

NELSON MANDELA
UNIVERSITY



**RESEARCH &
INNOVATION
REPORT
2022/23**



We are Nelson Mandela University

We are **Nelson Mandela University**.

We are the only university in the world to be named after Nelson Mandela.

Our iconic South African statesman, humanitarian and leader is known globally for what he achieved.

We are honoured as **Nelson Mandela University** to carry his name.

In return, we honour our namesake by endeavouring to live his legacy.

We honour him by using his name in full.

We are Nelson Mandela University.

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Research on the journey to Vision 2030

Foreword by Vice-Chancellor Professor Sibongile Muthwa

Strong, impactful research demands perseverance, experience, and foresight. It often involves years of dedication, self-questioning, and relentless pursuit of better solutions. We commend our researchers for their remarkable work and the inspiration they provide to the next generation of postgraduates.

Our University's 10-year strategy, Vision 2030, underscores our commitment as a dynamic African institution to foster research and innovation. Over the past two years, we've seen significant expansion in key priority areas outlined in this report: sustainability science, youth employability, food security, and the digitalisation of education. These endeavours necessitate close collaboration with researchers, citizens, governments, industry, and other organisations.

Fortunately, we've moved beyond the challenges of the 2020/21 COVID-19 pandemic, and there is a growing interest from local, continental, and global partners to engage with Mandela University. We actively pursue these opportunities and have made considerable progress.

In February 2023, our delegation visited the United Kingdom, solidifying partnerships with the University of Sussex and the University of Southampton. Professor Sasha Roseneil, Vice-Chancellor of the University of Sussex, emphasised our shared commitment to creating a better world and pursuing socially just scholarship.

As a socially conscious institution, we have numerous researchers dedicated to addressing real-world issues in Africa. Notable achievements include Professor Paul Watts and his team's work in microfluidic bio-chemical processing, enabling

cost-effective production of vital medications. Notably, in 2023, four South African women earned their PhDs in this field and we salute them: Dr Sibongiseni Gloria Gaqa, Dr Sinazo Nqeketo, Dr Kanyisile Mhlana and Dr Thembela Celia Sonti.

Doctoral and postgraduate researchers play a vital role in advancing research for Africa's Sustainable Development Goals and Africa Agenda 2063. Dr Steven Mufamadi's research in nanomedicine, utilising gold, silver and copper at the nanoscale, shows promise in treating cancer, HIV/Aids, diabetes, and other diseases.

Our report highlights the significant impact of research, often aided by digital transformation. Vision 2030 recognises the essential role of digitalisation in ensuring institutional sustainability and viability. Decreased state funding and a sluggish economy have placed pressure on higher education institutions.

Collaboration is essential, and the Department of Higher Education (DHE) acknowledges the shift to digitalisation, re-allocating funds to include this transformation. It is crucial for learning, teaching, research, innovation, internationalisation, information systems, data governance and cybersecurity.

We are also considering the establishment of a Virtual Academy, designed before the COVID-19 era. This cloud-based campus can accommodate full-time online students, both locally and internationally, with a focus on Africa. Research Professor in Learning & Teaching Cheryl Foxcroft has been tasked with its development, promising exciting prospects in the coming years.

In conclusion, I extend my gratitude to our researchers and academics for their contributions to our University's growth and reputation. Their efforts drive positive change in our world.

Prof Sibongile Muthwa
Vice-Chancellor



“As a socially conscious institution, we have numerous researchers dedicated to addressing real-world issues in Africa.”



Message from Dr Thandi Mgwebi

Deputy Vice-Chancellor: Research, Innovation and Internationalisation

It is with immense pride and enthusiasm that I present Nelson Mandela University's annual Research Report for 2023. Our journey in committing to research excellence, fostering a vibrant research culture and propelling innovation, continues to be deeply entrenched in our core values. The institution's RII vision is to transcend boundaries, be an institution of knowledge supporting flourishing researchers and make a meaningful societal impact.

In September 2022, we inaugurated our Research Week—a hybrid showcase and discussion on research and research culture. There was vibrant participation and collaboration, featuring esteemed stakeholders such as the Department of Science and Innovation, the National Research Foundation, the National Advisory Council on Innovation and the American Association for the Advancement of Science. Local industry, including the automotive sector, Transnet and Coega Development Corporation, also robustly contributed to an engaged event.

Concerted efforts to strengthen a strong research culture have borne fruit, with an increasing number of local and global research partnerships and innovation networks.

Over 2022/23, our international visits fostered collaboration and relationships worldwide, with notable connections including the Australia-Africa Universities Network (AAUN), Global Challenges University Alliance (GCUA) and South Africa Sweden University Forum (SASUF).

The SASUF is pivotal to our global strategy, bolstering ties and synergies in research, education, and innovation with 40 partner universities in South Africa and Sweden.

We are also on a promising trajectory of BRICS partnerships, exemplified by our engagement with Woxsen University in

India, exploring the uncharted realm of the Metaverse—a testament to our commitment to embracing cutting-edge technologies and evolving paradigms.

In keeping with our dedication to sustainability and societal engagement, sustainability science is a priority, encompassing diverse disciplines and underpinned by the establishment of the Institute for Sustainable Futures, affirming our commitment to the United Nations Sustainable Development Goals and the Africa 2063 Agenda.

We have actively participated in global platforms, such as the Global Science, Technology, and Innovation Conference (G-STIC) Rio Conference, representing our country and making significant strides towards the SDGs. The KaziHealth app, a digital solution for teacher health promotion, exemplifies our dedication to transdisciplinary research, aligning with our ethos of societal impact and innovation.

Further sustainability drives include critical areas such as ocean governance, inviting collaboration and dialogue on sustainability, climate change and environmental justice.

Our engineering hub eNtsa has stood as a beacon of engineering innovation for over two decades. In this era of rapid technological advancement, we are embracing digital literacy, AI, and the associated tools, responsibly and ethically.

We eagerly anticipate the University of the future, leveraging technology to advance systems and processes, reinforcing our global digital stage competitiveness in a just, fair and compassionate way.

In closing, I extend my sincere gratitude to our dedicated researchers, faculty, students, and partners for their unwavering commitment to research excellence and societal betterment.

Yours in research excellence,

Dr Thandi Mgwebi

Research, Innovation and Internationalisation



“Concerted efforts to strengthen a strong research culture have borne fruit, with an increasing number of local and global research partnerships and innovation networks.”



Research that awakens

Message from Dr Kwezi Mzilikazi, Former Director of Research Support and Management

A warm welcome to Dr Palesa Mothapo who, from September 2023, took over from me as Director of Research Support and Management. Dr Mothapo was formerly the Deputy-Director: Postdoctoral Research Support at Stellenbosch University. I have moved to Rhodes University as Deputy Vice-Chancellor: Research, Innovation and Strategic Partnerships.

Over several impactful years, our research profile has grown considerably. This includes an increase in the number of research chairs, transformation in research leadership, growth in external research income and an increase in NRF rated researchers. For 2022/2023 we have 12 new applications, and if successful, will increase our NRF-rated researchers to 107.

We've worked closely with the Director of Research Development and the Executive Deans of each Faculty to offer emerging and established researchers the support they need to produce research that makes a difference to our society and world - research that awakens.

After five consecutive years of growth in research outputs, we saw a slight decrease in 2022 compared to the previous year (561.06 in 2022 compared to 580.63 in 2021), but are confident that this will be reversed. We have revamped our Research Publication Management System and strengthened research support to encourage transdisciplinary work.

Transdisciplinary research is not easy, but one triumphant example is the development of 'Principles for transformative ocean governance'. This body of research was led by Nelson Mandela University's Institute for Coastal and Marine Research (CMR), in particular Professor Amanda Lombard, who holds the SARChI Chair in Marine Spatial Planning. It took three years (2020 – 2023) for the group of 21 senior researchers from around the world and across ecological, social, economic, industry and legal disciplines, to develop a set off 13 principles for transformative ocean governance and action.

Our transdisciplinary research focus also increasingly includes industry. The new AIDC-EC Chair, launched in June 2023 in the Faculty of Engineering, the Built Environment and Technology. The Chair partners with the Automotive Industry Development Centre – Eastern Cape (AIDC-EC) in research, innovation and technology projects with an emphasis on advanced automotive and manufacturing product development and production processes.

We are looking at increasing our multi-institutional partnerships with industry, higher education institutions, governments and funders worldwide as part of the drive to be proactive about developing students who will thrive in the future world of work, and to find solutions to the United Nations Sustainable Development Goals (SDGs).

Sustainability underpins Nelson Mandela University's research ethos, and we have numerous projects focusing on this. The Department of Chemistry, for example, is part of a three-year international project that started in October 2022, aimed at greening LPG fossil fuel gas in southern Africa.

Our relationships with German and Swedish higher education institutions and funders have remained particularly strong and we are working on a number of European Union-funded projects with other African and European countries.

A notable growth area for the University is the revitalisation of the Humanities, with increased funding for research under the leadership of Executive Dean Professor Pamela Maseko. An important milestone was the launch of the Dr Brigalia Bam Foundation Archive at our University in 2023.

In Dr Bam's words, it is a space where "we can revive our spiritual energies to bring about change for all of us. In Zulu we say 'ukuzihlaziya', or, as we say in the church movement, 'imvuselelo' – it means the great awakening or reawakening."

In conclusion, as we move forward into the next year, it is our intention to continue our research across all fields in the spirit of a great societal awakening.



“Concerted efforts to strengthen a strong research culture have borne fruit, with an increasing number of local and global research partnerships and innovation networks.”





A University for all

Message from Dr Priscilla Mensah, Director: Research Development and
Acting Senior Director: International Office

Nelson Mandela University aspires to provide an environment that encourages and supports a vibrant research, scholarship and innovation culture.

The Office of Research Development contributes to enhancing access and success for postgraduate students through funding for scholarships and research capacity development interventions. During the 2022 academic year, 169 NRF scholarships were taken up by 61 honours, 51 master's and 57 doctoral students. In addition, 591 Postgraduate Research Scholarships went to 234 honours, 242 master's and 115 doctoral students.

Postdoctoral and Research Fellows contribute to impactful research at Mandela and over the review period, 132 postdoctoral fellows were supported with funding from the NRF, Council and other sources at a combined investment of R14.4-million. Through the University Capacity Development Grant (UCDG) funded by the Department of Higher Education and Training (DHET), nearly 100 workshops offered valuable skills to over 300 staff and 800 students.

As part of its strategic objective to promote long-term sustainability through strategy-aligned resource mobilisation and responsible stewardship, the University has leveraged funding from the NRF and DHET to ensure that academic staff receive the support and training needed to attain higher degrees. Through the Black Academics Advancement Programme (BAAP), seven staff members were funded in 2022 to pursue their doctoral degrees or postdoctoral research. The NRF's Thuthuka programme has been funding emerging researchers for over a decade, with 17 grant-holders in 2022. The Nurturing Emerging Scholars Programme (NESP), launched in 2019, is currently in its second phase and the University has been allocated 6 NESP positions, two of which have already been filled.

The 2022 nGAP cohort at Nelson Mandela University consisted of 17 Black academics, of whom 10 are women. Targeted funding to support emerging academics is also offered through the Nelson Mandela University Internal Research Grants, which comprised the Conference Travel Fund (CTF), the Teaching Relief Grant (TRG) and the Research Development Fund (RDF). During the 2022 academic year, 18 CTF, 10 TRG and 10 RDF awards were approved at a combined investment of R1.2-million. Of the 38 grant recipients 23 (61%) are Black and 26 (68%) are women.

A key Internationalisation Strategy goal is to ensure active recruitment, enrolment and presence of international students on campus. A total of 1039 international students enrolled in 2022. Thanks to eased post-pandemic travel restrictions, the International Office hosted 136 inbound study abroad students from several countries.

It is encouraging to see Nelson Mandela University's visibility on international platforms continue to grow through networks, alliances and associations. These include the Global Challenges University Alliance (GCUA), the Sustainable Development Solutions Network (SDSN), and the Association of African Universities (AAU). Staff also participated in the GCUA mentorship programme and International Education Association of South Africa (IEASA) Directors forum and Conference.

Over the review period, Nelson Mandela University established partnerships and agreements with institutions spanning five continents: Africa, Asia, Europe, North America, and South America. The distribution showcases a predominance in Europe (39%), followed by Africa (31%), Asia (19%), South America (8%), and North America (3%). We also launched the Africa Engagement Programme, a visionary initiative that traces the footsteps of Nelson Mandela across the continent and serves as a catalyst for heightened partnerships with other African universities.



“It is encouraging to see Nelson Mandela University’s visibility on international platforms continue to grow through networks, alliances and associations.”

Message from Dr Nqobile Gumede

Director: Innovation Office

A strategic priority of Nelson Mandela University is to create and sustain an environment that encourages, supports and rewards a vibrant research, scholarship and innovation culture. The Innovation Office executes several programmes and services targeted at both students and staff, to encourage innovation and facilitate the translation of research outputs into products and services that have national and/or global societal benefit. Some 2022/23 innovation highlights are shown below:

Innovation Ecosystem Growth: Over the past year, our University's innovation ecosystem has continued to expand and foster a culture of vibrant innovation and entrepreneurship. In 2022, we hosted the first University TEDx event, TedxNelsonMandelaUniversity, a groundbreaking and inspirational gathering providing a platform for innovative and thought-provoking ideas.

A diverse line-up of speakers covered several fascinating topics, from the bioeconomy in Africa to South Africa manufacturing critical drugs for the continent. Speakers included [Prof Paul Watts](#), [Dr Judy Dlamini](#), [Mike Abel](#), [Prof Margaret Cullen](#), [Daniel Ndimba](#) and [Dr Phiyani Lebea](#) and the videos can be viewed on the [@TEDx](#) YouTube channel.

Overall, our first TEDx event was a resounding success, showcasing the power of ideas and the importance of creating spaces for open and inclusive discussions.

Patents and commercialisation of intellectual property (IP): In 2022, the University, through its subsidiary Innovolve, concluded one of its most significant technology licensing agreements to date, enabling a South African small and

medium-sized business to enter the renewable energy sector. Our team also continues to work closely with researchers to identify and protect intellectual property arising from their work, and to explore commercialisation opportunities through the formation of spinout companies and licensing of intellectual property generated. Overall, we are proud of the progress made in technology transfer at Nelson Mandela University, which includes the licensing of Active Pharmaceutical (API) manufacturing intellectual property and of intellectual property related to the production of solar grade silicon.

Startup Incubation: Propella business incubator has provided vital support to start-ups founded by staff, student and Gqeberha resident entrepreneurs. At the beginning of 2023, Propella graduated ten ventures focusing on technologies with an industrial application such as prosthetic engineering technologies, innovative dental solutions, and innovative aquaculture systems. This was after completing a three-to-four-year business and technology development industrial incubation .

I am grateful to the University community and our partners for their unwavering commitment to our research and innovation efforts. We also appreciate the innovation support received from the National Intellectual Property Management Office (NIPMO), and the Technology Innovation Agency (TIA), which enabled an increase in critical innovation capacity and technology development.

Over the past three years, NIPMO has funded two positions in our office, contributed to operational costs and supported us through various funding initiatives. During 2022/23, TIA has, inter alia, provided funding of about R2-million for three new projects: green hydrogen production, recovery of precious metals from waste and PV modules reuse.

We must acknowledge the challenges that continue to shape our journey, including sustainable funding, strategic protection of intellectual property, the complexity of globalising our innovations and the imperative of inclusivity. However, our collective determination is a given – we shall continue to overcome obstacles to advancement.



“Over the past year, our University’s innovation ecosystem has continued to expand and foster a culture of vibrant innovation and entrepreneurship.”



Eight Years of Innovation, Incubation and Entrepreneurship

Message from Masakhane Mlamba, Centre Manager: Propella

In January 2023, Propella was honoured as the “Incubator of the Year” at the Africa Startup Ecosystem Builders Summit and Awards. This remarkable recognition reflects Propella’s constant innovation and driving of impact projects with the support of its shareholders, partners and funders, as well as the amazing entrepreneurs who have chosen Propella as their launchpad. It is also testimony to the culture and collaborative spirit that has been established within the incubator ecosystem.

In 2022, Propella achieved eight years of making a positive impact in the entrepreneurial ecosystem, with 240 businesses incubated (89 from Nelson Mandela University), 80.7% black owned, 71.7% youth owned and which have collectively created over 1670 jobs opportunities, laying the foundation for a brighter tomorrow for our communities.

Propella has run workshops for over 5347 participants since its founding in 2015, with the goal of empowering young business owners to grow, develop their ideas and transform them into successful businesses. In 2022/23 more than 1400 participants completed the workshops, which address a wide range of topics, including funding and compliance, reinventing your business, pitching 101 and youth in entrepreneurship.

Propella continues to reinvent and innovate its incubation approach to increase its reach and to tap into new territories. One example is the recent collaboration with the Kouga Windfarm Community Development Trust in Kruisfontein, Eastern Cape, a community with high levels of socio-economic challenges. Propella recruited tech-savvy youth who participated in a Hackathon and Design Thinking workshop focusing on designing community safety solutions. The overall workshop was a success, and the participants were able to set up a platform for their own development, naming it The Humansdorp Youth Development Forum.

In terms of industrial ventures, in 2022/23, Propella’s three-year journey with 10 industrial ventures reached completion

on 5 May, when we graduated them to pre-commercial status. These ventures operate in a variety of sectors including renewable energy, healthcare, waste management, smart water management, manufacturing and construction. They have proven to be innovative, environmentally-friendly and socially beneficial, making them promising contributions to their respective industries, including patents. Respective industry leaders have mentored and supported them through the Propella incubation network.

With new projects on the horizon and a thriving network of entrepreneurs, startups, mentors, shareholders and funders, Propella is gearing up for another year of transformative growth and impact within the start-up community.

Propella extends a warm invitation to business owners, funders and partners to join this exciting journey and to help shape the future of innovation for many years to come.



Digitalisation

The rapid shift to digitalisation is sending waves of change across Africa, with technology impacting every aspect of our daily lives, from education to banking.

As the continent's researchers and policymakers negotiate uncharted waters, they are always mindful of placing people at the forefront of innovation: the digital age should help, not hinder, humanity.

**"It only seems impossible until
it's done."**

– Nelson Mandela

Inhuman touch

Artificial intelligence in war and patient care is not a magic bullet

Robot nurses, pets and soldiers are no longer in the realm of science fiction – but ethical issues surrounding artificial intelligence (AI) must be boldly confronted before allowing Western technology free rein on the African continent.

In his doctoral thesis, “Robots and Dignity from an Afro-Communitarian Perspective”, Department of Philosophy lecturer Karabo Maiyane explores the challenges around the development and use of AI, specifically in terms of how it affects the dignity of people who use it, or for whom it is used.



“Imagine a nursing home that is completely operated by robots,” he says. “How would this environment be for the patients in that environment?”

“Those in favour of technological products say that the system would run efficiently, with fewer mistakes or corruption. However, if you asked the patient in that environment, they would probably say that care was impersonal and ‘cold’.”

For people in medical and care settings, there is a direct correlation between care and the human provider, believes Maiyane.

“The main motivation for my research on the ethics of artificial intelligence is to conscientise our regulators and users about the dangers and benefits of emerging technologies.

“Hopefully, this is timely, in order to develop and implement risk mitigation processes.”

Care and conflict

Maiyane is investigating the need and demand for dignity in two specific settings: medical and care environments, and war or conflict zones.

The right to dignity, and how it presents itself in these two arenas, is an integral aspect of understanding the impact of AI.

Because needs vary – an elderly dementia patient, for example, might need a human caregiver, while a child with severe autism might benefit from a robot pet – he researched which technologies would positively enhance dignity.

“Human dignity refers to an intrinsic value that a person has,” explains Maiyane. “We cannot put a price on it – that is why treating any person as a means to an end is morally wrong. People are ends in themselves, and respect is the only treatment worthy of such a value.

“That is why human rights are universal and equal to all people. Many people agree with this definition of human dignity. However, there are different demands for fulfilling this need in both the care and conflict spaces.”

Will technology take away your job?

A major challenge presented by AI is that one line of computer code is able to do what 10 000 human professionals do, according to Maiyane.

“Such technologies may affect labour-intensive environments because of technological optimisation. And the jobs that it creates do not measure, in scale, to the ones lost.

“Low-skilled jobs, such as those in agriculture and manufacturing, and quantitative, data-based jobs in human resources, accounting, law, the banking sector and insurance could be in danger,” he says.

“Essentially, any quantitative employment that can be templated, or run through a programme, is at risk.”

In a care environment, for example, cleaning a patient who has soiled themselves enhances their dignity, because doing so makes them feel less humiliated and more comfortable.

Erosion of dignity, however, would be tying up a bed-bound patient with restraints, forcing them to take medication, with the excuse that they are “hostile”.

“In conflict spaces, killing a combatant is considered morally permissible, while torturing or parading their corpses is not. Torturing combatants and inflicting pain to solicit information undermines their dignity because this can be construed as treating the combatant as a means to an end.”

Focusing on the African continent is integral to Maiyane’s research. “Many technologies that we use in our day-to-day lives are not created with us – Africa – in mind. They are developed in America, Europe and China and then dumped in Africa.

“Our legislators always have to play catch-up with regulations, and by the time they get that right, the damage is already done.

“Consider the introduction of the World Wide Web and the dangerous consequences of unfiltered information – or

the disruption of our transport infrastructure by e-hailing applications,” says Maiyane.

Aspects such as the risk of unemployment, and impact on traditional care practices among African families, are key in how we should respond to technology’s quick-step march on the continent, he maintains.

The good and the bad

Maiyane sees both pros and cons in AI technology on the continent, but feels that governments and policymakers need to be acutely aware of the negatives.

Obvious AI advantages include assistance with mundane, daily tasks, such as robots carrying patients, taking them to toilets, filling prescriptions or setting reminders for medication.

“Even Paro, the robotic pet seal, is beneficial – recent studies show that it helped reduce anxiety among users. I would also like the benefit of a pet without having to care for it in the conventional sense.”

In conflict areas, the use of Unmanned Aerial Vehicles (UAVs) has been found to be effective in tracking and targeting transgressors, thus helping warring parties to avoid a full-scale invasion that could be costly in human and financial resources.

Critically, though, a major danger, especially in Africa, is overuse and under-regulation, Maiyane cautions. Problem areas in care and conflict spaces include:

- Robotic effectiveness may lead to negligence by both caregiver and the family
- Over-reliance on assistive technologies can result in caregivers “slacking off”
- High-quality robotic care could lead to family investing less time in a patient, resulting in a sense of abandonment
- In war zones, it has been argued that the ease and convenience of automated targeting has increasingly whetted the appetite for conflict, particularly because of the lowered human cost of going to war, thanks to technology.

Tread with caution

For Maiyane, research reveals a clear difference between human-operated and independent AI technology.

“Any instrumental use of technology does not pose serious threats, because humans operate it, with direct or proximal consent. I’m fearful of technology where even discretionary capacities are outsourced to technology.

“If a supermarket is fully operated by AI, I probably won’t use it. But I do enjoy ordering from a screen at McDonald’s.

“I think that there is a lot we can gain from the use of AI technologies in many domains – but we stand to lose more if this use is unregulated and not put rigorously under the microscope every step of the way.”

Statistics save lives

Research helps overstretched hospitals to make best decisions for vulnerable patients

A predictive scoring system aimed at improving treatment of intensive care unit (ICU) patients at Livingstone Hospital in Gqeberha may become a national gold standard, assisting medical professionals with making informed choices in critical situations – particularly in public healthcare settings.

Dr Sisa Pazi’s research culminated in a statistical model for assessing disease severity at ICU admission, which could also be used to predict in-hospital mortality.

The predictive scoring system uses patient information, such as age, and several other variables to obtain a numerical value, or score, for each individual at ICU admission. The higher the score, the more ill the patient; this score is then used to estimate the risk of in-hospital mortality.

A Department of Statistics lecturer, primarily responsible for teaching, research and engagement, Dr Pazi was the statistical consultant for the research project, which began in 2017, spearheaded by Livingstone Hospital’s Adult Critical Care Unit head, Dr Elizabeth van der Merwe, and Mandela University Department of Statistics Associate Professor Gary Sharp.

“Their plan was to collect a large database of patient information, which could be used for various interdisciplinary research projects. Prof Sharp then approached me to be statistical consultant, with a view to collecting data for a doctoral study,” says Dr Pazi. The resulting paper, “Prediction of in-hospital mortality: an adaptive severity-of-illness score for a tertiary ICU in South Africa”, encapsulated the research for Dr Pazi’s doctoral thesis.

Pioneering research

Several other papers have been published, but the umbrella topic, “Sustainable Critical Care: Biostatistics Empowers Life-Enhancing Decisions”, encompasses all the work done, according to Dr Pazi. “It was part of a broader interdisciplinary



“I wanted to use maths to solve real-world problems”

Born in East London to a domestic worker, Sisa Pazi was raised by his grandmother, Mavis Ndaró, who he describes as a “superwoman”.

Mathematics was Dr Pazi’s favourite subject at school, and he always knew that he wanted a career in numbers.

“I enrolled for a BSc at Nelson Mandela University in 2011. After learning of career opportunities in the field of statistics, I knew that as a statistician, I could use mathematical tools to solve real-world problems.”

Dr Pazi majored in statistics and applied mathematics, earning his BSc and MSc in 2015 and 2017 respectively, and graduating with his PhD in Mathematical Statistics in April this year. He also serves as a South African Statistical Association member, involved in facilitating bursaries and scholarships for undergraduate statistics students in South Africa.

Married to Sinoyolo and father to Zingce, 13, and one-year-old Lucwangco, he credits his mentors – grandmother Mavis Ndaró, sisters Noluthando Pazi and Unathi Faku, and Professor Gary Sharp – with putting him firmly on the path to finding solutions through statistics.



research project, which culminated in five research manuscripts, published in DHET-accredited journals, and six conference presentations.

“This is the first attempt to develop a predictive scoring system based on South African data. The purpose of the system is to identify high-risk patients who can then be treated with the urgency required. This aligns with a patient-first approach.”

Livingstone ideal location

The choice of Livingstone Hospital for a research project of this nature was fortuitous. “The timing aligned with Dr van der Merwe’s – and others’ – need to broaden research, and the plan by Mandela University to start a medical programme,” says Dr Pazi.

“Statistical skills in the health sciences are highly specialised, and this offered an opportunity to bridge that gap.”

Studies quickly showed how beneficial a predictive scoring system is, positively impacting both medical professional and patient.

“Predictive scoring systems are useful for standardising research and comparing the quality of ICU patient care. Additionally, for resource-constrained populations such as the South African public healthcare sector, predictive scoring systems are useful in facilitating triage guidelines,” Dr Pazi explains.

The system was initially developed using patient information from outside the African continent, and then tested at Livingstone Hospital.

“Although we found that it was adequate for use, it was clear that there was room for improvement. The current research paper then proposed a revised model based on data collected at Livingstone Hospital itself. This model can now predict in-hospital mortality with higher accuracy, allowing high-risk patients to be identified for urgent interventions.”

The chatbot revolution

Banking sector shaking up customer service with AI technology

Spurred on by the COVID-19 pandemic, South African banks are shifting to chatbot-assisted customer service at a rapid rate, in line with global trends. Will clients accept the transition from human interaction to being served by a robot? Customer service in banking has changed radically, with the traditional face-to-face relationship with a trusted bank manager being replaced by modern banking technology and a creep towards a cashless society.

Marketing Management Head of Department and Associate Professor Felix Amoah and his master's student, Christabel Rusike, investigated the factors influencing consumers' adoption of chatbot-driven marketing activities in the local banking industry.

"The digitalisation of society has been one of the most important processes to have happened over the past three decades," says Prof Amoah, who supervised Rusike's research. "The importance of this process increased significantly during the COVID-19 pandemic.

"The innovation of automated customer-centric ecosystems has enabled the introduction of new business processes and models in banking."

These include the emergence of cashless transactions (credit and debit cards), automated teller machines (ATMs) and banking apps for smartphones and computers.

"Banks are shifting from a labour-intensive approach to business to using machines, robotics and artificial intelligence instead."

The evolution of banking

AI is shaping the way business operates in the 21st century, with most banking services now digitalised.

Services such as online and mobile banking and cashless transactions have been embraced by consumers, and have led

to seamless banking, in which consumers perform their banking needs without interrupting their convenience or comfort.

"For marketing purposes, digitalisation is a gift: it enhances omni-channel marketing by boosting digital engagement with consumers and providing digitalised solution strategies," says Prof Amoah.

The digital divide

"The COVID-19 pandemic not only fast-tracked the transition to a digital economy, but also made digitalisation a 'life pulse' that promotes better quality of life, business survival, growth and connectivity," says Prof Amoah.

However, inequalities and digital inclusivity are flashpoints, particularly in the sustainable development sphere, and Prof Amoah and Rusike conducted multi-stage research on critical areas needing more attention from government, policymakers and business.

These included inequality of opportunities in the digital space, challenges facing ICT use among SMMEs, the adoption of digital financial technologies and barriers to digital financial inclusion for sustainable development.

"The outbreak of COVID-19 exacerbated existing digital inequality, as the vulnerable became even more vulnerable, and are now deprived of fully engaging in the 'new normal' driven by digital technology.

"Africa remains the most affected, as over half of its population, due to inequality of opportunities, is still without ICT, internet connection, access to, or participation in, the digital-driven economy," Prof Amoah concludes.





Professor Felix Amoah

“Through customer engagement and digitalised solutions, organisations help develop loyalty and trust that further leads to personalised relationships, enabling new product innovation and opportunities for integrating multiple products and services to meet customer expectations.”

“How may I help you?”

The use of chatbots has emerged as a new platform in recent years, with banks utilising them to engage with customers in a meaningful and productive manner, according to Prof Amoah.

“However, compared to mobile apps and social media platforms, chatbot adoption within the banking sector has not attracted many customers.”

This led Prof Amoah and Rusike to investigate the factors that influence the adoption and acceptance of chatbots within the South African banking industry.

The study also outlined what a chatbot is: an artificially intelligent (AI) conversational agent, commercial tactic or self-service technology that simulates human-like conversation and allows users to type questions which, in turn, generate meaningful answers to these questions.

In simple terms, it is a computer programme that allows humans to interact with digital devices as though they were communicating with a flesh-and-blood person.

The study identified eight factors influencing consumers in their decision to adopt chatbots in online banking:

- Relative advantage
- Perceived ease of use
- Perceived usefulness
- Facilitating conditions
- Price value
- Hedonic motivations (emotional, fun or experiential benefits)
- Social influence
- Perceived compatibility

“Exploring these factors as part of ongoing research would ultimately assist banks to position their offerings more attractively and productively, and help customers to articulate their own needs,” says Prof Amoah.

Who is the winner in digital banking?

While clients appear slow to embrace the perceived ease, speed and functionality of chatbot-based customer service, Prof Amoah says that the study aims to assist both banks and customers by helping the sector to formulate strategic interventions to boost use of chatbot platforms.

“Understanding how such a key functionality is received by consumers helps to enhance the online services offered by the industry.”

Sustainability

At Nelson Mandela University, sustainability involves social, economic and environmental areas, within and across academic disciplines. The University aligns its research with the UN Sustainable Development Goals, and in June 2023 was ranked highly in Quality Education (SDG4), Life Below Water (SDG14) and Life on Land (SDG15) at this year's global THE ranking awards. Furthermore, co-creating a sustainable, socially just world is a core outcome of the University's Vision 2030.

“When the history of our times is written, will we be remembered as the generation that turned our backs in a moment of global crisis or will it be recorded that we did the right thing?”

– Nelson Mandela

Cooking up fine art in the kitchen

Novel approach to printmaking uses eco-friendly and inexpensive materials

Not only the culinary arts are cooked up in a kitchen, with Nelson Mandela University academic Jessica Staple creating fine art prints using common household grocery items.

The printmaking lecturer in the Department of Visual Arts has been experimenting with and developing the mark-making technique known as planographic printmaking.

“The materials are very basic, like lemon juice, Holsum vegetable fat, green Sunlight soap, Maizena, candle wax and tin foil,” she says. Even fizzy cola soft drink comes into play.

Staple’s research explores low-cost, accessible and more ecologically friendly printmaking methods.

This builds on the existing work of other artists in this area of fine art printmaking, including French artist Émilie Aizier, who created the technique known as Kitchen Lithography, and the Lemon-Etch Litho of US-based Muskat Studios.

Staple says that many artists had modified Kitchen Litho and come up with a variety of methods that worked to a greater or lesser extent. Now Nelson Mandela University has put its own unique artistic spin on the process.

“We have attempted to address these issues with a technique that allows for a wide range of mark-making and does not require a press,” says Staple.



Jessica Staple

However, despite the low-tech nature of the process, there are still many variables at play. Staple spent two years focusing on researching the technique.

Stunning showcase

She exhibited the results of this work at her solo exhibition *On The Drawing Board* in April 2023 at the University's Bird Street Art Gallery.

"This exhibition is the result of a love for printmaking, drawing, problem-solving and the people around me," she says.

"The works displayed showcase progress and a selection of the best of what was produced during that time, including drawings, plates and prints.

"For the time-being, I am calling this technique 'Monolitho'. However, the name, like the technique, is not yet perfected. But it is getting close."

Staple taught two earlier versions, more closely aligned to the Lemon-Etch Litho process, as workshops to her university students in 2021 and 2022.

"I am amazed any of those students came back to study printmaking in their third year! However, substantial progress has been made since then and I now have a consistent, predictable, working technique."

This is based on stone lithography, the original planographic medium, as well as more recent developments in low-cost and easy-to-access fine art printmaking.

Affordable art

The potential impact of this research is significant: it provides students with a way to continue to produce prints without access to expensive, specialised products and equipment. For most, this is essential once they leave art school.

"The materials are very basic, like lemon juice, Holsum vegetable fat, green Sunlight soap, Maizena, candle wax and tin foil."



Due to the specialised nature of the original processes, South Africa does not manufacture the materials involved, so they have to be imported.

"I was trying to find a South African-based alternative that was not as expensive," Staple says of her research exploring low-cost, accessible and more ecologically friendly print making methods.

"It is non-toxic and also uses very little water relative to the other printmaking methods, and most of the materials are recycled."

Her other love – drawing – helped to prepare her for the "more unforgiving" planographic printmaking process, where erasure is not possible, and speed is called for.

"Once the mark has been made on the tinfoil plate, using a greasy drawing tool, it cannot be removed. In this there is 'honesty' and it forces you to really pay attention to who or what you are observing."

The Stellenbosch MA Visual Arts (cum laude) graduate is also co-director of Black Ink. Collective, a group of printmakers, educators and artists who are committed to effecting change within local communities.

Off-grid power and water project shows engagement in action

Renewable energy research benefits Riemvasmaak community

An ongoing Nelson Mandela University research project in one of the hottest, driest parts of the country is showing the power of renewable energy to change lives.

There is an overabundance of sunshine at Riemvasmaak in the Northern Cape, about 20km east of the Namibian border, where the University's School of Engineering has been conducting solar and wind energy research.

Run by the School of Engineering's Advanced Mechatronic Technology Centre (AMTC), the project is funded by the Manufacturing, Engineering and Related Services SETA (MerSETA).

The University's Renewable Energy Research Group (RERG) manager, Professor Russell Phillips, outlines the next phase.

"We will return to Riemvasmaak in September to expand the project with the installation of a covered growing area, which will include an aquaponics facility and solar refrigeration for produce," he says.

Aquaponics, a farming technique that combines aquaculture and hydroponics, maximises crop yield but minimises water use. This makes it ideal for the dry conditions found here.

"However, even with electrical power and pumped water, the harsh environment still makes any kind of farming a tough proposition," notes Prof Phillips. In addition, animals and birds cause damage to the crops, although the enclosed growing area will help to address this problem.



The School of Engineering is harnessing the sun through an array of solar panels

RERG has also partnered with the local community and sent members on a sustainable farming course, fostering self-reliance and paving the way for sustainable agriculture.

Blueprint for the future

“The overall aim of these various interventions remains focused on creating a blueprint of a fully sustainable off-grid farming solution for remote locations which can then be rolled out at scale,” Prof Phillips explains.

The project has already led to a supply of power and easier access to life-giving water. It was able, for example, to provide a guesthouse in the area with its first off-grid facility in 2018 in the form of a 1 kW portable solar pumping station.

As part of the ongoing project, a second research site in the Riemvasmaak area has been earmarked for an additional solar pump array as well as future research projects.

Overall, this solar energy project is an example of engineers, as scientists, solving technical challenges, sharing knowledge and contributing to social engagement.

It highlights the effects of climate change on the environment and the ever-expanding role that sustainable and renewable energy can play in increasing food security.

The knowledge exchange for researchers and students is extremely valuable and in the future similar projects may be looked for in the Eastern Cape.

“The overall aim of these various interventions remains focused on creating a blueprint of a fully sustainable off-grid farming solution for remote locations which can then be rolled out at scale.”



Members of the Riemvasmaak community came to Gqeberha to take part in a sustainable farming course

Upping the game to protect ocean resources

Bridge Inspection game advancing the learning experience of Law Enforcement Officers

In March 2023, FishFORCE, the Fisheries Crime Law Enforcement Academy, launched an innovative, educational game aimed at improving the training of Law Enforcement Officers (LEOs).

Fisheries crime is seriously threatening the sustainability of marine resources that are essential for food security, and compromising the rights and income of legal fishing operators, including the small-scale fishers who suffer the most from rampant marine resources poaching.

"The game, *FishFORCE: Bridge Inspection* took one year to develop and is based on extensive research on how to improve the knowledge, skills and performance of LEOs to combat fisheries crime," explains FishFORCE's Chief Operating Officer, Michael de Lange. "The need for it really came to the fore due to the COVID-19 pandemic, but it has since proved itself to be an invaluable addition to our overall training programme."



Michael de Lange

Access to the game is restricted to relevant users in the Department of Forestry, Fisheries and the Environment, South African National Parks, CapeNature, the South African Police Service and the Marine and Ocean Crime Priority Committee (Operation Phakisa) to ensure targeted use.

"Each user's gameplay data is sent to Google's BigQuery analytics where it is formatted into a report that can be used by a FishFORCE facilitator to enhance the learning journey," says de Lange.

The game can be used in any country

"The game design was based on the inspection aspect of the Port State Measures Agreement, and was piloted for South African law enforcement agencies but it can be used by any country, including our partner countries, with whom it has been shared, including Kenya, Mozambique, Tanzania and Namibia," de Lange explains.

FishFORCE: Bridge Inspection utilises digital technology to transform training into a detective experience underpinned

Fisheries crime refers to the full range of serious offences occurring throughout the fisheries value chain both at sea and on land, including document fraud, illegal fishing, human trafficking and corruption.





by fun and curiosity, to advance the learning experience of the LEOs and in this way to enhance their problem-solving skills through critical thinking. It features a virtual simulation environment of inspecting a fishing vessel to ensure it is compliant with the Port State Measures Agreement, with the goal of deterring and eliminating Illegal, Unreported and Unregulated (IUU) fishing by preventing vessels engaged in IUU fishing from using ports and landing their catches.

The game translates critical inspection procedures into an immersive experience in which LEOs can learn and fail in a safe environment. It trains them how to undertake activities such as permit and vessel inspections, and how to correctly fill out documentation for reporting a crime.

For the bridge inspections, the LEOs are required to thoroughly inspect key documents such as permits, logs, registrations, and transshipments. It presents various scenarios that the LEOs navigate in an entertaining way, gaining awareness, knowledge and practical tips.

Ten levels of increasing difficulty

The *Bridge Inspection* game comprises ten levels of increasing difficulty, each with its own scenario, characters, story and challenge. It teaches LEOs to do in-depth inspections and investigations on vessels entering our ports, including, for example, interviewing the crew, the captain, opening all doors, freezers and boxes, looking for ingredients of homemade explosives that can be used for blast fishing, looking for shark fins in the hold, picking up where there has been an evasion of satellite tracking, looking for signs of human trafficking and

ill-treatment of crew, detecting falsified vessel registration documents, drugs and weapons.

For each level, the player is scored on three key skills that the game has been designed to test, namely critical thinking, diligence and curiosity. From a neuroscience perspective, this approach deepens the learning outcomes and creates an environment where learners are interested in engaging with that content and remembering it.

Developed with SeaMonster

Bridge Inspection was conceptualised by FishFORCE, who approached SeaMonster, an impact games studio based in Cape Town, to develop the game. It is hosted on a web domain and is available on smartphones and desktops. Players log in via a URL and it can be downloaded and played offline.



Making drugs for Africa

The project goal is to lower the cost of pharmaceutical products, ensure quality, increase drug accessibility and ultimately improve Africa's health.

The proven ability to manufacture drugs locally in South Africa will help lower the cost, improve drug accessibility and ultimately better Africa's health.

"South Africa's import of pharmaceutical products amounted to US\$3.06-billion in 2021 (UN Comtrade database), the vast majority being drug substances or Active Pharmaceutical Ingredients (APIs) from China and India," says Professor Paul Watts, SARChI Chair in Microfluidic Bio/Chemical Processing.

"Added to this is the cost of formulating these APIs into tablets or 'finished drugs', which a number of companies do in South Africa, including Aspen, Adcock Ingram, Cipla and Specpharm. Other African countries do not have formulators and have to import the finished drugs, which is even more expensive and which makes medications unaffordable to the majority of patients in Africa."

Additionally, when the COVID-19 pandemic hit, the whole supply chain process was disrupted due to the shutdown of manufacturing activity, as well as export restrictions and bans. This created significant social, health, economic and political stress in Africa.

"To address the supply issue and also the quality of APIs, South Africa is now at an advanced stage of local drug manufacturing capacity using continuous flow technology to synthesise the APIs," Prof Watts explains. "Our goal is to lower the cost, ensure quality, increase drug accessibility and ultimately improve Africa's health."

Building pharmaceutical manufacturing capacity

Building pharmaceutical manufacturing capacity at scale is complex, and Prof Watts anticipates it would be operational in the next five years. "In preparation for this, ten years of research has gone into developing the necessary technology to manufacture the APIs in South Africa, and also to make them 20% to 30% cheaper," says Prof Watts.

"In any tablet, whether an aspirin or AIDS medication, about 70% of the cost of the drug is the API, which is the principal component. The other 30% is for the excipients, the substances that help deliver the medication to your system."



Professor Paul Watts

The National Research Foundation (NRF) has funded this critical research over the years and Prof Watts and his team now have the ability to produce medications for the "big five" diseases: TB, malaria, cancer, diabetes and HIV/AIDS, as well as for common illnesses, such as flu.



Four South Africa women PhDs in 2023. Left to right: Dr Thembela Celia Sonti, Dr Sibongiseni Gloria Gaqa, Professor Paul Watts, Dr Sinazo Nqeketo, Dr Kanyisile Mhlana

Creating the APIs

The continuous flow technology, also known as the microfluidic flow process, which is used to create the APIs starts with a microreactor about the size of a mobile phone. Built into the microreactor are a series of channels that the chemicals pass through.

A new South African pharmaceutical company is working with Professor Watts and his team to establish a commercial plant for commercially manufactured APIs using the continuous flow production method, which has proved itself at scale.



Four South African women PhDs

Professor Watts's team includes 20 PhD and master's students. In 2023, four South African women graduated with their PhDs for this work. Sibongiseni Gloria Gaqa produced two diabetes drugs using continuous flow technology, Sinazo Nqeketo produced the AIDS drug Dolutegravir, Kanyisile Mhlana produced the AIDS drug Nevirapine and Thembela Celia Sonti produced the AIDS drug Tenofovir.



"We have not developed new drugs as yet; what we have developed is a new way of more efficiently manufacturing known generic drugs," explains Prof Watts. "We can also manufacture drugs under patent, but we would need a licence for the patent – this would not be cheap, hence our initial focus is on generic drugs not under patent."

Creating jobs for science technicians

With continuous flow, the batches are all in specification, whereas with traditional technology one in ten batches is out. The added advantage of continuous flow is that it creates jobs, as the production can be handled by science

technicians as Africa does not have a huge amount of scientists.

"Once we get going commercially, all the equipment would come from Europe and be approved for drug manufacturing purposes," says Prof Watts. "We'd probably have one centre in South Africa where the drugs would be manufactured, and it would make sense for it to be near a port for export and procurement of raw materials. We are so close to doing something big here. We will keep on with it until it happens."

Remote-controlled marine glider dives into ocean research

eNtsa team's research platform measures factors affecting pollution

A team from eNtsa in the Faculty of Engineering, the Built Environment and Technology has designed and built a remote-controlled marine glider to provide a research platform able to gather data to a depth of 200m below the surface.

The information gathered by the glider can be used in the longer term to fight against ocean pollution.

Project leader Donnie Erasmus and team members Akshay Lakhani, Elbert Liebenberg, Hubert van der Merwe and Keegan Kroutz have been funded by merSETA in the project initiated by the University's Advanced Mechatronic Technology Centre (AMTC).

The result of their work is a buoyancy-controlled autonomous underwater vehicle capable of carrying a payload of sensors. These measure parameters such as conductivity (salinity), temperature and pressure (depth), all of which assist in monitoring the state of the ocean.

The project team hope the glider will gather information to enable various research entities to increase ocean monitoring activities and influence legislation with scientific evidence.

These entities can attach the required sensors and data-gathering equipment to the glider, with information collected going towards building a database on various ocean markers.

"If a requirement exists to carry a greater payload, the glider can be scaled for such in a new build," says Erasmus.

For the greater good

The project supports the work of the South African International Maritime Institute (SAIMI) and the South African Institute for Aquatic Biodiversity (SAIAB).

It also contributes to UN Sustainable Development Goal 14: Life Below Water, which aims to conserve and sustainably use ocean, sea and marine resources. This aligns with the Nelson Mandela University strategic trajectory for ocean sciences, as outlined in Vision 2030.

Erasmus explains the rationale behind the research:



eNtsa engineering director Andrew Young, left, and eNtsa group specialist Hubert van der Merwe test the glider in the pool



“South Africa has a coastline approximately 3000km long, flanked by the warm Mozambique Current on the eastern seaboard and the cold Benguela Current on the west,” he says.

It is one of the major trade lanes in the world, with many vessels travelling around the southern tip of Africa.

“South Africa has an exceptionally rich marine environment, which supports a large fishing industry and this, coupled with the trade lane, means there is a heightened risk of marine pollution.

“Plastic and marine pollution in turn lead to increasing acidification of the ocean, and this needs to be measured.”

It is therefore vital that parameters such as ocean temperature, pressure and salinity are monitored, enabling scientists to track changes and advise government on the necessary corrective legislation.

The information gathered by the glider can be used in the longer term to fight against ocean pollution.



Major boost for the automotive industry

The AIDC-EC Chair strengthens the University's position as a centre of excellence

In a major boost for automotive industry research, innovation and development, Nelson Mandela University launched a new AIDC-EC Chair in Automotive Engineering.

The Chair was launched in June 2023 in the Faculty of Engineering, the Built Environment and Technology. The Automotive Industry Development Centre – Eastern Cape (AIDC-EC) has endowed the new research chair for an initial three-year period, backed with a financial investment of R14-million.

Newly appointed AIDC-EC Chair of Automotive Engineering, Martin Sanne, brings 33 years of engineering and management

experience to his new role. "The automotive industry is a cornerstone of the Eastern Cape economy and Nelson Mandela University is perfectly positioned to conduct this innovative research," says Sanne.

The new agreement makes funding provision for postgraduate bursaries and provides support for undergraduate projects in the School of Engineering. The Chair will lead research, innovation and technology in automotive, manufacturing and multidisciplinary projects across the sector, particularly in the areas of advanced automotive and manufacturing production processes.

It will engage industry on new product development processes, aspects of commercialisation and knowledge generation. It will also engage with other higher education institutions and facilitate in-ternational student and staff exchange programmes and knowledge transfer in automotive engineering.



Dr Thandi Mgwebi, left, Martin Sanne and Professor Marshall Sheldon celebrate the launch of the AIDC-EC Chair of Automotive Engineering

Octocopter shows the power of drone technology

MandelaUni Autonomous Operations builds a flying lab 'workhorse'

The MandelaUni Autonomous Operations (MAO) group is developing a multipurpose octocopter drone that can be used as an agricultural crop-sprayer.

MEng graduate Kabelo Mpurwana has been working on the heavy-lift research platform.

Although not built from the ground up as a crop sprayer this particular application had become its first task.

"The octocopter will essentially be the lab workhorse, a platform that we can adapt for various projects," says Mpurwana.

"We needed a stable and versatile drone platform to support our research and testing with various payloads and sensory equipment.

"After careful consideration, we opted to develop our own octocopter configuration (with eight motors) for its functionality and high payload capacity."

Developing their own airframe has allowed MAO to keep the development costs down. It also means that the team can make future configuration changes and modifications with more ease.

"The drone's first research project involves determining the feasibility of creating a drone that can match the functionality and performance of leading crop-spraying drones at a significantly lower cost," explains Mpurwana.

"Currently, the drone is being prepared for its initial test flights. Following this phase, the necessary sensors and equipment for crop spraying will be added, and testing in that capacity will commence."

The octocopter is two metres in diameter and unloaded, weighs 22kg with a ready-to-fly weight of 36.8kg. It can carry a payload of between 23kg and 38kg, with a maximum take-off weight of 75kg.

Once loaded and in the air, it can fly for 18 minutes over the field where crops are to be sprayed. If there is no load and it is empty, the drone can fly for double this time.





Impressive statistics

Mpurwana says the octocopter will have a projected operational speed of between five and eight metres per second, which translates to 18 to 28km per hour.

It is powered by eight 14kg-thrust brushless electric motors, and two in-series 2.4 kWh LiPo 50V batteries weighing 16.6kg.

"The higher number of motors adds to its safety," comments Mpurwana.

"The drone most people are familiar with has four motors. Due to the dynamics of multi-rotors and how they fly, if you were to lose one of those motors, it would be impossible to control that drone and it would fall out of the sky," he says.

"However, with eight motors, you can lose one and continue flying. Lose two and you are coming down, but still under control."

In 2022, Nelson Mandela University was the first South African university to be awarded a drone licence. Students can learn specialised skills in a technical environment that supports the niche market of autonomous vehicle operations.

The sky is – literally – the limit, says Mpurwana, "There's still so much more we can do with drones and aerial robotics."

The University's focus on real-world drone solutions means it can offer products that may be commercially produced and used in relevant research and support; for example

being able to offer design concepts for new heavy-lift drones, which may be used in long-range payload delivery scenarios such as disaster management and famine relief.

By collaborating with industry, the MAO group can help to grow drone technology in South Africa, and contribute to economic growth.

"The drone's first research project involves determining the feasibility of creating a drone that can match the functionality and performance of leading crop-spraying drones at a significantly lower cost."

Hands-on fun with sun power can steer potential careers

Innovative AMTC boat race is a win for learning and partnerships

Youngsters from high schools and TVET colleges learnt about renewable energy while having fun at North End Lake in Gqeberha when the Advanced Mechatronic Technology Centre (AMTC) launched its first solar boat race.

The AMTC, in collaboration with the MerSETA, introduced the solar boat race in March 2023.

Its main goal was to expose technical high schools and TVET colleges to renewable energy and the application of the technology.

“The event was a huge success, with students from the Department of Electrical Engineering also designing and manufacturing a boat for the race,” says Nelson Mandela

University Mechanical Engineering principal lecturer Karl du Preez, director of the AMTC.

Each participating school and college was provided with all the hardware necessary to design and manufacture the solar boat, including two photovoltaic (PV) panels, a 12V outboard motor and the necessary components to manufacture the boat.

AMTC technologist Jan Hendrik de Jongh conducted training sessions at the participating schools and colleges to ensure that manufacturing and safety standards were adhered to.

Each team had three hours to navigate around a marked-out course on the lake, with pilots swapping every half-hour.

“By participating in a solar boat race, schools and colleges demonstrate their commitment to sustainability and renewable energy. This also encourages students and learners to think about their impact on the environment and how they can be more sustainable,” says Du Preez.





It also provides a unique – and fun – learning opportunity that may help to guide future career choices.

“They can learn about solar energy, engineering, design and teamwork. Students can also develop problem-solving skills as they overcome challenges that arise during the boat race.”

The event connected Nelson Mandela University with schools, organisations and businesses that share a similar interest in renewable energy, leading to various partnerships with local industries.

“Overall, the AMTC’s solar boat race has shown the potential for collaboration between schools, industries and communities in promoting renewable energy research and development,” says Du Preez.

With innovation and environmental stewardship being key values and research themes for Mandela University, the event was ideal chance to put theory into practice.

Collaboration and group-thinking are also integral to the work of the University’s Renewable Energy Research Group (REG), the research entity of the AMTC that co-organised the event.

REG’s Professor Russell Phillips says that the event was the perfect way to show budding engineers what might lie ahead in this career field, as well as spreading awareness of alternate sources of power.

“Once you have experienced the power of solar to push you in a car, or on a boat, you will have a better understanding of its potential,” he says.

And the youngsters dived in for the experience.

Newton Technical High School matric pupil Simbarashe, Njanji, 17, said “I enjoyed it a lot and it taught me how to adapt.”

His classmate Victor Mahlatini, 17, agreed. “It teaches us how to think out of the box – and also how important solar power is.”

A second solar boat race, planned for December 2023, aims to increase participation to a total of 20 solar boats.

This will encourage more schools and colleges to participate, providing even more students and learners with a unique learning experience in renewable energy and technology.

Food security

Hunger and malnutrition are a blight across too many countries in Africa, a continent vulnerable to the impact of extreme weather events. Violent conflict and economic pressures compound the danger of climate change to further threaten food security. These factors make it vital for universities to play their part in researching ways to address food security and sovereignty.

“It is in your hands to create a better world for all who live in it.”

– Nelson Mandela

Behavioural change response to water crisis

Research shows how behaviour change methodologies can shape water usage

Nelson Mandela Bay Metro, the Eastern Cape, South Africa and the world at large all are living on the brink of a water crisis, which is also a major threat to food security.

The University's Faculty of Business and Economic Sciences is giving careful thought to how best to address this problem.

"Over one billion people already face water scarcity and by 2025 this number may triple," says Professor Syden Mishi, Associate Professor and Head of the Department of Economics.



Prof Syden Mishi and researcher Farai Mushonga inspect the new Nelson Mandela University Residence water tanks

"However, supplying water, no matter how it is done, costs money," he says, adding that financing is a constraint in developing countries in particular.

The National Research Foundation recognised Prof Mishi with an award for Research Excellence for Early Career/Emerging Researchers in the Social Sciences, Humanities and Law category in September 2023.

Prof Mishi leads the University's Behavioural and Experimental Economics (RIBEE) team which includes, among others, Dr Godfred Anakpo, Dr Weliswa Matekenya, Nomonde Tshabalala, and Farai Mushonga.

"With the water crisis here in the Bay, as a group of researchers we have started to explore a number of issues." These include:

- How the water crisis can be managed from the demand side using behavioural insights
- Key challenges water authorities face (besides scarcity) that compromise the ability to supply adequate and quality water
- The overall effect of the water crisis on food security and sovereignty.

Among other relevant issues, the team has been exploring behavioural responses to the water crisis that will help to develop and sustain social norms for water conservation. Doctoral and master's students have taken up topics and young academics have had a number of papers published.

Their work has helped to gain behavioural insights that can be used to manage water demand at low cost.

Team effort

So far, the University has shared these insights with the municipality's Joint Operating Committee on Water Crisis, a Nelson Mandela Bay Business Chamber symposium with corporates, and through the Eastern Cape Water Crisis War Room, which includes the Department of Water and Sanitation, the South African Local Government Association (SALGA), and all municipalities.

"The water crisis is on everyone's lips and the work we have been doing has been noticed by National Treasury," says Prof Mishi, referring to discussions held with the Cities Support Programme.

The programme is a component of intergovernmental relations division of the National Treasury assigned to Nelson Mandela Bay.

The team also was invited to share ideas with the Mandela University Sustainable and Safe Campus Task Team in 2022. The presentation shared experiences from impactful interventions in one of the large off-campus student housing facilities, with a view to helping on-campus residences.

"Too many policies and interventions wrongly assume that people make conscious choices based on logic," says Prof Mishi. They do not factor in the power of unconscious thoughts and biases. "Behavioural economics is closing that gap."

Studies have shown that low-cost interventions can have a high impact when anchored in data and choice architecture, that is, giving the consumer the right to choose, but "nudging" them to make a certain choice.

Action not words

Prof Mishi cites research from Costa Rica and, closer to home, in Cape Town there is evidence of success with behavioural "nudges" for water conservation.

"Better management of water often involves getting some groups of people to alter their behaviour to benefit others," he says. "However, many behaviours that are predictable are not economically 'rational'.

"Educating people often does not change their attitudes or behaviours. We might be more successful by just targeting the behaviour without worrying about what people believe.

"Generally, you can't go wrong by harnessing the power of human nature."

SALGA has asked for assistance on a water supply efficiency initiative, expanding behavioural intervention in water demand management.

"We are currently developing a project plan to implement this, under the existing MoU between SALGA and Mandela University."

The University already has a highly productive Food Systems Working Group, which considers issues related to water as well

The University's Behavioural and Experimental Economics (RIBEE) team conducted a scoping review of the nature and extent of theft and vandalism of water infrastructure in 2021 in Eastern Cape municipalities.

Their results found that approximately R6.5-million was lost every month on average across the 13 water authorities.

The team then developed a behavioural response to the water crisis, which aims to create and sustain social norms for water conservation.

The research asked questions such as: Is it fashionable to save or harvest water? If end users do not see filling buckets with waste water as "high status" they may not use this simple water saving idea.

In general, they stated, awareness campaigns need to be behaviourally informed. For example, in some instances, people are aware of a leak but do nothing, as they believe it is the municipality's job to know about and then fix any and all public infrastructure.

On a broader scale, policymakers are increasingly recognising the value of behavioural economics in addressing issues such as water use and energy and resource conservation.

Public awareness of the value of water is key to behaviour change. "However," says Professor Syden Mishi, "we take for granted that making people 'aware' of a problem and of a 'solution' translates into the desired action.

"Think about your own experience: Does the fact of knowing that you should be doing something, for example, exercising regularly, result in your doing it?"

as food security. The next step is to set up a Food Systems Research Chair that can contribute to meeting the challenge of hunger in the context of the water crisis in southern Africa.

Marketing can help address hunger in Africa

Continent-wide marketing research digs into sustainable small grain foods

The sad sight of his fellow Zimbabweans in long queues for bags of mielie meal over the COVID-19 pandemic inspired the PhD research of Nelson Mandela University marketing student Arnold Moyo.

There and then he started to ponder why, when there were traditional African grains available, people were hungry for the less nutritious bags of mielie meal.

His doctoral thesis is looking at factors affecting consumer purchase intentions towards traditional grains in Zimbabwe, specifically the small grain foods of sorghum, millet and finger millet, also known as *rapoko*.

“Things were bad, there was a drought in Zimbabwe and a shortage of mielie meal,” he recalls.

At the time, a travel pass was given to essential workers involved in the fight against COVID-19 and it came with the benefit of priority access to goods and services so workers could quickly return to work.

“It didn’t sit well with my conscience that I could get my 10kg bag of mielie meal, but I had left behind a long and winding queue of people who had to wait the whole day to get their bag.”

The experience prompted Moyo to reflect on the shortage of basic foods.

“Why are we so adversely affected by drought and famine when we’ve got grain that is resilient, that we’ve grown over the years and is adapted for our conditions?”

“That gave me the idea to look at how we could leverage traditional small grain foods to provide food security for the people of sub-Saharan Africa – and that gave birth to my PhD.”

Working under the supervision of professors Felix Amoah and Marlé van Eyk of the Department of Marketing Management, Moyo then expanded his research to the entire continent.

Scoping review published in international journal

Prof Amoah said the scoping review for the study, published in the highly regarded international academic journal, *Cogent Business and Management* in May 2023, enhanced Nelson Mandela University’s reputation on the global stage. It also attested to the quality of the work and its relevance.





Arnold Moyo

The review showed there had been little research on increasing consumer demand for small grains.

“The anticipated outcome of the research is the creation of a model for explaining and predicting consumer intentions to purchase traditional small grain foods that is comprehensive and relevant to Africa,” says Prof Amoah. “Furthermore, the broader field of consumer behaviour literature will benefit from the development of a new model and measurement tools for food preference research.

“The model will be relevant to farmers, consumers and marketing practitioners, to improve production, purchase and consumption of traditional small grain foods not only in Zimbabwe but also in other sub-Saharan African countries.”

It’s a vital area for a continent where, according to international aid agency, World Vision, one in five people faced hunger in 2020, with numbers rising over the pandemic. More than a third of Africa’s population is undernourished.

Arnold found that current researchers had often focused on grain availability, or qualities such as taste, texture and smell of the food.

“In the last five years, however, there has been a sustained increase of interest in consumer research on traditional foods, led by Nigeria, South Africa and Kenya,” he says.

“But most of the research focused on food attributes, and it was from disciplines other than marketing, such as nutrition and dietetics, medical studies and so forth, where the focus was mostly on the product.

“However, science has proven that it’s not just about the product. You can make the product available but is it acceptable to the person who is going to consume it?”

“Instead of looking at the supply side, let’s start from the side of the consumer so that we stimulate demand.”

Moyo sees this as a more sustainable approach.

“If the market is there, entrepreneurs will come in to provide the service, and the supply chain will adapt to make sure that the product or service is available,” he says.

“Once we understand what happens in the mind of the consumer, then as marketers we can come up with interventions.

“There is a scarcity of studies on consumer behaviour towards traditional foods in Africa, which creates an opportunity for us to promote research in this area and, better still, to provide leadership.”

“Climate-smart” sustainability

There are also environmental sustainability issues, as these traditional grains do not require irrigation, Moyo notes.

“Maize is very susceptible to pests and these crops are not, and they are also healthier and more nutritious than mielie-meal,” he says.

Small grains are grown using traditional techniques, normally without chemicals, which protects the environment from potentially harmful pesticides, herbicides and some fertilisers.

Additionally, they are considered “climate smart foods” because of their resilience to hostile environments, making them a suitable crop for an arid region.

“Once we understand what happens in the mind of the consumer, then as marketers we can come up with interventions.”



Moyo hopes his research can contribute to the African Union's programme to promote food security on the basis of traditional small grain foods.

The United Nations Sustainable Development Goals are particularly relevant to the Nelson Mandela study, especially SDGs 1: No poverty, and 2: Zero hunger. It also touches on 3: Good health and well-being, 8: Decent work and economic growth, 12: Responsible consumption and production, 13: Climate action, and 15: Life on land.

"One of the big problems in Africa right now is unemployment and if we can create a market for traditional small grain foods,

it will assist in trade, leading us to attaining the goal of zero hunger," says Moyo.

"It will also move us towards achieving zero poverty, because once we create a stable and sustainable market for traditional small grain foods, we provide greater livelihood security for farmers.

"This will assist in providing not just social security in terms of health, but also economic security. It's a solution that addresses not only a local but a global priority."

He hopes the study will be finalised before the end of 2023.

Legal rights and access to food security in Africa

A research initiative between Nelson Mandela University and Rhodes University questions the role of law, specifically litigation, in ensuring food security in Africa.

The project was undertaken after the research team attended roundtable discussions on ensuring food security in Africa at the Sokoine University of Agriculture (SUA), Morogoro, Tanzania and the State University of Zanzibar.

The right to adequate food is a universally recognised human right, with prominent importance in international and regional treaties. Yet with billions suffering from hunger globally, giving effect to that right is far more complex than its mere recognition.

The COVID-19 pandemic has highlighted the importance of food security and the need to ensure access to a safe and nutritious food at all times.

This was the context within which Nelson Mandela University's Prof Amanda Spies and Dr Leah Ndimurwimo, and Rhodes University's Nicholene Nxumalo conducted their research.

With the South African National School Nutrition Programme (NSNP) especially hard hit by the pandemic, they analysed

“The researchers highlighted the complexity of litigating the right to food and the need for strong jurisprudence to give effect to it.”

the *Equal Education and Others v Minister of Basic Education and Others* judgment.

The researchers highlighted the complexity of litigating the right to food and the need for strong jurisprudence to give effect to it. Their study explores indivisibility and the interrelated nature of the right to food and how it complicates its justiciability in providing recourse in both South Africa and the continent at large.



Entrepreneurship and graduate employability

South Africa has among the highest levels of unemployment in the world, which has a devastating impact on youth and graduating students. In response, Mandela University is increasing its focus on youth entrepreneurship and graduate employability.

“In a world that so often decries the apathy of its youth, we can open our arms for the millions of adolescents eager to contribute their new ideas and bounding enthusiasm.”

– Nelson Mandela

21 years of engineering innovation and skills development

Youth development and knowledge transfer are integral to eNtsa

e Ntsa has a number of SMME skills development and student and youth training initiatives in partnership with industry and government.

“Our research and development goals are to provide solutions for clients and industry, as well as to be innovative for the workplace of the future. We need to develop the skills base that will be required for this, including youth development. Skills and knowledge transfer are an integral part,” says Professor Danie Hattingh, director of the internationally recognised engagement and engineering institute, eNtsa.

“Our transdisciplinary research and training team today includes 24 mechanical, mechatronics and electrical engineers, as well as student interns, graduates in training, postgraduates and postdoctoral fellows from a wide range of disciplines, including engineering, mechatronics, chemistry and business.”

Youth-focused development initiatives

“In terms of youth skills development we partner in a number of programmes, including Isuzu’s YES programme and other youth-focused development initiatives specifically focused on the automotive and eMobility spaces” explains eNtsa’s Operations Manager, Nadine Goliath. This is part of the government-led YES (Youth Employment Service) initiative to create work exposure opportunities for young South Africans between the ages of 18 and 35. “The trainees include engineering students, young unemployed people and young people straight from matric,” Goliath says.

“We are also active partners in the Incubating Great Engineering Minds (iGEMS) programme for school learners, to expose them to different avenues of engineering which helps them to decide what they would like to pursue,” adds Goliath. “We make it interesting for them, such as giving them an introduction to 3D printing and explaining how the technology is applied in industries like the automotive sector where they print different vehicle components.”

Variety of short courses

3D printing is one of a variety of short courses eNtsa offers that has proved popular in both online and face-to-face engagement formats. eNtsa’s offerings range from half a day

Established in 2002 by Prof Danie Hattingh, the eNTSA team has grown from four to over 80 people, including staff and students.

to four days, most of which are recognised by the Engineering Council of South Africa and which also count towards continuous professional development points.

“We encourage the participation of entrepreneurs and SMMEs to grow their knowledge base and offerings through



Prof Danie Hattingh



Nadine Goliath

the skills development opportunities we offer, and access to our equipment and expertise,” says Goliath. One of the entrepreneurs who attended the 3D short course designed a bracket to keep up his gutter; he then used his 3D printer to produce them in bulk and sell them at a fraction of the usual price.

Partnering in the eMobility space

In the eMobility space, eNtsa, through the uYilo eMobility programme, partnered in the UK Partnering for Accelerated Climate Transitions, which started in 2020 and concluded in April 2023. The goal was to capacitate key decision-makers and strategic divisions within government and municipalities in South Africa who contribute towards the country's climate change action plans and initiatives. “We shared key information about eMobility, where we are as a country and what is happening globally, and we welcomed international partner Cenex UK to present webinars on trending eMobility topics,” says Prof Hattingh.

In June 2023 Prof Hattingh, Goliath and eNtsa's Director of Engineering Engagement, Julien de Klerk, visited a number of higher education institutions and entities in Germany related to the automotive engineering space.

“Our objectives included exploring the possibility of introducing international eMobility electives in Nelson Mandela University's engineering curriculum, and developing a

Electric buses on the move

uYilo is a national programme hosted by Nelson Mandela University, operationally managed by eNtsa and initiated by the Technology Innovation Agency, to enable, mobilise and educate about electric mobility (eMobility).

uYilo's stakeholders feature across the eMobility value chain and include national government departments, the automotive industry, energy storage companies, intergovernmental organisations, industry associations and NGOs.

One of uYilo's many initiatives is the uYilo Kick Start Fund which supports the advancement of technology readiness of eMobility products and services for SMMEs within the eMobility value chain. The fund supported a Golden Arrow Bus Services (GABS) electric bus pilot project through a partnership between uYilo, GABS and Chinese bus manufacturer BYD, in which two 100% electric buses were extensively tested over a year in 2021.

The testing included the use of sandbags to simulate maximum passenger loads, and driving up the steepest hills. Only when the engineering team was satisfied with performance, charge range, and safety requirements were the two buses added to active service, and Today they carry passengers daily on the Retreat to Cape Town CBD route. The buses have a 300km range and are recharged at Golden Arrow's solar-powered depot in Epping, which produces 50 kWp energy.

Due to the success of this pilot, GABS says it plans to add 60 locally built vehicles to its fleet in 2024. GABS hopes to become the first scheduled bus service to operate electric buses in the country. “We expect the electricity costs to be approximately 70% less than the equivalent diesel costs per kilometre,” says GABS company engineer **Gideon Neethling**.

To lessen its dependence on the national grid, GABS hopes that renewable energy sources – especially solar – will eventually provide most of the electricity needed to power the buses.

Nelson Mandela University has been at the forefront of solar energy research in eMobility, including solar-powered charging stations.



Visit to Esslingen University of Applied Sciences

eNtsa's current research focus is solid state joining and small sample testing, with a focus on small punch creep work to assist with engineering decision-making around extending the life of ageing, high-value infrastructure within the petrochemical and power generation sector.

network that includes academia, research groups and industry-supporting entities within the German automotive engineering space," Prof Hattingh explains. "We are also exploring exchange initiatives between our team and institutional visits for our respective staff and students to promote closer knowledge transfer and engagement."

During the trip, the eNtsa team visited Reutlingen University and Esslingen University of Applied Sciences, including the Steinbeis Transfer Centre – a tech transfer centre that bridges academia and industry, as eNtsa does. Prof Hattingh has a strong, longstanding relationship with the Steinbeis initiative, which was established in 1971. "It is the model on which we established eNtsa in 2002," says Prof Hattingh, who had the vision to launch it at Nelson Mandela University and to continuously reimagine it.



Visit to Reutlingen University. From left: Prof Bernd Thomas (Reutlingen University: Energy Systems [Solar, Wind etc.] Thermodynamics); Prof Ertugrul Soenmez (Reutlingen University: Power and Micro-Electronics, Mechatronics); Prof Danie Hattingh (eNtsa: Director); Ms Nadine Goliath (eNtsa: Operations Manager); Prof Gerhard Gruhler (Reutlingen University: Robotics, Production Automation, Mechatronics – Former Vice President Research & Transfer); Mr Donnie Erasmus; (eNtsa: Deputy Director: Business Development and Engineering Projects); Mr Julien de Klerk (eNtsa: Engineering Engagement Director: eNtsa); Prof Helmut Nebeling (Reutlingen University: Machine Tools, Additive Manufacturing); Mr Hicham Abghay (The Reutlingen Research Institute [RRI]: EU Research Officer) and Mr Max Alber (Reutlingen University: International office)

Entrepreneurship incubator is growing

YouthLab expands its reach to help businesses flourish

The Madibaz Youth Entrepreneurship Lab (YouthLab) is becoming an increasingly powerful incubator for students' business dreams.

With rising youth unemployment, especially in the Eastern Cape region, youth employability and student entrepreneurship deserve attention.

Student Governance and Development Director Dr Bernard Sebake highlights how Nelson Mandela University is tackling this thorny social problem.

"Building on the successes of the Student Employability and Entrepreneurship Development (SEED) programme and our dedicated YouthLab, we are repurposing our infrastructure towards a rapid youth entrepreneurship incubator, in partnership with the Small Enterprise Development Agency," he explains.

Although not sector specific, areas of focus include the oceans economy – an obvious fit with an ever-developing Ocean Sciences Campus at Nelson Mandela University – along with tourism, manufacturing and agriculture.

"The main aim is to help early-stage businesses to develop and succeed. We will offer a supportive environment with the necessary tools and expertise," says Dr Sebake.

Student entrepreneurship specialist Karen Snyman in the Student Governance and Development department, is deputy chairperson of the EDHE's Community of Practice for Student Entrepreneurship. She is thrilled with the growth of the lab, which is now expanding into a fully fledged incubator.

"We applied to SEDA to establish this centre, which will provide services to student and alumni entrepreneurs, as well as unemployed youth, and youth-owned businesses," says Snyman.



Atlehang Nkotha and student entrepreneur Akalambo Fidel Mabolabola get to work in one of the incubator's meeting rooms

Based on North Campus, the YouthLab includes a board room, mini-amphitheatre, maker space, meeting areas and more.

This is a physical point of contact, and helps to formalise and streamline the coordination of entrepreneurial activities for students.

Access for all

Snyman describes how Student Governance and Development has been championing a bottom-up approach in response to the voices of students.

“Students want a door of opportunity to knock on and we want to provide it,” she says.

“And it has just grown. We developed a policy for students operating a business on campus because of the huge demand.

“You will be surprised at the amount of entrepreneurship going on right here,” says Snyman, “with at least 20 small businesses on the Gqeberha and George campuses.”

They include tuck shops, fashion outlets and a driving school – and the expanded YouthLab is a point of contact, and “office” space, for these and other entrepreneurs.

The criteria to operate a small business on campus include a lease agreement, payment of a modest “rent”, and other conditions geared to developing business skills.

Second-year Mandela University accountancy student Fidel Mabolabola, 21, is one of the young entrepreneurs using the incubator’s services.

He attributes the successful launch of his audiovisual business, Mamela Audio Connection, to the co-curricular Foundational Entrepreneurship course he took last year.

This short learning programme (SLP), facilitated by Prof Shelley Farrington in the Department of Business Management in collaboration with the YouthLab and Wadhvani Foundation, aims to instil entrepreneurial skills – and the ever-important mindset to go with them.

The SLP also introduced him to the YouthLab and its facilities.

“You basically start your own venture and they help you to build your business by learning how to develop a business model, market your business, get finance and so on,” says the Limpopo entrepreneur-in-training.

“It was really beneficial because after that, I had all the knowledge that I needed to start my business. Before that, I didn’t have the tools.”

YouthLab coordinator Atlehang Nkotha agrees.


“We have facilities here that we did not have before, and the demand is high – the students are hungry to succeed, and there is so much opportunity for the YouthLab to grow,” she says.

“In addition to projects,” says Nkotha, “the new space also is a place for mentoring, networking opportunities and business support.”

Today Fidel Mabolabola is chair of the student entrepreneurship society, Eco-System, and also a mentor for SEED, the Student Employability and Entrepreneurship Development programme open to all students registered at the University.

He is relishing the opportunity to share his new-found knowledge with his peers.

“I walked into this space clueless and now I have my own business – it’s fulfilling and something that I want to wake up to, each and every day.”



“Students want a door of opportunity to knock on and we want to provide it.”

Mapping research aims to boost student business savvy

Putting the spotlight on Mandela University's entrepreneurship support ecosystem

With youth unemployment a major challenge for South Africa, coupled with a lack of entrepreneurial performance, it is essential that universities play their part in supporting young entrepreneurs.

But, asks Nelson Mandela University master's student Atlehang Nkotha, "How do we assess the existing ecosystem within a university?"

"Do they, or do they not, provide a supportive entrepreneurial environment?"

Although existing research has shown that a university-based entrepreneurship ecosystem (U-BEE) can help to build this environment, there are no tools to measure this crucial area.

Nkotha's research, under the supervision of Prof Shelley Farrington of the Department of Business Management, and Mandela University alumnus Riyaad Ismail, now at the University of Antwerp, addresses this lack of assessment methods.

Specifically, Nkotha's dissertation is mapping the university-based student entrepreneurship support ecosystem of Nelson Mandela University.

"We have a very dynamic group of student entrepreneurs but many are in survival mode," says Nkotha.

"We want to boost them to think bigger, and not to be limited by their mindsets.

And we also need to ensure that they are investment-ready."

Many students have a bright idea or product that they would like to develop into a business, but do not know how to take the next step. Only after the University has helped to map what



Atlehang Nkotha

they are missing, can it fill these gaps and help them to grow their fledgling businesses.

Nkotha hopes to finish the project by the end of 2023. Once completed, her research will provide top management with a framework against which they can evaluate how effective the current student U-BEE is. Then they can plan and implement strategies to improve it.

The mapping will also provide useful insights for staff who focus on student entrepreneurship. Specifically, it will provide information on the state of student entrepreneurship support, the barriers students face, and ways to enhance student entrepreneurship activities.

Resources needed by those who provide support to student entrepreneurs, and the student entrepreneurs themselves, can then be identified and appropriately allocated.

This will help universities to assess their current U-BEE and plan for these systems in the future.

Assessment tool generated by international collaboration goes live

Mandela University is a key driver in new assessment method

The Student Entrepreneurship Support (SES) Assessment Tool, the result of a multi-year international collaborative project between Nelson Mandela University and other partners, is now live at Nelson Mandela University.

The project was funded by VLIR-UOS, an organisation that supports partnerships between universities in Flanders (Belgium) and the Global South. VLIR-UOS typically funds projects that focus on innovative ideas to address global and local challenges.

As part of the project, colleagues from Mandela University, the University of Pretoria and Ghent University (Belgium) developed a tool to create awareness of, gain insights into and assess student entrepreneurship support at South African public universities in 2020.

Mandela University Business Management Professor Shelley Farrington and Mandela University alumnus Riyaad Ismail, of the University of Antwerp, together with the Madibaz Youth Entrepreneurship Lab and ICT Services, teamed up to implement the tool via a survey at the University.

"It's been a massive project and we are finally live and implementing it," says Prof Farrington, who is project manager at Mandela University.

The stagnant number of student start-ups in South Africa was one trigger for the project in general and for lead researcher Ismail's MCom research in particular, as this had led to questions on whether or not university-based student entrepreneurship support is effective.

"Thus, our project aimed to identify and disseminate best practices in university-based student entrepreneurship support at South African public universities and to develop a tool that would assess this support."

"There are pockets of entrepreneurship but, overall, do we have an entrepreneurship culture?" Prof Farrington asks.

What is the SES Assessment Tool?

The Student Entrepreneurship Support (SES) Assessment Tool is designed to create awareness of, gain insights into and assess student entrepreneurship support at South African public universities.

Through self-assessment, it looks at seven elements of the university-based entrepreneurship ecosystem:

1. University environment and culture
2. Co-curricular entrepreneurship support activities
3. Formal entrepreneurship education
4. Incubator and accelerator programmes
5. Technology transfer offices
6. University venture funds
7. Internal and external collaborations.

There is a dedicated SES Assessment Tool website, with supporting documentation and implementation guidelines.

They hope that using the SES Assessment Tool will help to answer this question.

Farrington envisages that it will have far-reaching impact, as the results generated will provide stakeholders at Nelson Mandela University with access to data to assist them in improving and structuring the implementation of entrepreneurial support for their students.

As the project is longitudinal, the University will be able to administer the survey annually and compare results to those



Business Management Professor Shelley Farrington, left, and Student Governance and Development student entrepreneurship specialist Karen Snyman show the cover logo of the survey

of previous years and, when other universities participate, a national average.

An annual survey will increase awareness of the support available to student entrepreneurs at the University and encourage an awareness of entrepreneurship in general. The survey results will be useful in identifying areas needing attention, or specific activities to improve the support already offered.

The SES Assessment Tool and the website hosting it were introduced to the broader student entrepreneurship support community at the 2022 Annual EDHE (Entrepreneurship Development in Higher Education) Lekgotla, hosted by Nelson Mandela University. It should be available to all public universities in South Africa before the end of 2023.

“There are pockets of entrepreneurship but, overall, do we have an entrepreneurship culture?”

For the greater good

Cultural and sports impact on economy can and should be measured, valued

Government strategic foresight is a powerful thing when it takes flight. Take the **Mzansi Golden Economy Strategy (2011)** – which gave birth to the **South African Cultural Observatory (SACO)**, hosted by **Nelson Mandela University since 2015** – for example.

The SACO is a force for research-led creative sector insight. It is a project of the Department of Sport, Arts and Culture, and effectively acts as the StatsSA for the cultural and sport economy.

The SACO's bi-annual mapping study reports provide the nation with critical data on the country's cultural and creative economy. Its research shows that the sector contributes 3% to national GDP – on par with agriculture – and creates about one million jobs, or 6% of all jobs, in the economy.

It also shows that the potential of the cultural and creative industries (CCIs) outweighs their current contribution. More is needed to support the growth of the CCIs and to really use them to stimulate the economy and social cohesion.

"Prior to 2015, we didn't have this information," says Unathi Lutshaba, SACO executive director. "The SACO's cultural information system, or CIS, now forms the knowledge base off which government, policymakers, researchers, academics and a whole sector can make a series of important decisions to support growth, skills development and investment in the CCIs."

A data goldmine

The SACO's CIS is effectively a potent bedrock of qualitative and quantitative data on the CCIs. It covers diverse topics from economics and jobs to labour-absorbing sectors such as animation and gaming, gender and transformation insights.

The goal, say SACO partners Mandela University, Rhodes University and the University of Kwazulu-Natal, is to present sufficient evidence for greater recognition of an often undervalued and misunderstood sector.

While many people trade and participate in the creative economy daily, it is not given the same credit as, for example, the automotive or maritime industry, since it is harder to perceive intellectual property within an industrial scale ecosystem, says SACO senior researcher and strategist, Amy Shelver.

"Consider what it takes to produce a concert. From the scaffolding to the accounting or sales, the line-up to the marketing, the sound rig to the concert swag – these are micro-factories assembled and delivered within days for an event, with hundreds of jobs created along the way," says Shelver.

"But because the inputs, often part of an invisible supply and value chain that only shows the visible output – such as a single album or book – don't feel like a traditional industry, we're not savvy to the scale of the impact of CCIs and just how much they deliver."

The impacts of these are both tangible and intangible, the body of SACO work shows.

What is the creative economy?

The creative economy is an evolving concept which builds on the interplay between human creativity and ideas and intellectual property, knowledge and technology, according to the United Nations Conference on Trade and Development. Creative industries include advertising, arts and crafts, design, film, media and the performing arts.

SACO Research Outputs

1. SACO's flagship report is the biannual Economic Mapping Study
2. 300 research outputs since 2016
3. 6 frameworks on cultural seasons, diplomacy, measuring cultural employment, cultural statistics, monitoring and evaluation of publicly funded arts, culture and heritage
4. 2 guides on copyright and the development of a Sallywood
5. 1 event economic impact calculator
6. Country reports for diplomatic missions
7. 63 research dissemination workshops and 28 capacity building workshops since 2016
8. SACO's research has reached tens of thousands of people across the country, especially in rural areas
9. SACO has worked with international organisations such as UNCTAD, UNESCO, OECD, GIZ, British Council, Argentina's SiNCA, Statistics Canada, the African Union and Malawi University of Science and Technology (MUST).



- Audio-visual and Interactive Media (R48.4-billion in 2020, 30% of 3% to GDP).

The dominance of these domains is expected, says Professor Jen Snowball of Rhodes University.

“Since these domains involve the commercial application of cultural and creative content, such as in film and television, video games, fashion design, architecture and advertising, they were always going to be high performers.”

Nelson Mandela University recently was awarded another five-year term to host the Observatory, and will expand focus to include sport.

A worthy cause

Since 2016 the SACO, hosted as a satellite to the main Nelson Mandela University campus, and lead by the University's top researchers, has produced 300 research outputs.

The largest domains in terms of contribution to output are:

- Design and Creative Services (R51-billion in 2020, 32% of 3% to GDP)

The quest to green LPG Gas

The Department of Chemistry is part of an international project aimed at greening LPG fossil fuel gas in southern Africa.

Greening the production of LPG used for cooking, heating, in laboratories and for many other purposes, is part of the world's shift to sustainable, green fuels.

GreenQUEST is a multi-institutional, transdisciplinary German–South African research partnership aimed at greening the production and use of fossil fuel LPG in southern Africa, where it is widely used for cooking and heating in households, in laboratories and for many other purposes.

Chemistry professor and Deputy Dean of the Faculty of Science, Zenixole Tshentu, who is leading the Mandela University GreenQUEST team explains, "The goal is to develop a sustainable and green liquefied fuel gas called gLFG by integrating complex analytical and technological process development. This will be part of a holistic assessment of the technical, economic, environmental and social dimensions along the entire gLFG value chain."

Liquefied petroleum gas (LPG) is derived from natural gas or from the oil refinery process, which is carbon-intensive and fossil-fuel-based.

Researchers from the African Climate and Development Initiative, the Energy Systems Research Group and the Graduate School of Business at the University of Cape Town (UCT) are part of the team of top international chemists, business leaders, climate specialists and sociologists working on the GreenQUEST project, which is jointly coordinated by



Prof Jack Fletcher, Director of the Catalysis Institute at the Department of Chemical Engineering at UCT, and Dr Tobias Sontheimer, Head of the Energy and Information Department at the Helmholtz Zentrum Berlin, Germany.

Innovative catalysts and collaborative process

“The innovation lies in the scientific and technological development of the catalysts and process in collaboration with Prof Fletcher and his team,” Prof Tshentu explains. The research process is to integrate a series of reactions to create a carbon-neutral system. It starts with breaking down carbon dioxide (CO₂) to carbon monoxide (CO), then from CO to methanol, then to dimethyl ether (DME) and finally to gLFG.

“Our team at Mandela University, which includes two master’s students (Christian Asiema and Luzuko Mbumbulwana), a postdoctoral fellow (Dr Peter Fapojuwo) and Drs Ogunlaja and Tywabi-Ngeva from the Department of Chemistry, is involved in the development of the catalysts for converting DME to gLFG,” says Prof Tshentu.

“Since the 1980s, catalysts have been developed for a one-pot conversion of CO₂ to LFG but this process has not been successful; therefore a multi-step process is proposed in

Multi-institutional partnership

The three-year Green QUEST research partnership includes Nelson Mandela University’s Department of Chemistry, the University of Cape Town (UCT), Helmholtz Zentrum Berlin (HBZ) and several other German and South African partners. The three-year project is funded by the German Federal Ministry of Research and Education (BMBF) and officially started in October 2022.

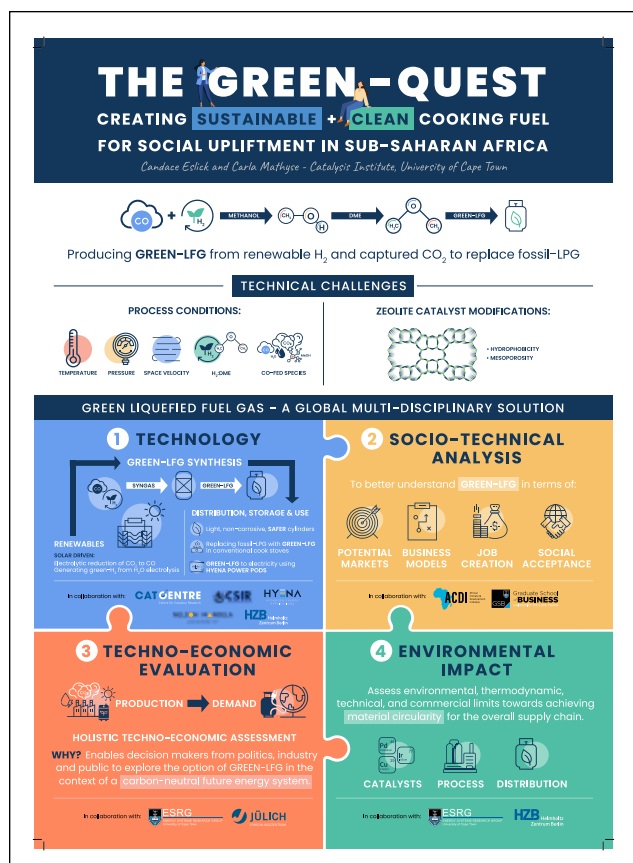
GreenQUEST. If the catalyst development from Mandela University is successful, the UCT team will further develop the process.”

Assessing whether communities would use gLFG

On a social level, the project will closely engage with a range of off-grid southern African communities where most people rely on LPG and other polluting fuels, such as firewood, charcoal and paraffin, which negatively impacts their health and contributes to carbon emissions. GreenQUEST will assess the social acceptance of gLFG to determine whether these communities would be prepared to use it.

The pricing of gLFG will be a key factor down the line, and it would probably need to be subsidised by governments to be affordable for the end users. The idea is that carbon credits could offset the cost if a carbon tax was introduced. “In developed countries, the carbon credit system is well established, but we still need to figure out how it would be done here, and we would need to work out how green gLFG is,” says Prof Tshentu.

“In addition, GreenQUEST will enable the establishment of new relationships and strengthen existing ones between South African and German partners, paving the way for lasting strategic alliances in crucial areas of climate change research and mitigation.”



Health

The Faculty of Health Sciences' interprofessional research and community engagement places an emphasis on social justice and healthcare. This focus explores a range of pressing issues in South African society – from lung and heart diseases associated with working in mines to managing depression and anxiety, and studying nutrition and activity in township schools. The Medical School, established in March 2021, embraces a comprehensive primary healthcare approach underpinned by the pillars of disease prevention: health promotion, treatment and rehabilitative medicine.

**“Health cannot be a question of income;
it is a fundamental human right”**

– Nelson Mandela

Exploring South Africa's health heritage

Indigenous herbal medicine and practitioners a research goldmine

With up to 80% of South Africans choosing indigenous healers and plants over mainstream medicine, local health knowledge is a rich resource that fills a critical gap in the country's overstretched healthcare system.

The role of Traditional Health Practitioners (THPs) and Traditional Herbal Medicine (THM) in the lives of Western and Eastern Cape citizens is the focus of groundbreaking research by Mandela University anthropologist Professor Luvuyo Ntombana and medical anthropologist Dr Denver Davids, Acting HOD, Department of Sociology and Anthropology.

They are investigating and documenting the use of THM among THPs, *bossiesdokters* (bush doctors), Rastafari healers and local people.

"Knowledge and use of THM is very common in rural and semi-rural areas throughout South Africa," says Dr Davids, "but was largely subjugated in the past and remains poorly documented.

"South Africa has a plural, but strained healthcare system, and the use of medicinal plants – and consultations with indigenous healers and doctors – is not only widespread, but also the primary source of healthcare for a large part of the population.

"Indigenous healers are widely consulted for common and more serious conditions, and are perceived as more easily accessible, culturally sensitive and as offering holistic treatment, which counters some barriers sick people experience in accessing Western allopathic medicine."

The power of plants

Most plant species in Africa have medicinal characteristics and are utilised in indigenous medicine, according to Professor Ntombana.

"In most southern African countries' basic healthcare systems, indigenous medicine remains the most economically viable and easily available source of therapy. It is used by people in many developing nations who cannot afford the high cost of Western medications, and because indigenous remedies are more desirable culturally and spiritually.

"If the vast amount of knowledge about the usage of medicinal plants is not actively explored and collected, it is likely to be lost to future generations.



Dr Denver Davids



Prof Luvuyo Ntombana

“Compiling a record of the plants will ensure that knowledge is kept safe, and the plants are used sustainably,” he concludes.

Dr Davids explains that there is scant knowledge about the healing systems of indigenous African people – nothing was well recorded before, or even after, European exploration.

Investigations into THPs focus on two areas: comprehending practitioners’ understanding of communicable and non-

communicable conditions and identifying, understanding and better documenting South African medicinal plants for future conservation and research.

The pandemic’s silver lining

The outbreak of COVID-19 motivated this study, which explores knowledge of medicinal plants used to treat coronavirus-related symptoms in rural villages far from city centres, with limited health care access.

“At the outset, there was no specific medication for treating pandemic symptoms,” says Prof Ntombana, “and rural African people visited their indigenous healers or herbalists when confronted by what was then an unknown or apparently incurable illness.”

These healers and herbalists see more patients than conventional doctors, owing to healthcare system limitations, the belief in a spiritual aspect to illness and readily available, more affordable remedies.

During COVID-19, several indigenous healing plants were prescribed to patients for their symptoms and researchers are actively investigating these as part of their general research.

The proven value of THM

Indigenous medical practices are also receiving a lot of attention from global health players, cementing the importance of building an inventory and documenting the many medicinal plants and herbs in use.

- An estimated 200 000 practising indigenous healers across South Africa.
- Around 50 000 of these are in the Eastern Cape.

Xhosa indigenous medicine

Before colonisation, South Africa's indigenous people relied on their deep knowledge of medicinal plants and healing methodology, according to Prof Ntombana.

Women dominated the healing community and were particularly knowledgeable about pregnancy, childbirth and parenting.

Medicines are found across diverse geographical areas, such as mountains, grasslands, rocky areas or near rivers.

"As the Eastern Cape is rural, natural forests are found – and in them, most medicinal plants. The elderly, who respect the ecosystem, teach the young how to find medicines without destroying them for the future," says Prof Ntombana.

Some examples of the many plants being studied include: *Umnonono* (*Strychnos henningsii*), *Intlungunyembe* (*Acokanthera oppositifolia*), *Umhlonyane* (*Artemisia afra*), *Isivumbampunzi* (*Tulbaghia* spp.) and *Impepho* (*Helichrysum* spp.).



Ongoing research records how each prescription or supplement is used to help prevent disease and small illnesses, including headaches, stomach aches, fractures and sprains, while herbal vitamins, natural medications, baths and massages are ingested or applied to avoid all types of illnesses and maladies.

Sustainable practices

"When I collected plants with indigenous healers, they were attentive to harvesting samples from multiple mature specimens and did not harvest young plants," says Dr Davids. "They were careful not to disturb the growth of the plant by uprooting it, except when the roots and bulbs were needed for specific remedies and symptoms.

"Specific species, which are known to be scarce, were often substituted with other species that are believed to possess similar properties."

Several studies have shown the impact of over-harvesting on the trade of medicinal plants, with some threatened or already extinct.

Many medicinal plants used and traded throughout South Africa have been evaluated by the South African National

Biodiversity Institute's (SANBI) threatened species programme (Red Data List), focusing on monitoring species at high risk of extinction.

"Biodiversity and conservation strategies are important for monitoring threatened species and should be advocated in rural areas," emphasises Dr Davids.

Indigenous vs global: a place in the sun for both

THPs and mainstream medicine can work together, and often do.

Dr Davids says that indigenous healers, for example, don't claim to diagnose or cure HIV or TB; instead, they work closely with local clinics, developing professional relationships with allopathic doctors.

"A way to truly preserve medicinal knowledge is to recognise the role played by THPs," says Prof Ntombana. This way, everybody wins.

The government is accused of sidelining THPs during the medication regulation process. One concern raised is that once indigenous medicines are regulated, THPs will lose their right to intellectual property (IP), with only conventional pharmaceuticals benefiting from IP rights.

Prof Ntombana insists that it is crucial, therefore, to put THPs at the forefront of dialogue about their own knowledge, and to protect their rights.

Study a group effort

The study is funded by the South African Medical Research Council, and research is conducted in partnership with Walter Sisulu University, the University of KwaZulu-Natal, Great Zimbabwe University and the National University of Lesotho.

Dr Davis says that the researchers are committed to advancing the educational revolution through decolonisation, and these studies are a first step in the right direction.

"I agree with scholars such as Joshua Cohen, when he argues that it is difficult to emphasise and comprehend the extent to which science has subjugated indigenous medicine in South Africa."



Overcoming anxiety: coping skills training

Short, sharp and useful, a short-learning programme that focuses on coping skills

At the outbreak of the COVID-19 pandemic, anxiety across the spectrum of healthcare workers was so high that psychiatrist and Executive Dean of the Faculty of Health Sciences, Professor Zukiswa Zingela, developed a psychological preparedness training programme to support them.

“As healthcare workers we received medical training in how to diagnose and treat patients with COVID-19 but nothing about how to address our anxiety. I felt the psychiatry and mental health teams should be playing a tangible role, hence the development of the programme,” says Prof Zingela.

Enhanced Preparedness Training

The programme has since been adapted into a short-learning programme for working adults in any sector, and renamed Enhanced Preparedness Training (EPT). “It focuses on strengthening people’s self- and group coping and management skills,” Prof Zingela explains.

“It enhances self-management when faced with challenges and is achieved through a number of techniques aimed at instilling a sense of calm and an ability to manage stress. When we feel calm we are able to manage our fears, thoughts, feelings and behaviour; we are able to think logically about how to move forward and come up with feasible solutions.”

What we are thinking and feeling

The programme is delivered in three parts. The first takes the form of a 45–60-minute mind-care session, borrowing from theories of cognitive behavioural therapy that focus on what we are thinking and feeling, and how we behave when we interact with ourselves and others at work and at home. The other two sessions are a 20-minute relaxation and mindfulness session, followed by a 45-minute team-care session that looks at the role one can play to enhance the function of the team or their work environment.

“We all carry anxieties and fears when faced with challenges and it is within our control to manage these or to seek help from someone who can help us achieve this. During the EPT programme we share different methods of mindfulness and relaxation, including guided imagery, mind-body feedback



Prof Zukiswa Zingela

Healthcare workers in three resource-limited hospitals in Nelson Mandela Bay – Dora Nginza Hospital, Nelson Mandela Academic Hospital and Elizabeth Donkin Hospital – participated in the programme from mid-April 2020. “It was designed to be short, sharp and useful so that in one to one-and-a-half hours they could leave the session with enhanced coping skills,” says Prof Zukiswa Zingela.



mechanisms and grounding techniques. Through these, people learn how to manage and overcome the different forms of anxiety we all experience," says Prof Zingela.

She continues, "When we feel anxious we start taking shorter, shallower breaths, which disturbs the oxygen-carbon dioxide balance in our bodies. We also experience other effects like increased blood pressure, which may lead to dizziness, dry mouth, pins and needles and even palpitations. If this continues it can lead to a full-blown panic attack. The session on relaxation and mindfulness techniques helps with this. When we know how to normalise our breathing it immediately starts to reverse these physical symptoms and a sense of calm is restored, which rejuvenates our coping skills."

Focusing on the here and now, not on the regret or pain

"No matter how stressed we are or how hard our lives are, we have all experienced at least one moment when we felt peaceful or happy, and we draw on this," Prof Zingela explains. "The grounding techniques are about achieving mindfulness through progressive relaxation that helps us to start focusing on the here and now, not on the regret or pain of the past or the fears we might have about the future."

From September 2023, the EPT programme will be available to all who may wish to access it, across the University's faculties and externally. It will be offered countrywide, both as a face-to-face intervention and online version. The Faculty of Health Sciences works with internal and external facilitators who have a background in psychology or social work, and those in the medical and nursing professions with qualifications in mental health. The facilitators include the Director of the School of Behavioural and Lifestyle Sciences, Professor Zoleka Soji, who is a clinical social worker, and the Dean of Learning and Teaching, Dr Phumeza Kota Nyati, who is a psychologist.

South African Journal of Psychiatry

Qualitative and quantitative data was collected from 761 healthcare workers who participated in the psychological preparedness training programme. Results showed a significant positive change from pre- to post-intervention measures in the perceptions of health workers about the COVID-19 outbreak, their associated anxiety and their ability to control their reactions to stress and to support others. This was published in March 2022 in the South African Journal of Psychiatry, titled: "Developing a healthcare worker psychological preparedness support programme for the COVID-19 outbreak".

The EPT programme is structured in the form of two different options: the two-day programme for companies or individuals, and the three-day programme for professionals in the employee wellness sector who wish to train as programme facilitators. The faculty is currently applying for the EPT programme to be approved for Continuous Professional Development.

"It enhances self-management when faced with challenges and is achieved through a number of techniques aimed at instilling a sense of calm and an ability to manage stress."

"As healthcare workers we received medical training in how to diagnose and treat patients with COVID-19 but nothing about how to address our anxiety."

Health and financial plight of ex-mineworkers in the Eastern Cape

An estimated 300 000 ex-miners are living in conditions of abject poverty.

Over 300 000 ex-miners never received the money or healthcare due to them when they could no longer work in the mines due to age or occupational illness and injury.

“This is a painful story of ex-miners from the Eastern Cape who, over the decades, went to work in the mines in different provinces of South Africa,” explains the Executive Dean of the Faculty of Health Sciences at Nelson Mandela University, Professor Zukiswa Zingela.

“The majority have never received the financial payments due to them when they left the mines, nor the health assessment or healthcare they required when they could no longer work and support their dependants. Many others who retired didn’t know the process of claiming their pension benefits or provident fund savings.

“A minority of ex-miners have been paid out by the mines, or claimed their medical insurance or pension funds or received a payout from the Compensation Commissioner. The majority have not. The money is sitting in funds waiting for the miners to claim it but time is not on the miners’ side, and a number have died while waiting for compensation.” – Prof Zukiswa Zingela.



Rural Eastern Cape in the former Transkei where many ex-miners live in very remote areas

In consultation with the Ex-Miners Council and the Eastern Cape Department of Health, Prof Zingela is leading a team from the Faculty of Health Sciences to research the plight and health needs of ex-miners. "The majority of an estimated 300 000 ex-miners (according to Department of Health research) are living in conditions of abject poverty, which is very much part of the social determinants of ill health, and yet they have money due to them," says Prof Zingela. This situation has dragged on for years.

Prof Zingela and her team are now pursuing the research required for this critical initiative, initially focusing on the Eastern Cape but with the aim of making it a southern African project.

Promises made that have come to nothing

"It's imperative that we achieve results this time as the ex-miners are understandably disillusioned and angry that many promises have been made to help them but have never come to anything," Prof Zingela explains.

The biggest challenge is tracking and tracing the ex-miners to help them access the medical evaluation, the results of which are required in order to link them to the appropriate channels and funds for application and disbursement of their money.

Government has proposed that one-stop-shops are established in Mthatha and Bisho where ex-miners could access all the support departmental services they need. They would be provided with transport or transport money to get to the one-stop-shops. If the ex-miner has died, an immediate family member would be able to take his place but they would need documentation and to be able to give a history of the deceased's symptoms and behaviour.

Deep rurality complicates access

What complicates access is the deep rurality of where the ex-miners live. The more rural the area, the more difficult it has been to find them and help them access the services they desperately need, linked to the different government departments, including the Compensation Commissioner for Occupational Diseases in Mines and Works, and the departments of Labour, Health, and Social Development.

NGOs like the Nonesi Community Development Resource Centre have assisted with tracking and tracing since 2017. They visit rural areas in the Eastern Cape and hold meetings with the traditional leaders and communities to explain that they are looking for the ex-miners who come from the area. In addition to assisting the ex-miners to go for a basic medical examination, they take their history in mining and get their employment number to trace them through the system. Nonesi works with a trust that includes specific mines and has helped some of the miners to receive their due compensation.

Current basic medical evaluation is too limited

"A key issue that my team is addressing is the fact that the current basic medical evaluation is mainly limited to lung and heart diseases but there are potentially other health

Mapping where the ex-miners are living

An initiative to resolve this aberration of social justice was started by the then Minister of Health, Dr Aaron Motsoaledi in 2014. Its aim was to conduct the basic medical evaluations that ex-miners require to claim compensation if they can no longer work due to occupational illness or injury, but it never achieved its goal.

What the Department of Health started doing under Dr Motsoaledi was to map where the ex-miners are living and estimate the numbers. "From this, they know the largest number of ex-miners are in the Eastern Cape, with others in North West, Mpumalanga, Limpopo, Lesotho, Mozambique, Botswana, Angola, Malawi and Zimbabwe," Prof Zingela explains.

The late Executive Dean of the Faculty of Health at Nelson Mandela University, Professor Lungile Pepeta, helped to revive the initiative the Department of Health pre-pandemic, but tragically died of COVID-19 in 2020.

problems directly associated with working in mines, and we are proposing that we do research to motivate for the evaluation to be expanded to include other diseases," Prof Zingela explains.

"One example is TB from pneumoconiosis (lung disease caused by the lung's reaction to inhaling certain dusts), and any miner who is HIV positive is vulnerable to TB," Prof Zingela explains. "There are also a number of mental conditions, such as depression, anxiety and substance misuse disorders, from working in the mines and then from being an ex-miner and poverty-stricken.

"We want to research the social justice issues that affect ex-miners, including the social, health and psychological problems resulting from not having an income, and the community-based interventions we could co-create with the ex-miners population that could make a difference to their health and social challenges.

"We are partnering with the Mthatha-based Walter Sisulu University in our research and we are hoping to start this year, once our proposal is approved by the research and ethics committee."

Nanomedicine’s golden touch

The DSI-Mandela Research Chair in Nanomedicine innovates life-changing treatments for diseases.

Dr Steven Mufamadi and his team are using gold, silver and copper at the nanoscale for their research into the treatment of cancer, HIV/AIDS, diabetes and other diseases.

“My aim is to create a platform to significantly advance the treatment of disease through nanomedicine,” says Dr Mufamadi, who holds the DSI-Mandela Research Chair in Nanomedicine.

“Gold, silver and copper in liquid form at the nanoscale have antimicrobial and anti-cancer properties and at that scale they generate energy for treatment,” Dr Mufamadi explains. “They literally ‘light up’ to show where the disease is, like an x-ray, and can then be used to treat it. Gold nanoparticles are used in the treatment of cancer and HIV/AIDS, and silver and copper nanoparticles in the treatment of internal and external wounds.”

Dr Mufamadi has strong local and international networks from which the Chair develops partnerships to work on life-changing innovations. His first major task at Nelson Mandela University was to build the nanomedicine laboratory from scratch at the Medical School on the Missionvale Campus. The laboratory was completed in March 2023.

Transdisciplinary platform

Over the past two years Dr Mufamadi has developed a transdisciplinary platform for master’s and PhD students from a range of fields, including pharmacy, physiology, environmental health and medical laboratory science. The Chair now has over 20 master’s and PhD students.

One of the PhD students, Itumeleng Zosela, is researching the use of gold nanoparticles to treat colon cancer. She is showing how gold’s anti-cancer activity can kill cancer cells, initially in a cell culture and she is now working on primary cells directly from a person with cancer. In mid-2023 Zosela spent three months at Novartis in Switzerland doing internship training in nanomedicine as part of the Chair’s partnership with Novartis and the University of Basel.

Nanomedicine is the application of atomic or molecular size nanotechnology, such as the use of metallic materials at nanoscale (between 1-100 nanometres), for the targeted treatment of disease.



HIV and Cancer nanomedicine formulations

"From 2023 we are partnering with Afrigen (the first company in South Africa to produce the COVID-19 vaccine using the mRNA platform) in nanomedicine formulations for HIV and immunotherapy for cancer," says Dr Mufamadi. "We are setting up specific collaborative projects and are planning to absorb some of our postgraduate students in these projects."

Other research the Chair is working on includes:

Pharmaceutical detection and treatment of contaminants in water

The aim is to produce clean water as part of a consortium with the Nanotechnology Institute at the University of Waterloo in Canada, Universidade Federal do Rio de Janeiro in Brazil and other universities. "We also co-produced a review paper on this subject with the University of Johannesburg's Department of Chemical Engineering, titled 'Efficient detection and treatment of pharmaceutical contaminants to produce clean water for better health and environmental', which was published in the international *Journal of Cleaner Production* in February 2023," says Dr Mufamadi.

Environmental health project air purifier (robotics)

The aim is to create a robot that moves around and cleans the environment by sucking in polluted air, including air polluted with TB and other harmful bacteria and viruses, including COVID-19. The robot works like a vacuum cleaner and contains a vacuum space with active antiviral nanomaterials in the filter membranes that immediately kill the virus. Master's student Yolanda Mngongo, who is currently developing the filter, won third prize in the DAAD (German Academic Exchange Service) Falling Walls Lab Johannesburg competition. She is advancing the use of nanotechnology to curb nosocomial infections in different areas of healthcare delivery, such as hospitals.

Blood transfusion project

"The senior researcher in the Chair, Dr Mpho Ngoepe, has completed the synthesis of nanomaterials to engineer artificial blood in powder form to create blood that doesn't need a blood group, which can be stored at normal room temperature and that is easy for use in ambulances and remote areas," Dr Mufamadi explains. They have been working with the South African National Blood Service on this and have finalised a joint review paper on artificial blood, which they have submitted to the *International Journal of Blood Medicine*. "We're in the testing phase now, and we aim to have a prototype

First master's and PhD programme in nanomedicine in Africa

"We are in the final stages of establishing a master's and PhD in nanomedicine, which will be the first in South Africa and on the continent," says Dr Mufamadi. "Already approved by the Council on Higher Education, we hope to launch it by the end of this year and accept the first students from the beginning of 2024. We are confident it will attract students from all over South Africa, Africa and beyond." He has also established an elective course in pharmaceutical nanotechnology for final-year students in the Department of Pharmacy. There were ten graduates in 2022 and four in 2023.

ready within a year. We'll use a microfluidic lab-on-a-chip technology to reproduce the artificial blood – I learnt this skill while working at Novartis in Switzerland. The goal is to commercialise the product down the line. Part of our mandate from the Department of Science and Innovation (DSI) is to achieve this with all the research we do."

Breast cancer

Breast cancer is the most frequent cause of cancer death in South Africa. According to the 2014 National Cancer Registry (NCR), 1 in 27 women in South Africa are at risk of developing it. Triple negative breast cancer (TNBC) is the most aggressive form. Dr Mufamadi says: "We are working on a drug delivery system where we use nanoliposomes, lipid nanoparticles containing chemotherapy and/or green nanoparticles to develop a personalised nanomedicine for TNBC patients. Postdoctoral fellow Dr Aidan Battison, who was with the Chair for a year, has finished the synthesis for this and her successor, Dr Stiaan Schoeman, is now taking it through the cell culture stage.

Social justice

Social justice is integral to the DNA of Nelson Mandela University, as it was for our namesake. We are dedicated to realising a socially just, democratic society that promotes equality for all who live here.

Access to legal justice is a core tenet of that philosophy – every citizen has the right to equal access to the law. Paying lip service to this right is not enough; putting it into practice is key.

“Our daily deeds as ordinary South Africans must produce an actual South African reality that will reinforce humanity’s belief in justice, strengthen its confidence in the nobility of the human soul, and sustain all our hopes for a glorious life for all.”

– Nelson Mandela

Justice for all

Faculty of Law initiative provides solid legal advice to vulnerable communities

A Mandela University academic's PhD thesis has catapulted Clinical Legal Education (CLE) into new and improved territory, providing both students and their clients with unparalleled benefits.

In 2021, Dr Marc Welgemoed, Criminal and Procedural Law department head and CLE module coordinator, graduated with a doctoral thesis focusing on how to make CLE more relevant and educational for final-year law students to thoroughly prepare them for professional practice.

His pioneering work was put into practice from 2022 by the Faculty of Law through the Law Clinic on Missionvale Campus.

The revised CLE module now offers practical methodologies to improve quality of training, which in turn provides solid legal advice to the community through the Law Clinic.

From 2022, the results of his thesis were incorporated into a revised Civil Procedure module, using more relevant, practical methodologies to improve the quality of the training. In turn, this means the Law Clinic provides solid legal service to the community. "Students working at the Law Clinic after completing this module will have a better understanding about legal procedure when advising and rendering practical legal services to indigent members of the community," Dr Welgemoed explains.

An average of 15 clients visit the Law Clinic daily, consulting with approximately 146 final-year law students who share the weekly schedule, doing 90 minutes of consultation at a time.



Dr Marc Welgemoed

"It represents a double win of exposing students to community service and enabling equal access to the law and justice while ensuring final-year law graduates are equipped with the professionalism, practical skills and ethics required for the workplace."

All final-year law students undergo CLE at the Law Clinic. An average of 15 low-income or indigent clients visit the Law Clinic daily, consulting with approximately 146 final-year law students who share the weekly schedule, doing 90 minutes of consultation at a time.

In his PhD, Dr Welgemoed showed that the standard curriculum for civil and criminal procedure and the law of evidence is far too theoretical. "The golden thread that must run throughout the LLB is to prepare students to be imminently employable," Dr Welgemoed says. "They must not only be able to think like lawyers, but must have sufficient skills to hit the ground running."

"We need to make sure they are, inter alia, adept at taking instructions. They need to hone their consulting skills, learn how to draft documents, different forms of summons, letters of demand and how to do mediations," he explains.

They need to learn how to probe further in each matter presented to them. If it is a divorce, which is top of the list of matters attended to by the Law Clinic, they need to ask about maintenance for the children, whether either party has a pension fund, what their needs are. "It is not good enough to state, 'The client didn't say'," says Dr Welgemoed. "It is the attorney's duty to probe further or to ask the client to get more paperwork or work out their expenses, or whatever is required. We impress on the students that the quality of legal services we offer at the Law Clinic should not be any different from the quality that people with financial means can access at top law firms."

All of the student consultants are closely supervised by practitioners like Dr Welgemoed. No work leaves the clinic until it they have approved it.

The law clinic operates exactly like a law firm, focusing on all types of civil cases, with an emphasis on divorce, evictions, maintenance matters and domestic violence.

Students naturally cannot go to court, but they can do the bulk of the consulting work and then hand over the work to one of the Law Clinic's six candidate attorneys.

"Our teaching and learning approach is based on 'constructivism'," says Dr Welgemoed, "where the students are empowered to do research and find solutions themselves. When dealing with clients, students first need to seek the solution for themselves and then approach the lecturers to see if they are on the right track. In this way, they learn to marry their practical experience with theoretical knowledge. We constantly emphasise to students that they are rendering a very important service to the community by way of providing access to justice. They might be the client's only chance of justice being served."



Consultation at the Law Clinic with candidate attorney Reade Foong

"Students might be the client's only chance of having justice served."



Research awards and facts and figures



Researcher of the Year Award

Babalwa Magoqwana

Faculty of Humanities

Despite the black feminist thought and its interventions through ‘intersectionality-race, class and gender’ in understanding the postcolonial gender relations today, African societies tend to use indigenous languages to articulate and conceptualise issues differently as opposed to the global North, says Babalwa, a senior lecturer in Sociology and Anthropology. Her research on Maternal Legacies of Knowledge: Towards a Woman-Centred Vernacular Sociology in South Africa is supported by the National Institute for the Humanities and Social Science. The essence of this project is to re-historicise and reconnect the language and sociology to the matriarchal roots and “woman-centred vernacular theory” of the African continent. The project hopes to contribute to towards multi-cultural and pluralistic knowledge beyond the biases around the ‘fathers’ only.



“I still believe that ... great scholarship comes when one starts taking one’s own context seriously.”

Emerging Researcher of the Year Award

Emma Ayesu-Koranteng

Faculty of Engineering, the Built Environment and Technology

“I am passionate about low-income housing provision and the environment, mass timber construction, construction health and safety, sustainable construction and construction contractor development,” says Emma, a senior lecturer and head of the Department of Building and Human Settlements Development. She reviews how timber can be used in the built environment without leaving carbon footprints in line with sustainable development goals. Emma is researching mass timber at doctoral level as well as using sustainable materials for affordable housing. She co-leads the Department’s learning and teaching engagement unit and serves as project leader on timber research projects at the University. She is also a member of the Chartered Institute of Building.



“This is my race, my journey, my life. I simply want to better the person I was yesterday.”

Research Excellence Awards

Pierre Pistorius

Faculty of Science

The ecology and conservation of marine predators such as seabirds, seals and dolphins, underpin much of the research conducted by Pierre, a professor in Zoology. Focal to his research is the impact of climate change and human activities on marine ecosystems and the development of novel means to better manage these systems. Marine top predators serve as important ecological indicators that are used for marine ecosystem-based management and spatial planning. His research involves wide international collaboration with researchers from France, Norway, New Zealand, Australia, the UK, Seychelles and the Falkland Islands. Prof Pistorius has published over 150 peer-reviewed scientific papers and communicates much of this research to the public through various media outlets.



“An absolute fascination with the oceans, and a deep yearning to better understand her magic, motivates my ongoing research on her beasties and her shores.”

Anass Bayaga

Faculty of Education

Increasingly, both developed and developing nations require urgent improvement in students' cognitive engagement in Science, Technology, Engineering and Mathematics (STEM). Access to and the implementation of computer application technologies toward enhanced human-computer interface (HCI), are increasingly limited in all socioeconomic statuses in Africa. In response, Anass, an associate professor in Education, focuses on augmenting information processing (computational cognition) via adaptive technologies. Transdisciplinary research assists in STEM cognitive enhancement with a thrust on neuro (cognitive) mathematics, computational cognition and decision making. Unlike existing research, the mathematics/STEM connections linking pattern recognition, spatial visualisation/perception, and information processing, are examined to apply and enhance computational decision-making and processes through 4IR technologies.



“Because Creation or Nature is easily expressed in mathematical language, I doubt if the Creator isn't a Mathematician.”

Faculty Researchers of the Year Awards

Andrew Phiri

Faculty of Business and Economic Sciences

The research of Andrew, a professor in Economics, is interdisciplinary in nature and does not prescribe to any specific school of economic thought but allows data to “speak for itself”. His research focuses on identifying and applying analytical tools, which have the mathematical accuracy to draw precise inferences from real world data. In unveiling “hidden facts” on key economic issues, his research enhances our ability to evaluate which competing theories best explain these facts and which existing economic policies are (un)likely to work. The research also suggests new policy framework designs, which have a higher probability of improving people’s welfare.



“As is the case with mankind, it is really doubtful that any economy can truly prosper without being highly sacrificial.”

John Smallwood

Faculty of Engineering, the Built Environment and Technology

Construction globally generates a disproportionate number of fatalities, injuries and occupational disease, with a negative impact on participants and their families’ health and well-being, also contributing to the cost of construction and development. John, a professor in Construction Management, conducts personal health and safety (H&S)-related research and his student research has contributed to change through practitioners across the construction industry. To date, these studies have addressed strategies, tactics, and interventions at industry, organisation, and project level, to improve H&S performance over three decades. However, the advent of Industry 4.0 and its related technologies, constitutes a further opportunity to contribute to improving H&S performance, requiring related research and the development of frameworks and models.



“Given that health and safety is a ‘life and death’ issue, meaningful research relative thereto, and implementable recommendations have the potential to ‘make a difference.’”

Faculty Researchers of the Year Awards

Anass Bayaga

Faculty of Education

Increasingly, developed and developing nations require urgent improvement in students' cognitive engagement in Science, Technology, Engineering and Mathematics (STEM). Access to and the implementation of computer application technologies toward enhanced human-computer interface (HCI), are increasingly limited in all socioeconomic statuses in Africa. In response, Anass, an associate professor in Education, focuses on augmenting information processing (computational cognition) via adaptive technologies. Transdisciplinary research assists in STEM cognitive enhancement with a thrust on neuro (cognitive) mathematics, computational cognition and decision making. Unlike existing research, the mathematics/STEM connections linking pattern recognition, spatial visualisation/perception, and information processing, are examined to apply and enhance computational decision-making and processes through 4IR technologies.



“Because Creation or Nature is easily expressed in mathematical language, I doubt if the Creator isn’t a Mathematician.”

Ilse Truter

Faculty of Health Sciences

The United Nations' Sustainable Development Goal 3 aspires to ensure health and well-being for all, and this is the research focus of Ilse, a professor in Pharmacy. One cannot manage if you cannot measure and her research into the prescribing and usage patterns of medicine aims to measure, so that we can better manage our scarce healthcare resources. It involves surveys with consumers, patients and healthcare professionals, to working with “Big Data”, analysing millions of health records. Both clinical and cost factors are considered. Ultimately, a healthy population can lead to the economic well-being of a country. She also researches headaches/migraine, ADHD, vaccines, pharmacy services, and health systems management.



“Be curious. Be courageous. Enjoy the journey towards your dream ... how you travel is as important as what you are travelling towards.”

Faculty Researchers of the Year Awards

Babalwa Magoqwana

Faculty of Humanities

Despite the black feminist thought and its interventions through 'intersectionality-race, class and gender' in understanding the postcolonial gender relations today, African societies tend to use indigenous languages to articulate and conceptualise issues differently as opposed to the global North, says Babalwa, a senior lecturer in Sociology and Anthropology. Her research on Maternal Legacies of Knowledge: Towards a Woman-Centred Vernacular Sociology in South Africa is supported by the National Institute for the Humanities and Social Science. The essence of this project is to re-historicise and reconnect the language and sociology to the matriarchal roots and "woman-centered vernacular theory" of the African continent. The project hopes to contribute to towards multi-cultural and pluralistic knowledge beyond the biases around the 'fathers' only.



"I still believe that ... great scholarship comes when one starts taking one's own context seriously."

Joanna Botha

Faculty of Law

Joanna, a professor in Public Law, believes in the premise that inter-group hostility is linked to social hierarchies and the power dynamics between marginalised communities and those with 'in-group' status. Her research uses a contextually sensitive and people-orientated approach for the development of a regulatory framework for hate crimes and hate speech. South Africa's Constitution also plays a prominent role in Joanna's research, with the rights to substantive equality, human dignity and freedom of expression being key. "I aim to use engaged research to enhance law's capacity to construct meaningful change and development in an inclusive, socially just South Africa," she says.



"Be curious, be brave, believe in your work and you will inspire change."

Faculty Researchers of the Year Awards

Janine Adams

Faculty of Science

Our research ensures that science assists to both conserve coastal habitats like estuaries, but also transcends to policy, which is widely implemented to protect the country's estuaries, says Janine, a professor in Botany. Innovative methods for water quality improvement are identified to ensure healthy estuaries, ecological and societal benefits, such as recreation and subsistence use. Her research is aligned with the UN Decade of Ecosystem Restoration and priority sites for action which have been identified. Janine's research outputs are used in global studies to understand the response of coastal wetlands to climate change including sea level rise and extreme events. South Africa's diverse coastline is a privilege to study, offering rich opportunities to explore the habitats where people live, work and play, she says.



"My passion is making a difference and ensuring that knowledge is transferred across the science, policy and management spectrum."

Faculty Emerging Excellent Researcher Awards

Ayanda Deliwe

Faculty of Business and Economic Sciences

Quality education and improvement, motivated by the need to make education change the world, is the research focus of Ayanda, a lecturer in Business Management. Her personal belief is in providing and administering academic empowerment, which facilitates personal growth and development. In as much as charity begins at home, those being assisted end up being dependent and she aspires for independence and self-realisation. Improved education can address poverty, one of the major societal challenges.



"Change your mindset and stop asking yourself who am I to ... rather ask: who am I not to ...?"

Faculty Emerging Excellent Researcher Awards

Emma Ayesu-Koranteng

Faculty of Engineering, the Built Environment and Technology

"I am passionate about low-income housing provision and the environment, mass timber construction, construction health and safety, sustainable construction and construction contractor development," says Emma, a senior lecturer and head of the Department of Building and Human Settlements Development. She reviews how timber can be used in the built environment without leaving carbon footprints in line with sustainable development goals. Emma is researching mass timber at doctoral level as well as using sustainable materials for affordable housing. She co-leads the Department's learning and teaching engagement unit and serves as project leader on timber research projects at the University. She is also a member of the Chartered Institute of Building.



"This is my race, my journey, my life. I simply want to better the person I was yesterday."

Obakeng Kagola

Faculty of Education

The involvement of men in the learning and teaching of young children can contribute towards developing a different form of masculinity that is caring and pro-femininity, says Obakeng, a lecturer in Early Childhood Education. He explores the notion that foundation phase teaching is socially constructed as a career only suitable for women in his research. Obakeng works together with School Governing Bodies (SGBs) as leaders and community members, to think of ways they can foster change through disrupting gendered ideas, such as foundation phase teaching as only suitable for women and not a profession commendable for everyone.



"In our actions we work towards our destinations; through acts of kindness, we forge paths to changing the world for the better."

Faculty Emerging Excellent Researcher Awards

Fouzia Munir

Faculty of Humanities

Many of us are living lives of oppression, adversity and deprivation, says Fouzia, a lecturer in Applied Languages. Her research has addressed social justice issues and skills development. She believes we can all play our part in uplifting our society, helping the vulnerable and fighting for the rights of those who cannot fight for themselves. In a world beset with human suffering, multidisciplinary research is needed in pursuing the vision of a society that is based on the principles of equality and justice for all.



"Research is growth. Researchers have the power to drive change and create a better tomorrow for everyone."

Amanda Spies

Faculty of Law

The research of Amanda, an associate professor in Public Law, questions law and social change and how strategic litigation can be used to change the law to benefit women. A distinct focal point is her interrogation of seemingly procedural aspects of litigation and adjudication, how arguments are framed, how facts and experiences are presented to courts and how they are perceived and weighed in judicial deliberation. She believes that her research has benefited from her prior experience as strategic litigator around women's rights, providing her with insight into the different ways in which law and justice are framed and constructed, thereby unmasking the partisanship of law, and suggesting room for reform.



"Always strive for excellence."

Faculty Emerging Excellent Researcher Awards

Anina Coetzee

Faculty of Science

Fynbos, a habitat type in the Cape, contains more than 300 plant species that depend on sunbirds to visit them so that they can produce seeds. The research of Anina of Natural Resource Management helps us to understand these species better and to conserve them so that society can benefit from their beauty and the healthy environment they produce. Sunbirds are highly dependent on the sugar water produced in these plants' flowers. Because sunbirds and these plants depend on each other so strongly, they affect each other's survival and evolution and therefore must be conserved together.



"Create little pockets of heaven in your own community."

Research facts and figures 2022

NRF Rated Researchers

Name	Rating Category	Rating Period	Gender	Race	HEAVA/RA
Faculty of Humanities (5)					
Boswell, R Prof	C1	2018-2023	F	B	
Crous, ML Prof	C3	2018-2023	M	W	
De Villiers, AC Prof	C3	2023-2028	F	B	
Hurst, A Prof	C3	2018-2023	F	W	
Janse van Vuuren, HE Prof	C2	2019-2024	F	W	HEAVA
Faculty of Business & Economic Sciences (5)					
Farrington, SM Prof	C2	2019-2024	F	W	
Fourie, HE Prof	C3	2017-2022	M	W	
Hove-Sibanda, P Prof	Y2	2022-2027	F	B	
Mishi, S Prof	C3	2023-2028	M	B	
Venter, E Prof	C1	2018-2023	F	W	
Faculty of Education (4)					
Blignaut, SE Prof	C2	2023-2028	M	B	
de Lange, N Prof	C1	2019-2024	F	W	HEAVA
Powell, L Prof	C2	2023-2028	F	B	HEAVA
Webb, P Prof	C1	2019-2024	M	W	HEAVA
Faculty of Engineering, The Built Environment & Technology (11)					
Abou-El-Hossein, K Prof	C2	2022-2027	M	B	RA
Emuze, FA Prof	C3	2019-2024	M	B	RA
Futcher, LA Prof	C1	2023-2028	F	W	
Hattingh, DG Prof	B3	2018-2023	M	W	
Haupt, TC Prof	C1	2023-2028	M	B	RA
Shakantu, W Prof	C2	2023-2028	M	B	
Sheldon, M Prof	C2	2022-2027	F	B	
Smallwood, JJ Prof	C2	2020-2025	M	W	
Thomson, K-L Prof	C2	2022-2027	F	W	
Van Greunen, D Prof	C2	2018-2023	F	W	
Von Solms, R Prof	B2	2021-2026	M	W	HEAVA
Faculty of Health Sciences (3)					
Morton, DG Dr	C3	2022-2027	M	W	
Truter, I Prof	B3	2023-2028	F	W	
Ten Ham-Baloyi, W Dr	Y2	2019-2024	F	W	

Name	Rating Category	Rating Period	Gender	Race	HEAVA/RA
Faculty of Law (2)					
Vrancken, PHG Prof	C1	2019-2024	M	W	
Spies, A Prof	Y2	2020-2025	F	W	
Faculty of Science (65)					
Adams, JB Prof	B2	2022-2027	F	W	
Anandjiwala, R Dr	C3	2019-2024	M	B	HEAVA
Agyingi, C Dr	Y2	2018-2023	M	B	
Ajonijebu, DC Dr	Y2	2023-2028	M	B	
Appadu, R Prof	C2	2021-2026	M	B	
Barton, BJ Prof	C2	2020-2025	F	W	
Booth, GL Prof	C1	2018-2023	M	W	RA
Calitz, A Prof	C1	2020-2025	M	W	HEAVA
Christopher, AJ Prof	B3	2018-2023	M	W	RA
Cowling, RM Prof	A1	2021-2026	M	W	HEAVA
Connan, M Dr	C2	2023-2028	F	W	RA
Dallas-Daw, HF Dr	C2	2022-2027	F	W	RA
Dabrowski, JM Dr	C2	2020-2025	M	W	RA
Dauids, H Prof	C3	2022-2027	F	B	
Downing, TG Prof	C1	2018-2023	M	W	
Du Plessis, MC Prof	C2	2020-2025	M	W	
Engelbrecht, JAA Prof	C2	2018-2023	M	W	HEAVA
Ferg, EE Prof	C2	2021-2026	M	W	
Fritz, H Prof	C1	2018-2023	M	W	HEAVA
Frost, CL Prof	C2	2021-2026	F	B	
Gerber, TIA Prof	C1	2018-2023	M	W	HEAVA
Gibbon, T Prof	C2	2020-2025	M	W	
Grant, CC Dr	C3	2018-2023	F	W	RA
Groenewald, NJ Prof	C1	2018-2023	M	W	HEAVA
Hayward, MW Dr	B3	2019-2024	M	W	RA
Hlangothi, SP Dr	C2	2022-2027	M	B	
Janse van Vuuren, A Dr	Y2	2020-2025	M	W	
Kakembo, V Prof	C1	2019-2024	M	B	
Kerley, GIH Prof	B3	2018-2023	M	W	HEAVA
Kirkman, SP Dr	C1	2022-2027	M	W	
Kraaij, T Dr	C2	2020-2025	F	W	RA
Landman, M Dr	C3	2021-2026	F	W	RA
Leitch, AWR Prof	C3	2018-2023	M	W	HEAVA
Little, KM Prof	C2	2021-2026	M	W	
Linol, BL Dr	Y2	2018-2023	M	W	
Lombard, A Prof	B2	2021-2026	F	W	
Marean, C Prof	A2	2018-2023	M	W	HEAVA
Mhlanga, SD Prof	C2	2023-2028	M	B	
Miranda, NAF Dr	C3	2020-2025	M	W	RA
Nagiah, S Dr	Y2	2021-2026	F	B	
Neethling, JH Prof	B1	2019-2024	M	W	

Name	Rating Category	Rating Period	Gender	Race	HEAVA/RA
Faculty of Science					
Nel, JL Dr	B3	2019-2024	F	W	
Nel, P Prof	B3	2022-2027	F	W	RA
O'Connell, JH Dr	C2	2022-2027	M	W	
Ogunlaja, AS Dr	C2	2023-2028	M	B	
Olivier, EJ Dr	C2	2022-2027	M	W	
Oosthuizen, WC Dr	Y1	2022-2027	M	W	
Pichegru, L Prof	C1	2023-2028	F	W	HEAVA
Pistorius, PA Prof	C1	2023-2028	M	W	
Potts, AJ Prof	P	2019-2024	M	W	
Pretorius, CJ Dr	Y2	2021-2026	M	W	
Prins, AL Dr	C2	2021-2026	M	B	
Quick, L Dr	Y1	2019-2024	F	W	
Rishworth, GM Dr	Y2	2023-2028	M	W	
Roux, D Prof	B3	2017-2022	M	W	HEAVA
Scholtz, BM Prof	C2	2023-2028	F	W	
Strydom, NAF Prof	C2	2023-2028	F	W	
Tshentu, Z Prof	C2	2021-2026	M	B	
Venter, A Prof	C2	2021-2026	M	W	
Venter, JA Prof	C3	2020-2025	M	W	
Van de Venter, M Prof	C2	2023-2028	F	W	
Van Dyk, EE Prof	C2	2018-2023	M	W	
Watts, P Prof	B1	2021-2026	M	W	
Weigt, M Dr	C2	2021-2026	M	W	
Wesson, JL Prof	C2	2018-2023	F	W	
Total Number of Rated Researchers = 9			F = 35	B = 24	
			M = 60	W = 71	

HEAVA – Honorary, Emeritus, Adjunct, Visiting or Ad Personum Professor; RA – Research Associate

Research Outputs

There has been a slight decrease in research outputs in 2022 from the steady increase over the last 5 years. *2022 numbers are still preliminary and await final approval by the Department of Higher Education and Training.

	2016	2017	2018	2019	2020	2021	2022*
Books and Chapters	30.84	22.52	35.48	21.0	60.06	55.75	51.57
Conference Proceedings	81.09	54.23	41.93	49.6	24.86	39.0	39.26
Journal Articles	319.4	312.33	349.93	389.0	472.45	485.88	470.23

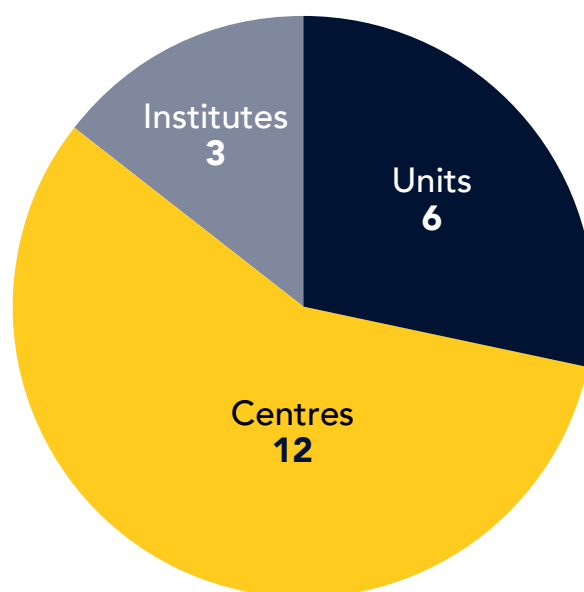
Details of Research Entities

Name	Acronym	Leader	Faculty	Email address
Centres in Faculties (11)				
Built Environment Research Centre	BERC	Mr C Allen (Interim)	EBET	Chris.Allen@mandela.ac.za
Centre for Community Technologies	CCT	Prof D van Greunen	EBET	Darelle.vanGreunen@mandela.ac.za
Centre for Research in Information and Cyber Security	CRICS	Prof RA Botha	EBET	ReinhardtA.Botha@mandela.ac.za
Centre for African Conservation Ecology	ACE	Prof G Kerley	Science	Graham.Kerley@mandela.ac.za
Centre for High Resolution Transmission Electronic Microscopy	HRTEM	Prof EJ Olivier	Science	Jaco.Olivier@mandela.ac.za
Centre for Rubber Science and Technology	CRST	Prof P Hlangothi	Science	Percy.Hlangothi@mandela.ac.za
Telkom Centre of Excellence	CoE	Prof J Wesson	Science	Janet.Wesson@mandela.ac.za
African Centre for Coastal Palaeoscience	ACCP	Dr H Cawthra	Science	Hayley.Cawthra@mandela.ac.za
Centre for Broadband Communication	CBC	Dr D Waswa	Science	David.Waswa@mandela.ac.za
Centre for Philosophy in Africa	CPA	Dr MS Nzioki	Humanities	Mutinda.Nzioki@mandela.ac.za
Raymond Mhlaba Leadership Centre	RMLC	Prof L Ntombana	Humanities	Luvuyo.Ntombana@mandela.ac.za
Units in Faculties (6)				
Family Business Unit	FBU	Prof E Venter (Acting)	Business & Economic Sciences	Elmarie.Venter@mandela.ac.za
Unit for Positive Organisations	UPO	Prof G Freedman	Business & Economic Sciences	Grant.Freedman@mandela.ac.za
Unit for Economic Development and Tourism	UFEDT	Prof R Ncwadi	Business & Economic Sciences	Ronney.Ncwadi@mandela.ac.za
Unit for Visual Methodologies for Social Change	UVMSC	Dr M Childs	Education	Margie.Childs@mandela.ac.za
Drug Utilisation Research Unit	DURU	Prof I Truter	Health Sciences	Ilse.Truter@mandela.ac.za
Sustainability Research Unit	SRU	Prof H Fritz	Science	Herve.Fritz@mandela.ac.za

Institutional Entities

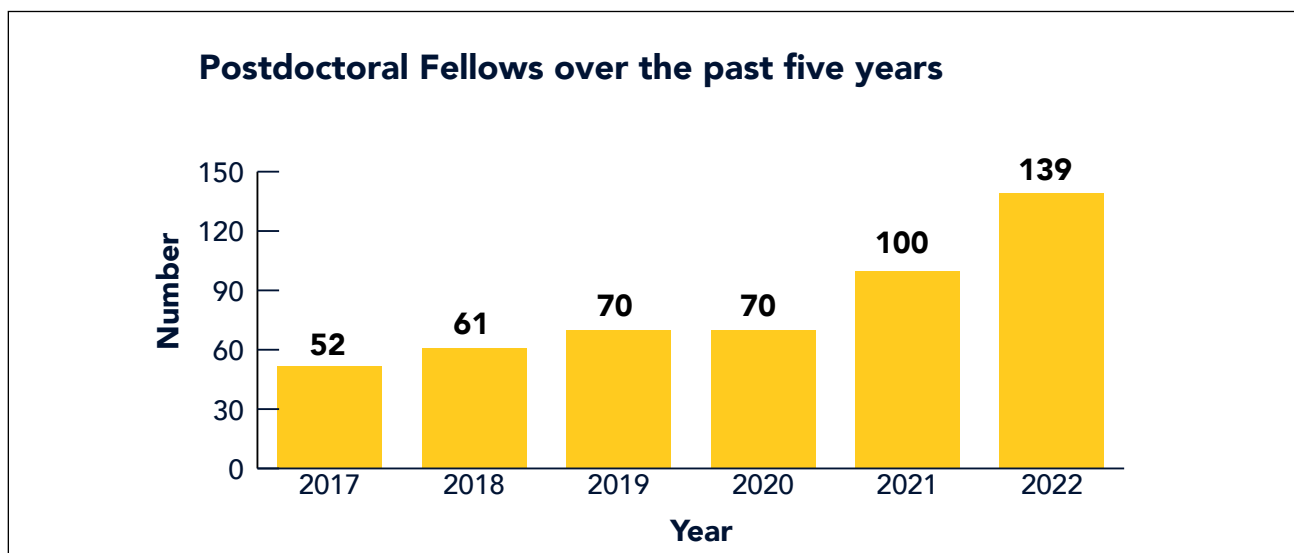
Name	Acronym	Leader	Email address
Entities reporting to the DVC: RII – University based (3)			
AEON – Earth Stewardship Research Institute	ESSRI	Dr B Linol (Acting)	Bastien.Linol@mandela.ac.za
Institute for Coastal and Marine Research	CMR	Dr N Hadi (Acting)	Nomtha.Hadi@mandela.ac.za
Centre for Women and Gender Studies	CWGS	Dr B Magoqwana	Babalwa.Magoqwana@mandela.ac.za

Number of Research Entities



Research Chairs

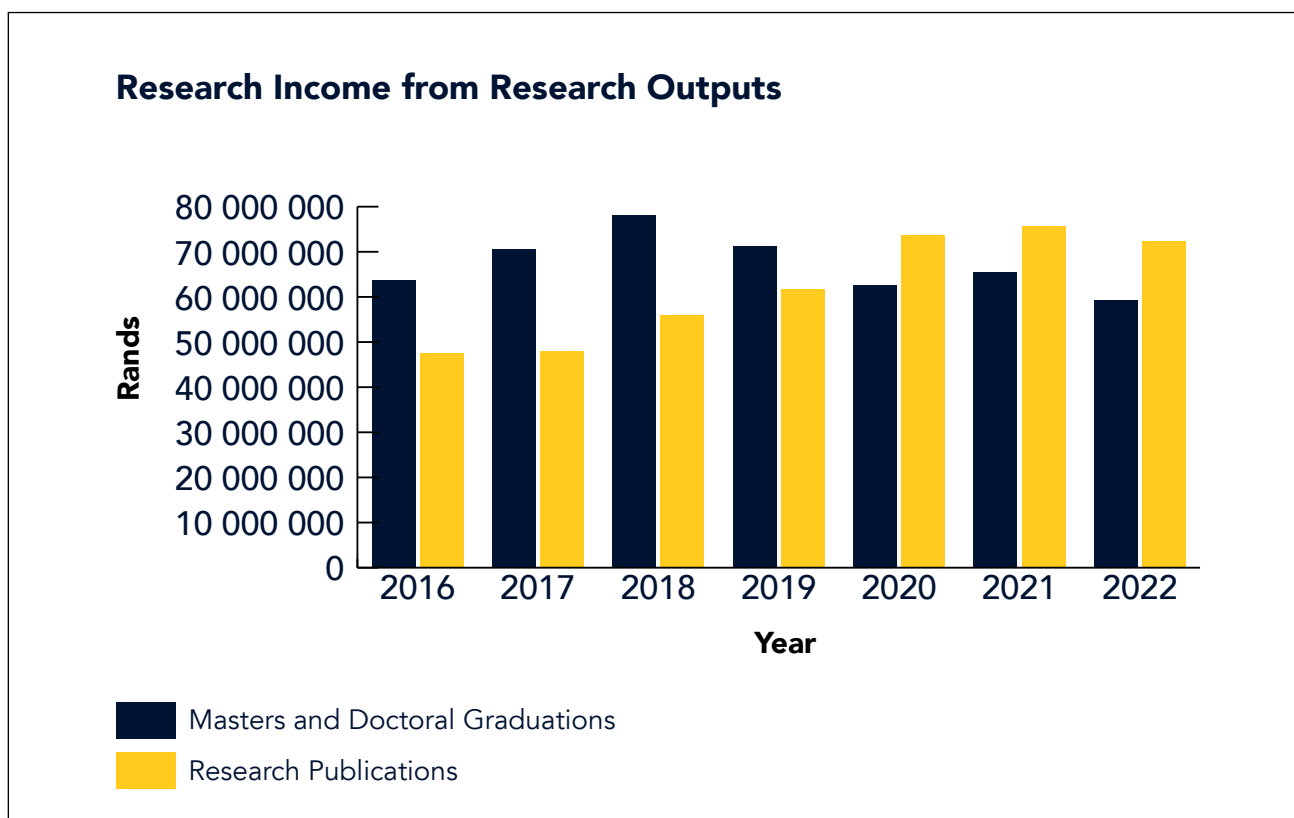
No.	Title	Name	Name of Research Chair	Department	Affiliation
1	Professor	A Hurst	SARChi Chair in Identities and Social Cohesion in Africa	Philosophy	Humanities
2	Professor	A Lombard	SARChi Chair in Marine Spatial Planning	CMR	DVC: RII
3	Professor	J Adams	SARChi Chair Shallow Water Ecosystems	Botany/CMR	Science / DVC: RII
4	Professor	P Watts	SARChi Chair Microfluidic Bio/Chemical processing	Chemistry	Science
5	Professor	P Vrancken	SARChi Chair in Law of the Sea	Law	Law
6	Professor	M Roberts	SA-UK Bilateral Chair in Food Security	CMR	DVC: RII
7	Professor	A Keet	Chair for Critical Studies in Higher Education Transformation	CriSHET	DVC: RII
8	Professor	S Mbanga	Chair in Human Settlements	Building and Human Settlements	EBET
9	Professor	I Gorch	Isuzu Chair in Mechatronics	Mechatronics	EBET
10	Mr	K du Preez	merSETA: Engineering Development	Engineering	EBET
11	Professor	S Vally	DHET/DST SARChi Chair in Community Adult and Worker Education (hosted with UJ)	Hosted by UJ	
12	Professor	C Walter	UNESCO Chair in Physical activity and Health in Educational Settings. Co-hosted with University of Basel, Switzerland	Human Movement Science	Health Sciences
13	Dr	L Powell	Research Chair: Youth Unemployment, Employability & Empowerment	CriSHET	DVC: ETP
14	Professor	R Boswell	Ocean Cultures and Heritage	Sociology and Anthropology	Humanities
15	Professor	PD Gqola	African Feminist Imaginations	Sociology	Humanities



Research Fellows in 2022

Research Fellow	Gender	Race	Department	Faculty
Dr Maëlle Connan	Female	White	Zoology/CMR	Science
Dr Bastien Linol	Male	White	GeoSciences/AEON	Science
Dr Chloé Guerbois	Female	White	Sustainable Research Unit	Science
Dr Rexwhite Enakrire*	Male	Black	Computing Sciences	Science
Dr George Kehdinga*	Male	Black	Secondary School Education	Education

*These Research Fellows resigned before the end of 2022



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