NELSON MANDELA UNIVERSITY

January—June 2018

Faculty of Science

News

Editorial

The academic year in 2018 started again with a flurry for the GMMDC staff as the annual sponsored value and extent of its mathematics and science development work in schools and colleges grew to over R10 million which is spread across 80 secondary schools in six districts of the ECP. The GMMDC also held its first official advisory board meeting in March after its status was upgraded to an engagement centre late in 2017. The Advisory Board of the GMMDC consists of ten members and include senior officials with a wealth of relevant experience representing the Science and Education faculties of the NMU, Basic Education at both the provincial and national level, the TVET College sector and Umalusi.

A belated re- launch function of the centre was held in March together with the public introduction of a second innovative Android educational application for mobile phones that was developed and tested by the GMMDC over the past three years. The TouchTutor® Quiz application is an exciting and innovative additional support platform that will allow all mathematics learners at secondary schools in the country to freely access curriculum support, self-assessment with feedback and multi-language support. The application holds great promise for sustainable development at scale as it also allows for the introduction of phone-based competitions and gaming as part of the quest to stimulate interest in STEM related subject at school and college levels. The successful integration of STEAM activities as an extension of development and support for teachers and learners continued with great success in semester 1 of 2018. Five STEAM experiential workshops were held at selected project schools in four districts of the ECP over this period and feedback from all participants and stakeholders were overwhelmingly positive. A fully interactive mobile exhibit to display and showcase ICT-assisted models and projects of the GMMDC was also used for the first time during events in 2018. The exhibit, with accompanying sharing of project information, was presented this year at events such as National Science week, Mandela Centenary Celebrations at Mvezo and National Sci-Africa Festival in Grahamstown. The exhibit was also used to effectively market the Nelson Mandela University and has drawn much appreciation and praise from the public and stakeholders alike. Needless to say, the first semester of 2018 was again an exciting and vibrant period for the centre, full of valuable interactions with key stakeholders as we were building awareness and skills in the interest of Mathematics and Science development.

Global paradigm shifts in education supports integrated use of ICT and STEAM activities for creative problem solving and innovative design

Left to right: Mr Dali Matta, Old Mutual, Mr Asemahle Ceza, former TAPS learner, Prof Werner Olivier, Director GMMDC, Dr Phil Collett, Programme Manager, GMMDC, and Mr Drik Greeff, DBE attending the launch of the GMMDC and the new TouchTutor® Quiz application

Govan Mbeki Mathematics Development Centre
empowering young minds

Mr Devereaux Joubert, Director, The Code Group, Mr Asemahle Ceza, former TAPS learner, Mr Cornelius Greyling, CEO, Avocado Choc and Prof Werner Olivier, Director of GMMDC

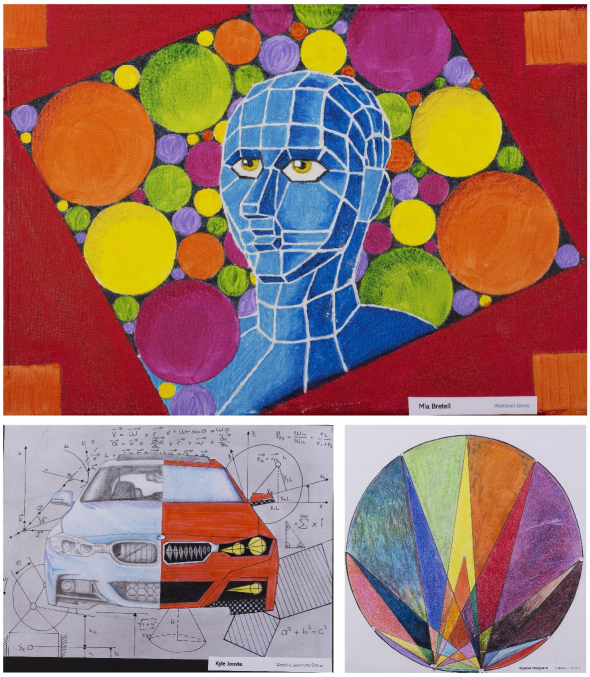
Above left: Best newcomer certificate presented to the GMMDC for its exhibition

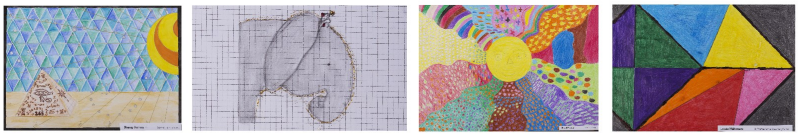
Above right: Mrs Carine Steyn facilitating a group of learners building the various 3-D Solids. Also on display is a model of the Warka Water Tower built from the 4D

GMMDC at the National Science Festival

Innovation 4.0; the theme of this year's 22nd Annual Scifest Africa (South Africa's National Science Festival) held in Grahamstown from 7-13 March. The festival attracted more than 62,000 visitors and offered a programme consisting of 64 exhibitions (of which the GMMDC was one) and 701 events, presented by 291 contributors from 77 organisations (including NASA). The festival received extensive media coverage, with the GMMDC making their television debut with a Friday morning interview, live on ETV's Sunrise. The exhibition took a multi-pronged, interactive approach and provided appeal to visitors of all ages. It featured Mathematics and Physical Sciences using Technology as a mediating platform, thus promoting the world-wide STEAM phenomenon. Android tablets and guides were on hand for visitors to explore the TouchTutor® materials. The free TouchTutor® Quiz mobile Android application was also demonstrated, and learners were encouraged to download, register and participate in a SciFest competition where a few prizes were up for grabs. An interactive touch screen was also on display. Learners could take part in hands-on activities where they could build their own 3-D solids using the innovative 4D Frame Kits.

Have you ever drawn maths?





The prize winners with Prof Werner Olivier, from left to right: Mia Brettell, Hoërskool Grens; Shanay Archery, Beaconhurst High School; Mandilakhe Khonza, Urban Academy; Mzukisi Nthilsila, KwaMagxaki High School; Zukhanye Hlalaleni, Get Ahead College; Fatima-Zahra Hoosain, Nasruddin Islamic School; Zaafirah Kerdemay, Nasruddin Islamic School; Masixole Mangwana, KwaMagxaki High School

GMMDC's first ever Math-Art competition

Nelson Mandela University's Govan Mbeki Mathematics Development Centre (GMMDC) completed the first Math Art competition in May this year. This competition is in line with the international trend incorporating Art into STEM (Science, Technology, Engineering and Mathematics) education.
"This is a more modern approach to mathematics where learners are encouraged to explore the links between mathematics and art. Through this modern approach the potential of Mathematics for future careers can be realised", said GMMDC director Prof Werner Olivier.

This was a competition where the focus was to represent mathematics in an artistic manner. In other words, to create a beautiful 2-dimensional artwork using mathematics. The artworks were judged on the creativity of linking mathematics to art and entrants had to include a 100 to 200 words paragraph describing how they portrayed mathematics in their art project.

The competition, which started on 3 March and ended on 4 May, was open to teachers and learners from the Eastern Cape Secondary Schools. We received 113 entries from 36 schools. We are looking forward to expanding this competition to the whole of South Africa next year.

Winners were announced on 18 May and the prizegiving was on Friday, 25 May at the Nelson Mandela Metropolitan Art Museum. The artworks were exhibited at the Nelson Mandela Metropolitan Art Museum from 18 May to 8 June.

The school with most entries was Get Ahead College from Queenstown and the teacher with most winning entries, Mr Sonwabo Poni from KwaMagxaki High School.

Delegates and staff of the GMMDC attending the annual regional GeoGebra Conference

STEAM Maths activity with grade 11 and 12 learners from project schools in Duncan Village, East London

Conference links GeoGebra, STEAM Education and creative design

The GMMDC hosted its fifth annual GeoGebra conference for teachers and TVET college lecturers on the 25th and 26th of May this year with the conference theme being "GeoGebra for STEAM education: Linking maths and arts for beauty in design". This year the GeoGebra conference had a distinct STEAM flavour as it followed an international education trend where science, technology and the arts are promoted through mathematics. The two-day conference was well received by local educators and international guests included one of Europe's leading researchers in STEAM education, Finland's Kristof Fenyvesi, a researcher at the University of Jyvaskyla and the vice-president of the world's largest mathematics, arts and education community, called the Bridges Organisation. From Hungary, there was also Gyorgy Tury, Dean of the Faculty of Communication and Arts at Budapest Metropolitan University and Gabriella Uhl, art historian, curator and associate professor at the same university.

The conference programme included several presentations linking art and mathematics along with practical sessions, where teachers learnt how to include GeoGebra in their classrooms. A gala prize-giving for a Math-Art school competition which was run by the GMMDC in the second school term, was held at the Nelson Mandela Metropolitan Art Gallery to close the first day of the conference. On May 23, as a pre-conference activity, Fenyvesi, in partnership with the GMMDC, ran an "Experiential Learning Workshop" for 100 pupils and 30 teachers from eight schools in Duncan Village, East London, where participants were given a practical taste of how art and maths connect, as they explored tessellations in 2D and built soccer ball and other Platonic 3D structures. GeoGebra was used during workshop activities to demonstrate and understand the underlying mathematical structures. The experiential learning workshop was extremely well received by pupils who appreciated the opportunity to learn mathematics through art, and to do art through mathematics.

Launch of Duncan Village ITSP

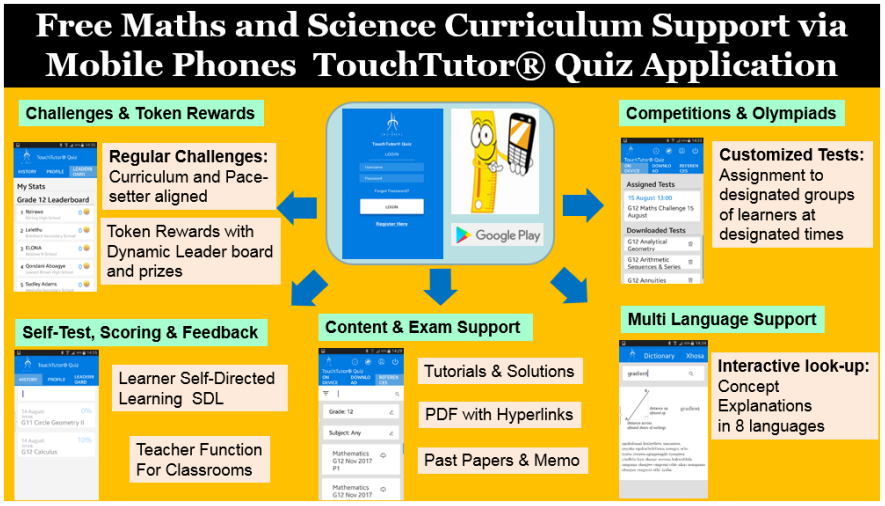
Together with long-time partner and sponsor Old Mutual, the GMMDC has expanded into 8 schools in Duncan Village, East London. The aim of the OM-sponsored Integrated Mathematics and Physical Sciences Support Programme (ITSP) project is to introduce a curriculum-aligned offline Techno-Blended Model (TBM) for teaching and learning of mathematics and physical sciences in classrooms. This model, which is similar to that which was implemented in OM project schools in KWT over the past 3 years, involves structured training and support for teachers and learners.

The ITSP implementation plan for Duncan Village includes a centralized Saturday Incubator School Programme (ISP) for selected performing Grade 11 & 12 learners from all 8 project schools. Fifty learners per grade will be targeted and the contact sessions of the Tablet and TouchTutor® assisted Saturday programme will be offered at the Gompo Learning Centre. For learners who do not receive Tablets to take home, access is provided through structured after school Maths and Science support (TAPS) with Tablets and TouchTutor® material on a regular basis. Also, a Professional Learning Network programme (PLN) for in-service Mathematics teachers which includes technology, pedagogy and content knowledge training and provision of laptops, data projectors and digital T&L resources for the classroom.

Above: ISP Learners receive their tablet and resources. Below: In-service maths teachers of the Professional Learning Network

New TouchTutor® Quiz application

The TouchTutor® Quiz was developed by the GMMDC in collaboration with IT company AvoChoc, and was created to make learning material, language support, assessment and practise for maths and science freely available to all learners on their own mobile devices. The app is aimed at high school learners and teachers primarily but can cater for revision purposes for College and University students. Users should be online to register and to download tests but may use downloaded material offline. Results are uploaded and recorded once the user is online again. Question types include multiple choice, matching, sequencing, true or false, numerical and text answers. The GMMDC plans to expand participation in its annual online maths and science competitions as well as continue to add to the range of questions and tests. The new app has been gamified by the inclusion of a leader-board and tokens. In future, the Centre intends to offer a commercial service for customised assessment. The updated TouchTutor® Quiz app can be downloaded from the Google Play store on any mobile device.



TouchTutor® Quiz application and curriculum support application via Mobile Phones

GMMDC in the news

New free app to boost learners' Maths and Science results

IN many underresourced schools across South Africa, often with underqualified teachers, learners do not always gain the mathematical knowledge or skills they need to excel at school or to access universities.

To give learners a better chance, Nelson Mandela University's Govan Mbeki Mathematics Development Centre (GMMDC) has been using cutting-edge technology to boost teaching and learning in Maths and Science in secondary schools – and launched its second unique education app on Friday, May 4.

The app, TouchTutor® Quiz, which is available free from the Google Play Store, provides mobile access to Maths and Science content, self-tests with feedback, multilingual support and even school- or province-based competitions, linked to the Grade 8 to 12 school curricula for Maths, and the Grade 10 to 12 Physical Sciences curricula.

"The new app will allow us to bring more innovation into the classroom and help even more pupils, which we are really excited about," said GMMDC director Prof Werner Olivier.

The app is a spin-off of GMMDC's first app – the ground-breaking TouchTutor package – which is an offline teaching and learning resource that covers the complete school curriculum. To date, more than 7 000 Grade 10 to 12 learners at over 100 project schools have received tablets with TouchTutor support through GMMDC's incubator school programme or their tablet-assisted after-school peer support programmes, and more than 1 500 teachers from 450 schools have received laptops through GMMDC's teacher development programmes.

GMMDC has also set up tablet- and desktop-based resource centres at most of the project schools – benefiting a further 10 000 learners.

Over the past three years, more than 50% of the ISP and TAPS learners at project schools in Nelson Mandela Bay and other Eastern Cape districts, have enrolled for university study programmes.

"Our aim now is to reach and support a much wider target group of teachers and learners via the new mobile quiz app," said Olivier.

"Teachers of Maths and Physical Sciences are in desperate need of modern teaching approaches to connect and address aspirations and the content gaps of learners in South Africa."

Olivier said Friday's launch was also an opportunity to celebrate the "impact and maturation of the TouchTutor package after more than five years of research and development". – REPORTER

Offline tablets see marks flying

Duncan Village pupils to benefit from project too

By QAQAMBA MAGADLA

AFTER the success of a technology-linked maths and science programme at 18 schools in Bhisho, Old Mutual has introduced the programme at eight schools in the impoverished East London township, Duncan Village.

The Old Mutual Flagship Education Programme (OMEFP) maths and science development project, which was launched in Bhisho three years ago, saw a significant improvement in the marks of participating Grade 11 and 12 pupils, inspiring a two-year R4-million extension.

Grade 12 pupils who participated in the Bhisho incubator school programme achieved a 98% pass rate for both maths and science in last year's final exams, with 92% achieving bachelor passes.

The most improved maths pupil – Xhanllosivee Mancunga from Forbes Grant High School – went up from 42% in December 2016 to 69% in December last year, while the most improved science pupil – Sithimiso Mlilakaza from Archie Velile High – jumped from 18% to 60%.

The top pupil for maths, Andile Nyingwa from Hector Peterson High, achieved 93%, and Richard Varha High's Unigcine Pono achieved the top mark for science, 82%.

Each school can select top performing pupils in each subject who can take the tablets home.

And it is hoped that the Duncan Village project, in which the company has invested R3,5-million, will see a similar leap in results at Alphendale, Ebenezer Majombozi, Greenpoint, Kusile, Lumko, Mzokhanyo and Qaqamba Sinovuyo high schools. Developed by Nelson Mandela University's Govan Mbeki Mathematics Development Centre (GMMDC), the programme "TouchTutor®" includes a laptop-based model for teachers to use as a classroom resource and seven- and 10-inch tablet-based models for pupils (the latter placed in resource centres at the schools), for use after school hours as an offline support platform.

Selected pupils have access to their own tablets on a 24/7 basis for the full duration of the school year.

TouchTutor® includes video content lessons, animated PowerPoint lessons, open-source GeoGebra software, self-tests, language support and various other digital support material to enhance understanding in maths and science.

GMMDC director Professor Werner Olivier said the new "screen generation" of pupils had provided the inspiration for the offline and curriculum-aligned project.

"Running the project in the Bhisho area gave us the opportunity to test, refine and demonstrate the impact of an offline technology-blended model in a rural context. It worked exceptionally well, and we are really excited to bring the model to Duncan Village," said Olivier, who also runs the programme in Nelson Mandela Bay, Mthatha and several Karoo towns, where pupils have had similar or even better results.

"What is beneficial in Duncan Village is that our programme follows a successful IT project which was being run in the schools [by Leap Schools and Edunova (Leed), with funding by Old Mutual], so many of the teachers and pupils have already been trained to use IT," he said.

Over the next two years, GMMDC aims to boost the impact of the programme even more by adding science, technology, engineering, arts and mathematics activities.

The centre has also developed a mobile app for interschool maths competitions and free maths curriculum support via mobile phones.

Based on the project's success, the company's senior project manager, Kanyisa Diamond, said: "Our intent is to replicate this success and surpass it where possible in the Duncan Village schools, where we are also supporting a number of schools with leadership development."

DIGITAL SUPPORT: Offline video lessons on tablets – along with plenty of other curriculum-aligned content – is making maths and science much easier for pupils in selected high schools across the Eastern Cape, including eight in Duncan Village. INSET: Prof Werner Olivier PICTURE: SUPPLIED

Maths, science is now on the phone

Free Android app offers offline curriculum help

By GUGU PHANDLE

SECONDARY school pupils unable to perform at their top level due to under-resourced schools will now have a chance to put their best academic foot forward with a ground-breaking maths and science mobile application.

The Nelson Mandela University's Govan Mbeki mathematics development centre (GMMDC) has been using cutting-edge technology to boost teaching and learning in maths and science to schools in need.

The app, TouchTutor® Quiz, is available for free on Google Play Store, offering teachers and pupils mobile access to maths and science academic content.

The app's curricula follow those of grades 8 to 12 ones for maths, and grades 10 to 12 for physical sciences.

There are high hopes that the app will boost the pass rate in these two key subjects.

"This app can be used by pupils, teachers and schools anywhere in South Africa," enthused GMMDC director Professor Werner Olivier.

"It builds on our existing programmes, which have already led to improved understanding and real results in the classroom.

"The new app will allow us to bring even more innovation into the classroom and help even more pupils, which we are really excited about."

TouchTutor® Quiz can be downloaded on Android phones and tablets, which can be linked to data projectors for teachers to use in class.

It is a spin-off of GMMDC's first app – the ground-breaking TouchTutor® package – which is an offline teaching and learning resource that covers the complete school curriculum.

This app, first introduced in 2012 and expanded each year until its 2017 completion, brings maths and physical science concepts to life for pupils through offline video lessons, PowerPoint presentations and innovative software called GeoGebra.

It also boosts understanding, memory and self-confidence through past papers, interactive self-tests and language support in several of South Africa's official languages.

In another project, GMMDC, working closely with Old Mutual, has developed an incubator school programme that offers hundreds of pupils across the province adequate maths and science learning material.

The cities involved include East London, Komani, Port Elizabeth and King William's Town.

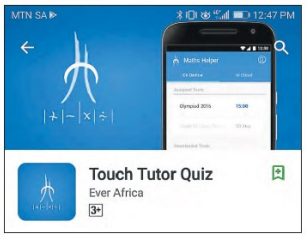
East London project leader David Nzirawa says helping pupils reach their full potential is really inspiring. "We host classes at the Gompo Library every Saturday. Here, 100 Grade 11 and 12 pupils are taken through rigorous maths and science lessons using GMMDC's teaching programmes.

"These children are so receptive to information. They are willing to learn and make a change in their lives and that is truly inspiring," said Nzirawa.

GMMDC has provided the selected 100 pupils with tablets that they can take home so that they can study using the app.

The schools involved with GMMDC's East London incubator programme include Alphendale Secondary School, Sinovuyo High School, Ebenezer Majombozi High School, Greenpoint High School, Khusile Comprehensive School, Mzokhanyo High School, Qaqamba High School and Lumko High School. — gugup@dispatch.co.za

INVESTING IN THE FUTURE: Professor Werner Olivier, director of Nelson Mandela University's Govan Mbeki Mathematics Development Centre (GMMDC), is the driving force behind the new TouchTutor® Quiz app PICTURE: SUPPLIED



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