NELSON MANDELA UNIVERSITY

July 2022

Faculty of Science

News

Faculty of Science visits Vhembe District

Student Recruitment collaborated with the Nelson Mandela University Faculty of Science and University of Venda (UniVen) Science Faculty on its engagement activities in Vhembe Limpopo from 03 – 06 May 2022.The initiative was about bringing science to the community and allowing learners to participate in science activities that were taking place. The week long initiative, which showcased different activities, also involved the community. The visit coincided with a career week event in the region during the period.

Chiefs, school principals, and community leaders were in support of the program as they attended all the engagements taking place during this period. Before the start of the day, the delegates would visit the home of the local Chief to pay homage and outline the purpose of the day so that the chief may be aware of happening in the village and to get support from the Chief and community. The delegation during this period was led by Dr. Eric Maluta from the UniVen Science faculty.

The entire initiative was supported by the local Vhembe district office which hosted the various student engagements. Parallel to this was educator sessions, where Nelson Mandela University via central student recruiters interacted with the Life Orientation and STEM educators of the district.

The outreach included motivational talks, science career talks, general career talks, role modeling, science exhibitions, science shows, and science experiments. There were several other exhibitors like the South Africa Space Agency (SANSA), University of South Africa, STEC, Phalaborwa Foundation, South Africa Agency of Science Advancement (SAASTA), South African National Biodiversity Institute (SANBI) Natural Science Collections Facility (NSCF), Govan Mbeki Mathematics Development Centre (GMMDC).

> “The Vhembe District is richly endowed with natural resources, with highly competitive forestry, agricultural, and tourism industries.”

The Science team was led by the faculty dean, Prof Muronga, he engaged with top STEM learners throughout the week. Various community visits were held, where again NMU, had the opportunity to engage with the local Chief and his community.

Faculty of Science also had full participation from George Campus with Director of School of Natural Resource Science and Management Prof Josua Louw as part of the delegation. Prof Louw showcased the unique George Campus offerings.

The Vhembe District is richly endowed with natural resources, with highly competitive forestry, agricultural, and tourism industries. At the same time, it is a region that faces significant challenges in terms of environmental degradation, climate change, food and water security, and disparities in terms of access to resources and wealth.

The specific aspects relevant to the region were highlighted. These included alien plant invasions, soil erosion, biodiversity loss, water pollution and supply, food security, poverty, and sometimes poor-quality education.

Students were also sensitized about the importance of “softer” skills for a successful career.

Left: Prof Muronga addressing the community and delegates in Vhembe. Right: Learners from Vhembe District standing proudly.

Learners combine maths and art in unique coffee table book

By Carine Steyn

In the past, maths and art were always seen as separate disciplines, worlds apart. But when they are studied together, it's clear there are strong links between the two. A great deal of creativity goes into mathematical breakthroughs, while plenty of mathematical precision goes into an artwork.

To encourage learners to bridge the gap between maths and art – and gain the skills they will need to navigate careers in the highly innovative and technologically creative Fourth Industrial Revolution – schools across South Africa, since 2018, have had the opportunity to participate in a MathArt competition.

And now their maths-inspired artworks are available for all to see in a unique coffee table book, *MathArt Expressions by South African Youth*, launched on Friday, 24 June 2022.

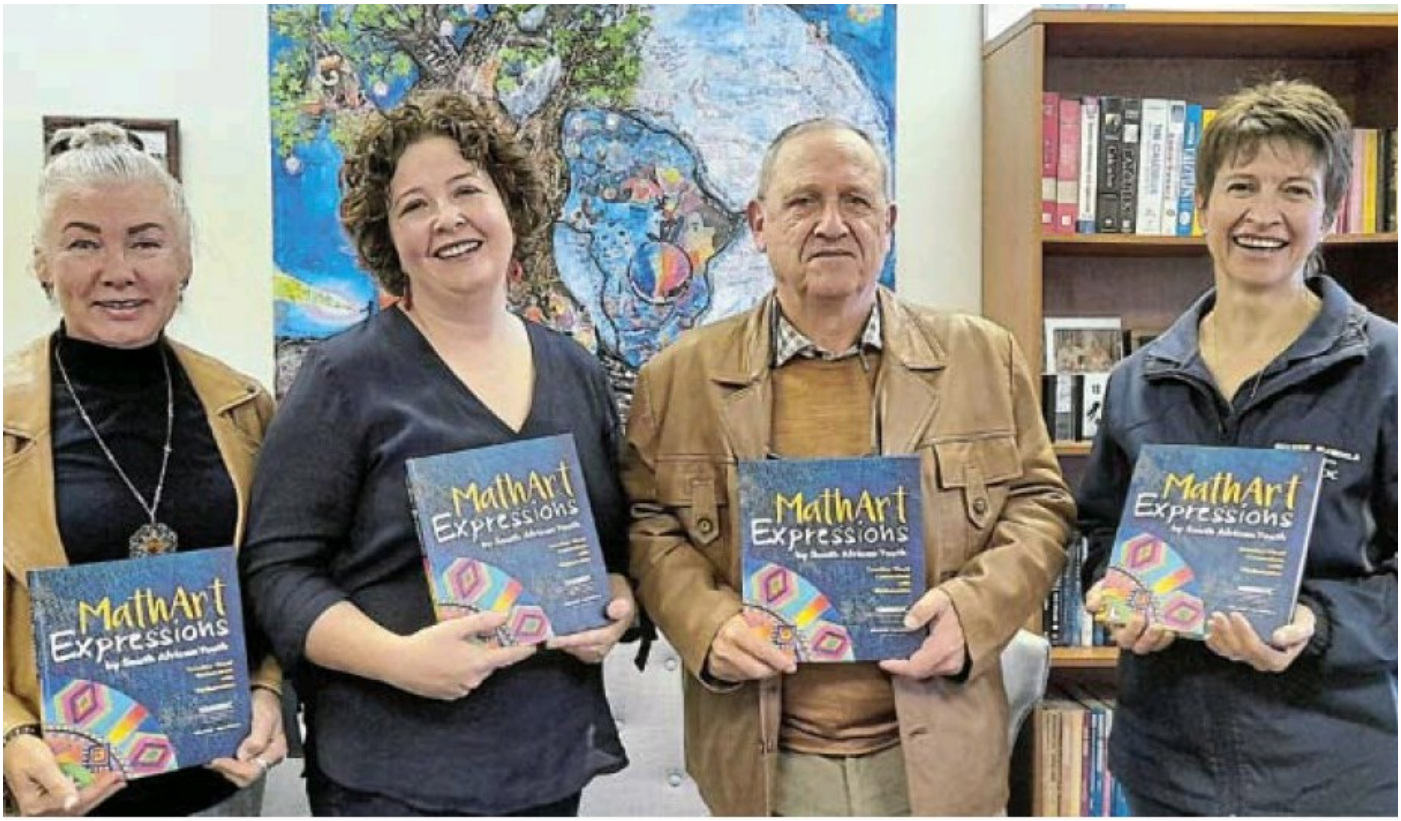
The competition, run annually by Nelson Mandela University's Govan Mbeki Mathematics Development Centre, draws entries from every province – with many of the winning entries going on to be displayed overseas, through the international Bridges Organisation, a partner with GMMDC, and a supporter of the global shift towards STEAM education – an educational approach that uses Science, Technology, Engineering, the Arts and Mathematics to encourage critical thinking among learners.

"In the book, we explore what we've done with the maths and art project and how we are working to promote the STEAM approach in teaching mathematics at school, in line with international trends," said GMMDC director Prof Werner Olivier. "The math art project is a practical way to promote trans disciplinarity in schools."

True to form, the book uses a metaphor from the world of science and maths – the natural processes of a baobab tree - to explain how the art competition evolved.

Using more visuals than words, the "roots" chapter tells the story of GMMDC and how its emphasis on STEAM education inspired the competition. The "trunk" chapter expands on the competition and shares how it has grown from provincial to national, including more and more learners and educators, and how it has also strengthened maths education. The "branches" chapter describes the incredible artworks received from the learners, and the different themes they have explored, while the "fruits" chapter depicts the unexpected outcomes, for instance, how the learners have shared the emotions they have experienced – both their frustration and excitement – as they have grappled with the subject of maths, or the searching questions they have asked about the subjects they explore. The "reach" chapter covers the competition's footprint, from an educational and international perspective.

"The MathArt project has gained a lot of support over the years from schools across the country," said GMMDC project coordinator Carine Steyn. "And every year, we are blown away by the calibre of the entries."



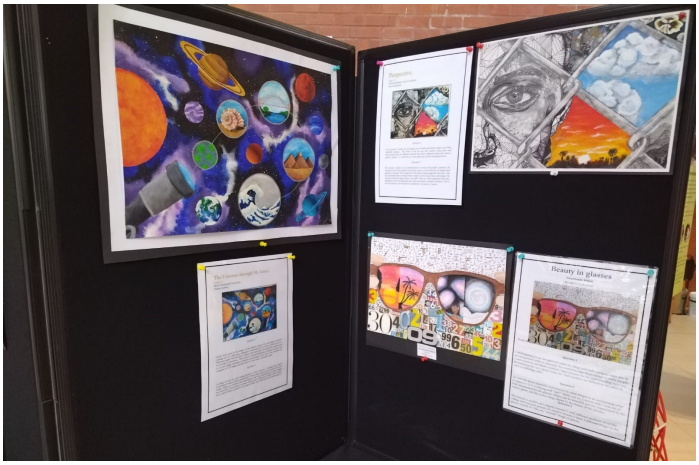
Staff from Govan Mbeki Mathematics Development Centre (GMMDC) proudly holding the MathArt Expressions coffee table book.

"One of our aims has also been to make the project as accessible as possible to all learners, especially those in under-resourced schools. All you need to enter the competition is a piece of a paper and a pencil."

Learners submit a photograph of their artworks online, and then the selected top entrants courier their artworks to GMMDC for final adjudication by a diverse panel of judges, including mathematicians, artists, teachers, lecturers, STEAM educators, architects and designers. Where necessary, GMMDC assists learners to submit their artworks.

"Through the competition, we can encourage learners and teachers to see maths differently. They are encouraged to see maths as not boring, but relevant and fun," said Steyn.

Over the years, the project has also gained the support of several organisations, including Experience Workshop, the Eastern and Western Cape Departments of Basic Education, Umalusi (the Council for Quality Assurance in General and Further Education and Training), the South African Mathematics Foundation (SAMF), the South African Agency for Science and Technology Advancement (SAASTA), and several others.



Some artworks that were on display at the MathArt Expressions book launch

Downloadable App MobiTutorZA Academy bridges the gap in mathematics curriculum.

Originally published by The Herald. Written up by Jade Alexander

Nelson Mandela University's Govan Mbeki Mathematics Development Centre (GMMDC) is helping to bridge the two-year gap in the mathematics curriculum for learners. The free and downloadable app MobiTutorZA Academy is a maths and science learning-support app developed by GMMDC.

The programme is available both online and offline and includes technology-blended lessons linked to the grade 12 curriculum, pupil support in several different languages, mobile-based assessments, feedback via Zoom and many other tools.
These have been tried and tested over the past 10 years by the university's Govan Mbeki Mathematics Development Centre (GMMDC).

About 60 grade 12 pupils at three Gqeberha schools have a chance of improving their maths marks. The matric maths classes at Ethembeni Enrichment Centre in North End, Paterson High and St Thomas High — along with an additional 15 past pupils outside these schools who failed matric maths and are repeating the subject to improve their chances of getting into university thanks to an innovative programme.
The method has proven to help push pupils' marks up throughout the country, even over the past two Covid-19-affected years.

"The MobiTutorZA Academy programme integrates technology to support the teaching and learning of maths and is aimed at self-directed learning outside school hours," the centre's director, Prof Werner Olivier, said. "It's all about giving learners skills for the future and creating jobs for our young generation."

Isuzu Motors donated generously towards the programme. Isuzu Motors SA's department executive of corporate and public affairs, Mandlakazi Sigcawu, said the company was excited to invest in the future of these pupils. "Investing in someone's future is one of the greatest things you can do".

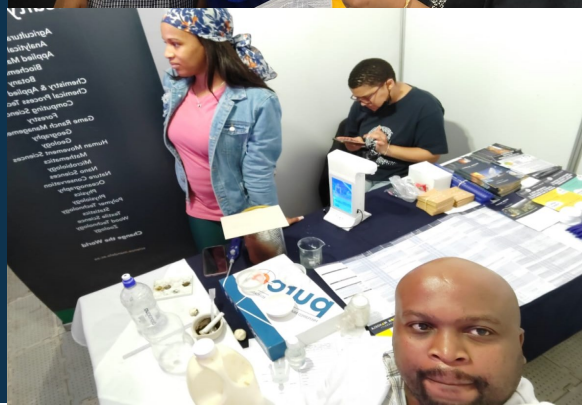
Engcobo Career Expo

The Faculty of Science was invited to the Eastern Cape Career and Science Expo in Engcobo, Eastern Cape. The Career & Science Expo was designed for grade 7-12 learners to provide them with information about careers in the Maths & Science Space World, Engineering Financial Services, Aviation 4IR- 4th Industrial Revolution Robotics Manufacturing, Agriculture Maritime, and more.

The Science Marketing Team and Dr Phiri from the Chemistry Department attended the expo. It was hosted on the Engcobo Village sports ground Thursday, 12 May. Each exhibitor was assigned a stall, learners and other guests came around to each stall where the dignitaries and exhibitors encouraged children about the importance of education, and the need to apply to universities to further their education.

Dr Phiri showed the learners some exciting chemistry experiments that sparked many questions by learners. The Science Marketing Team provided the learners and other guests with information about the Faculty of Science. Learners also received Nelson Mandela University Prospectus' and information from the Govan Mbeki Mathematics Development Centre (GMMDC).

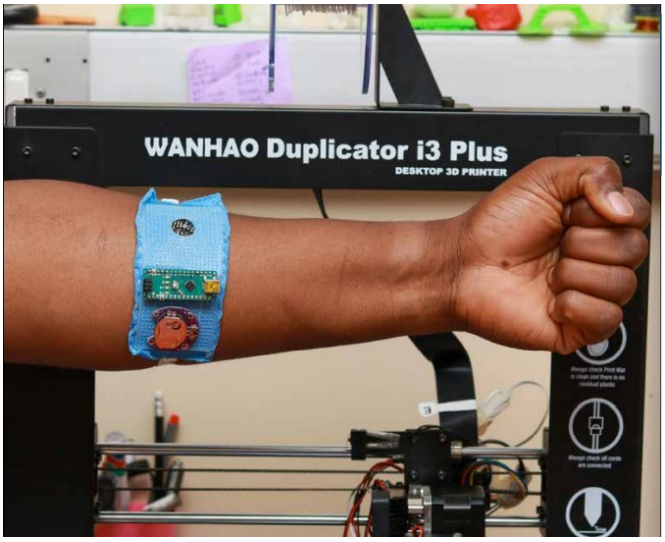
Overall, it was a successful expo. The learners were engaged and were excited to learn about the Faculty of Science and courses we offer.



RECOGNITION FOR HIS E-TEXTILE DEVICE SPURS ON PHD STUDENT VICTOR AGBAKOBA

Originally published by Science Scope, publication of the CSIR. Volume 19. Number 1 of 2022. Compiled by: CSIR Communication.

CSIR PhD student Victor Agbakoba's research on a custom-made 3D-printable bionanocomposite filament for a wearable e-textile device received an honourable mention at the 2021 Natural Fibrenamics Awards. The award ceremony was held online at the fifth International Conference of Natural Fibres in Portugal. Victor Agbakoba's 3D-printable bionanocomposite filament was prepared by melt-mixing poly (lactic acid) biopolymer and cellulose nanocrystals. The cellulose nanocrystals were extracted from sawdust at the CSIR's Biorefinery and Industry Development Facility.



Agbakoba explains that the applicability of poly (lactic acid) and cellulose nanocrystals bionanocomposite is limited due to issues like inadequate dispersion and poor flexibility. To tackle the issue of dispersion, Agbakoba used green solvents to re-disperse the freeze-dried cellulose nanocrystals prior to melt-mixing them with the biopolymer. Furthermore, Agbakoba added optimised ratios of non-toxic bio-based additives to improve the miscibility and flexibility of the final bionanocomposite filament.

As a result, the bionanocomposite filament possessed excellent balance between strength and flexibility – which he says is a key requirement for the wearable e-textile device he made. Agbakoba proceeded to directly 3D print a grid pattern onto a stretchable polyester fabric; this resulted in a hybrid material where the bionanocomposites grid acts as a lightweight exoskeleton. Thereafter, a pulse-rate monitoring sensor and a programmable Wi-Fi-enabled microcontroller (Arduino nano) were stitched directly onto the fabric. The conductive pathway was established via direct stitching of the circuitry, using a 0.1 mm enamel-coated copper wire; the ends of the wires were soldered to establish the connections. For this version of the device, the pulse rate is measured, processed, and transmitted in real time. The measured signal is visually transmitted by different blinking sequences of LED lights located on the surface of the microcontroller.

> "To receive recognition at this level, while doing my PhD, is really affirming and is an indication that I am on the right track with my studies. It also makes me feel good to see all the hard work I put in, pay off." – says Agbakoba

As a PhD student under the supervision of Dr Maya Jacob John of the CSIR's Centre for Nanostructures and Advanced Materials, and Prof. Percy Hlangothi of the Nelson Mandela University, Agbakoba was able to tap into his academic support structure for guidance on how he can best demonstrate bionanocomposite materials for 3D-printing applications by using biopolymers and adding waste biomass – an innovation that extracts value from waste to develop high-value products.

"The use of waste biomass, together with biopolymers for 3D-printed materials, is an untapped space in the country. 3D printing is a technology that has not been fully explored and there's generally a heavy reliance on imported materials for it. Therefore, my research aims to fill this gap in the market," adds Agbakoba.

Agbakoba is passionate about using his education and the skills he has acquired to respond to industry-related problems and needs.
"The knowledge that I have gained through my PhD experience, together with the Natural Fibrenamics Award, has proven to me that education needs to be a multidimensional experience. The collaboration with an academic institution like the Nelson Mandela University and the CSIR has encouraged me to keep a good balance between theoretical and practical knowledge. The combination of academic guidance and industry-based knowledge has empowered me to consider starting my own business in the future, where I would develop systems to assist small, medium sized enterprises and contribute towards a bio-circular economy," Agbakoba says. He notes that having access to infrastructure, funding, a network of experts and intellectual guidance from an academic institution have all contributed to creating a conducive environment for him to excel.

"I wish more research students could have the same opportunities that I have had. Even though I am based at Nelson Mandela University, I have access to the state-of-the-art processing and testing equipment at the CSIR and I can contact the experts who give me guidance when I need it. My supervisors also encourage me to participate in international workshops and this, in fact, was my fourth presentation at an international conference. Additionally, the bursary funding that I have received through the Department of Science and Innovation covers all the expenses that come with my research project. All these things play a big role in making one's PhD experience a little easier," Agbakoba concludes.

Agbakoba intends to improve the functionality of his e-textile device. Additionally, the future versions of this technology will feature integrated wireless communication capabilities, like Wi-Fi and Bluetooth, for convenient transmission of these signals to a receiver device such as a mobile app.

Investing in Youth and STEAM Education

Originally published by iKamvelihle Development Trust (iKDT) Newsletter 17. Written up by Jade Alexander

The iKamvelihle Development Trust (iKDT) has since its inception in 2015 recognized the importance of providing support to disadvantaged schools, including the focus on Science, Technology, Engineering, Arts and Mathematics (STEAM) education.

iKamvelihle Development Trust (iKDT) has an active partnership with the Faculty of Science and the Govan Mbeki Mathematics Development Centre (GMMDC). Through this collaboration they are implementing a STEAM programme which targets schools in the Cala circuit of the Eastern Cape Province.

In January 2022, as soon as the schools opened, they launched the pilot programme in Maths and Science. The schools were provided with intensive teacher training and support.

Educators and local DoE representatives of the and team members from the NMU and iKDT

This is complemented with devices that can be used independently by learners with software that has been developed by the GMMDC. The programme has received positive reviews from educators and is raising the morale of learners.

The programme has experienced challenges and the demand for it is high but the current roll-out can reach only a few schools.
If this programme could receive more funding, it would be possible to extend it to many schools and support the training of unemployed graduates for teaching purposes. With active support and partnerships, the youth from disadvantaged communities can have better prospects for the future in our country. We all have the duty to invest in human resource development and help to address the problem of youth unemployment, poverty, and inequality.

The "Arts" in STEAM education.

In the partnership programmes iKDT encourages learners to appreciate the value of the arts. One such initiative is the MathArt Competition which has been designed by the GMMDC and is facilitated by Ms Carine Steyn. The participants are required to submit artwork which depicts creativity and originality of expression in describing the worth of mathematics in education. A significant number of learners from the pilot schools have entered this national competition. Some of such artwork expressions have been incorporated into a book that will be launched at NMU on 24 June 2022.

Advancing Access to Medicinal Drugs for Sustainable Development in Africa Webinar

On 4 April 2022 the Faculty of Science hosted a virtual webinar on advancing access to medicinal drugs for sustainable development in Africa. The webinar was facilitated by Director of School: Biomolecular and Chemical Sciences, Dr Buyiswa Hlangothi.

Prof. Azwinndini Muronga started off by welcoming the guest speakers and other attendees. The webinar featured presentations from two guest speakers, Prof. Paul Watts, the Research Chair of Microfluidic Bio/Chemical Processing and Prof. Maryna Van de Venter a Professor of Biochemistry.

Prof Watts' presentation emphasised: "Rather than importing drugs let's do it ourselves. This will lower the costs and will guarantee supply chains and ultimately improve the health of society." He explored other topics such as South African formulators, shortage of medicines, life expectancy, vaccination success and inequality, South African ARV costs and statistics related to these topics.

According to archaeology the use of plants as medicine dates to 60,000 years ago. Prof. Maryna Van de Venter opened her presentation with this interesting fact. She used her presentation to explore why access to affordable medicine is limited in Africa. Prof Maryna Van de Venter further stated that researchers can improve herbal medicines in Africa by:

- Validating health claims and confirming safety
- Developing new standardised herbal products
- Identifying new lead compounds for pharmaceutical drugs
- Promote cultivation to prevent over-harvesting

This sort of webinar contributes to the learning and research of students in our Faculty and beyond.

Virtual Open Day

Nelson Mandela University hosted faculty-based Virtual Open Days to grant prospective students with in-depth knowledge of each faculty.

The Faculty of Science hosted their virtual open day on Friday, 10 June 2022. The virtual open day received an impressive 1,120 views. Executive Dean Prof. Azwinndini Muronga welcomed the viewers and provided a brief description of the Faculty of Science and what we have to offer.

Prospective students were further encouraged to join the faculty by Principle of George Campus, Dr. Kaluke Mawila. "The pandemic has forced all of us to think and do things differently, hence, the need for us to connect in this manner." says Dr. Mawila.

Throughout the virtual open day prospective students received information on how to apply to university, calculating Applicant Score (AS), information about financial assistance, student housing, and other important information.

New Staff: Science Marketing Team

Sisipho Ngesi
Marketing Coordinator

Jade Alexander
Marketing Coordinator

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