students' main contribution to innovation is arguably by means of the Fabrication Laboratory (FabLab).

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INCUBATION ACTIVITIES

CUT has a relatively small incubator, consisting of nine individual working spaces. These are rented out to new start-up businesses that are preferably developing high-technology devices. The maximum incubation period is normally limited to three years, during which time those companies occupying incubation space are expected to establish their businesses in the protected environment of the incubator. Furthermore, they are expected to attend short courses in business development offered by a suitably qualified member of CUT staff. Business entities participating in the incubator occupy furnished premises, and those that meet certain predefined criteria qualify for subsidisation of their telephone, internet and stationery expenses, while photocopying services up to a specified maximum number of copies per month are provided free of charge.

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ASSISTIVE DEVICES TO IMPROVE LIFE FOR PERSONS WITH DISABILITIES OR RHEUMATOID ARTHRITIS AND OTHER DISEASES

People with disabilities are often among the poorest and the most vulnerable in society. They are often denied access to education and training, which in turn results in a lack of skills necessary for employment. An assistive device opens doors to learning, employment and social participation. There is a tendency to regard people with disabilities as a homogeneous group, all requiring the same type of intervention and the same type of device. The reality is that people with disabilities are as diverse as society itself, with each individual having his/her own unique contributions to make and needs to be met.

Currently, most of the assistive devices in South Africa are imported and expensive, and therefore unaffordable for provincial hospitals. As a result, such hospitals are forced to attempt to manufacture their own devices from the available materials. These devices are not patient-specific, however, and not suited to the needs of all patients. The centre, with the assistance of the Vision 2020 Innovation and Incubation Programme, is embarking on a project to develop a range of devices to support individuals with a range of disabilities.

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THE PRODUCTION OF PRE-OPERATIVE MODELS THROUGH ADDITIVE MANUFACTURING (AM)

Reconstructive surgery involves the repair of an injured or deformed part of the body through surgical procedures. Each reconstruction is patient-specific and requires a unique clinical approach. The final outcome of reconstructive surgery is largely dependent on the surgeon's ability to plan the relevant operation. The better the surgeon is at planning and simulating the procedure, the easier it becomes to approach the surgery with confidence and to avoid mistakes or complications. Currently, surgeons make use of aids such as radiographic film, computer tomography (CT) scanning and magnetic resonance imaging (MRI) to visualise the planned procedure and to guide them through it. However, the use of these aids is limited where complicated procedures are required.

Previous research has shown that AM can be a very useful tool in the planning of surgical procedures. A model of the anatomical feature where surgery is required can be produced in a medium such as nylon polyamide from the CT data of the patient. Having a pre-operative model of the patient considerably shortens the duration of surgery. This benefits the patient by reducing the risk of complications such as infections and excessive blood loss during prolonged surgery. Other advantages include lower costs for the patient and reduced fatigue for the surgeon.

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SUSTAINABLE DEVELOPMENT

SUSTAINABLE AGRICULTURAL DEVELOPMENT PROGRAMME

There is a dire need for the introduction and enhancement of technical levels of production, as well as highly skilled agricultural experts and sustainable agricultural development. A combination of structured, continuous training in technical aspects and an improved level of education are means to attain the goal of sustainable socio-economic development. The objective is thus to ensure food security via agricultural production, along with a sustainable livelihood for farmers, by ensuring a reasonable level of profitability from activities such as agricultural production and/or agri-processing and/or agri-tourism.

The project's impact is highly significant in that historically disadvantaged individuals (HDIs) are converted from developing farmers into commercial farmers, while their socio-economic status is greatly improved. The successful implementation of this project will lead to improved farming sustainability and higher levels of literacy among HDIs, thus creating more jobs and reducing crime.

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THE KAROO RIVIERA: CROSS-BORDER TOURISM DEVELOPMENT PLAN FOR THE MIDDLE ORANGE RIVER

The Middle Orange River system or "Karoo Riviera" incorporates the area ranging from the Gariep Dam to the Vanderkloof Dam. The tourism potential of this area is largely untapped, and due to the wide geographical spread of the Karoo, tourism development is unable to reach its full potential. Development and marketing plans must be addressed at local, district and provincial level, which poses a challenge to tourism managers and policy makers, since co-operation across provincial borders is never easy.

Integrated tourism development as envisaged by local government is inhibited and constrained by demarcated physical boundaries between and within provinces and municipalities in the relevant provinces, thus inhibiting the optimal tourism development of the Middle Orange River system. The objective is to develop a cross-border tourism development plan for the Karoo Riviera.

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RESEARCH

RESEARCH AND DEVELOPMENT

The Central University of Technology, Free State's Research and Development Plan, 2014-2020 was implemented during the first term, 2014.

During 2013 all role-players engaged with Research and Innovation Strategies toward fulfilment of Vision 2020's committed research and innovation outputs. As a result of a two day workshop, a Research and Development Plan 2014-2020 was drafted and approved by Senate in August 2013.

The University's Vision 2020 articulates the four leading principles as: *Sustainable development*, *Socio-economic development*, *Input leading to outcomes* and *Outcomes leading to impact*. Consequently, the CUT's Research and Development Plan aligned its strategies with the four key goals:

- The development of a sustained, relevant and responsive research culture
- The qualitative and quantitative improvement of research outputs
- Socio-economic development through transfer and innovation
- The development of strategic research and innovation partners and programmes

The four leading principles became the main performance indicators of Research and Innovation. This approach corresponds with international best practice in research management.

The focus of all research and development activities is that they result in *outputs*, *outcomes* and impact. The importance of the above mentioned approach is that whilst an enabling environment is created in support of research, the policy directives and management of research are aimed at maximising the *outputs*, *outcomes* and *impact*.

The following plan was drafted:

Focus	Objective	Activity
Scholarly development through Research and Innovation Training	Scholarly engagement with the research process and research cycle	■ Pre Doctoral training ■ Doctoral Training ■ Post-Doctoral training ■ Programme on postgraduate supervision ■ Programme on scientific writing ■ Programme on technology transfer and innovation ■ Annual Faculty Research Seminars ■ Colloquiums and discussion groups
Research partnership development	Capacity growth of research projects	■ Multi-, inter- and trans disciplinary research ■ Joint ventures with national and international universities, research bodies and research councils ■ Joint ventures with Government/ business/industry
Development of research clusters and programmes	Strengthening of research capacity	■ Student retention and throughput ■ Publications ■ Conference attendance ■ Patents ■ Rated researchers ■ Research Funding

The following mainline strategies will support this plan:

Strategy 1: Human skills and potential development

Strategy 2: Structural development

Strategy 3: Intellectual skills development

Strategy 4: Resource development

Strategy 5: Policy support

FLAG HOLDER

CENTRE FOR RAPID PROTOTYPING AND MANUFACTURING (CRPM) AND PRODUCT DEVELOPMENT TECHNOLOGY STATION (PDTS)

ADDITIVE MANUFACTURING (AM) SERVICE TO INDUSTRY AND RESEARCHERS

The CRPM offers state-of-the-art equipment to accelerate the manufacturing of products using a variety of AM techniques, i.e. rapid tooling and rapid manufacturing. This financially self-sustainable activity was established with the assistance of government agencies such as the Technology and Human Resources for Industry Programme (THRIP), the National Research Foundation (NRF), and various industrial partners. These partnerships have played a role in putting the CRPM at the forefront of AM research in South Africa and internationally.

The products delivered by the CRPM serve as prime examples of the efficacy and productivity of the South African manufacturing industry, while simultaneously allowing students – both undergraduate and postgraduate – to engage in work-integrated learning and to gain industrial engineering experience. The CRPM's vast customer base includes local entrepreneurs and international companies, with approximately 500 commercial projects being completed annually. Approximately 8-9% of the annual turnover is spent on the production of research models.

The CRPM has a proven ability to produce pre-operative planning devices and medical implants for reconstructive surgery from the medical scans of patients with deformities or damage due to accidents or cancerous growths.

The process of producing patient-specific titanium implants is a highly specialised field, and CRPM has conducted a number of case studies during the past year. This was done in collaboration with Dr Cules van den Heever, a Prostodontist from the University of Pretoria. He also assists maxillo-facial surgeons as well as ear, nose and throat specialists in manufacturing patient-specific implants and external soft tissue prostheses such as ears and noses, as well as full facial prostheses. Since his involvement with the CRPM, Dr Van den Heever has embraced the possibilities inherent in AM technology to the benefit of his patients.

The CRPM has been in discussion with the various role players to establish where and how the CRPM can use its specialised equipment and expertise to provide a better service to doctors and patients, as well as to play a role in the social upliftment of vulnerable state patients who do not have access to medical aid funds for life-changing procedures.

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CASTING OF ARTWORKS OF LOCAL ARTISTS

The PDTS regularly trains local artists to manufacture silicone moulds of their artworks. This enables them to reproduce their original artworks to sell copies of the work and become economically sustainable. The artists work in different mediums, such as steel-filled plastic and other plastics suitable for casting. By doing this, they are encouraged to investigate how they can produce different looks of the artwork with which they started. About nine artists have been trained thus far.

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MEDICAL DEVICE INNOVATION PLATFORM (MDIP): DEVELOPMENT OF MEDICAL DEVICES FOR RESEARCH AND COMMERCIAL PURPOSES

The primary aim of the Medical Device Innovation Platform (MDIP) is to develop well-manufactured medical implants and devices for use by clinical practitioners in the treatment of patients, keeping in mind that the success of any medical implant is dependent on the overall condition – medical and otherwise – of the patient in question, as well as the nature of the trauma to which a patient has been exposed.

The Medical Research Council (MRC), local clinical practitioners and external private funding agencies are the community partners in this project, with the MRC acting as facilitator of the participating universities. The programme also serves as a funding channel for postgraduate students, especially those from previously disadvantaged groups.

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PDTS SHORT COURSES OFFERED TO STAFF, STUDENTS AND TECHNICAL STAFF FROM INDUSTRY

COURSE IN PLASTICS

The PDTS offers a short course in Plastics to interested staff and students, as well as to technical staff in the industry. The course, which is presented by an expert in the field, provides attendees with a much better understanding of the processes involved in the manufacturing of plastic products, as well as the various uses for plastic. The knowledge gained during the course can be used to advise small-, medium- and micro-sized enterprises (SMMEs) on the use of plastics, thus serving as a form of community industrial support.

COURSE IN WIRE-CUTTING

Working collaboratively in a community partnership with Kopaneng Converters (Pty.) Ltd., the PDTS and CRPM offer a wire-cutting course that teaches participants how to operate a wire-cutting machine and cut the necessary parts.

BASIC COURSE IN SOLID WORKS

The PDTS offers a basic course in solid works to staff and students, as well as to technical staff in the industry. The training includes designing and drawing techniques using computer-aided design (CAD) in 3-D. A person who has completed the course will be equipped with basic skills in solid works, as well as the ability to complete projects within a shorter period of time.

INTRODUCTION TO SKETCHING AND DRAWING

The PDTS is the community partner in the presentation of this course to staff and students, designed to create a better understanding of the use of sketching in the design process and the subsequent involvement in the development of products. Attendees are taught to translate their concepts into sketches before commencing with CAD.

ADVANCED COURSE IN SOLID WORKS

Working as joint community partners, the PDTS and CRPM present an advanced course in solid works, where attendees are trained to work effectively and efficiently in utilising all the

available functions. The course allows attendees to improve their design skills using CAD in 3-D, and to use CAD more efficiently to complete projects in a shorter period of time.

ADVANCED COURSE IN SKETCHING AND DRAWING, INCLUDING RENDERING FROM COMPUTER-AIDED DESIGN (CAD)

This course is presented by an expert in the field, and teaches attendees to make better use of sketching in the design process. Attendees learn the skill of first sketching their concepts before commencing with CAD.

BASIC COURSE IN FINITE ELEMENT ANALYSIS (FEA)

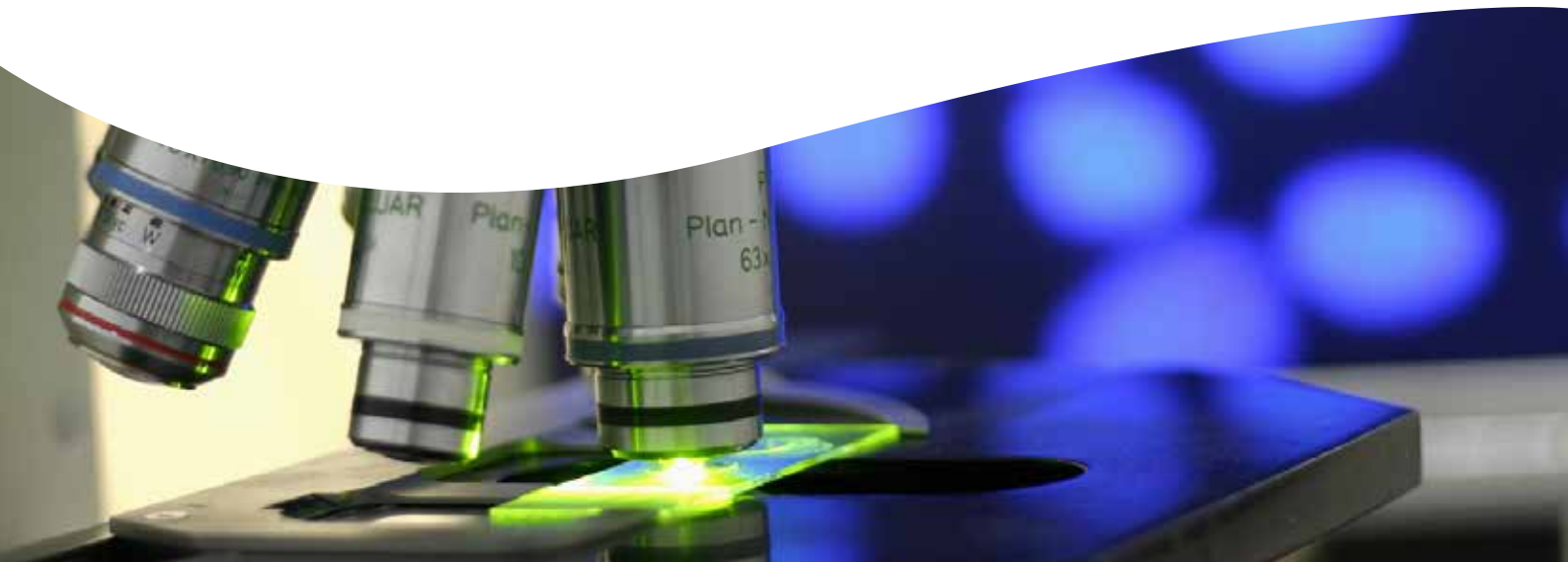
This course is presented by an expert in the field, and has the PDTS as the community partner. It enables attendees to develop a product by means of CAD and to then transfer it to the FEA process, thus ensuring sufficient strength of the product.

COURSE IN TOOL DESIGN

This course, which is offered to students, staff and external participants, provides a better understanding of the tool design and manufacturing process. Attendees are then able to make provision for tooling in their own design processes, thus enhancing their final product.

COURSE IN COMPUTER NUMERICAL CONTROL (CNC)

This PDTS-supported course is presented to students, staff and external participants, providing them with a better understanding of CNC machines and computer-aided manufacturing (CAM) software. Attendees are taught how to write a CNC programme and run it on the machine, and also how to use the machine to cut parts and tools.



SUCCESS STORIES WITH INCUBATION

COMPUTER AND SOFTWARE RETAIL

Another former CUT student who graduated with a BTech in Mechanical Engineering in 2002 is now the owner of a successful computer and software retail business. During his studies at CUT, he was employed as a Student Assistant in the CRPM. After graduating, he entered the CUT Incubation Programme and launched an IT support and computer service and maintenance enterprise, incorporating hardware sales, website hosting, internet service provision, network installations, and the supply and installation of CCTV camera systems. After leaving the Incubation Programme in 2007, he opened an office in Bloemfontein, for which he received support from CUT in the form of subsidised office space, access to office facilities such as a fax machine and photocopier, as well as general office assistance. According to him, the support he valued most was the advice and assistance he received from the Science Park personnel.

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