

News

Faculty of Science

Editorial

The Govan Mbeki Mathematics Development Centre (GMMDC) programme for semester two of 2018 was again packed with a number of exciting project activities and development milestones of different types. Dedicated efforts by GMMDC staff have ensured that the scope of GMMDC engagement activities in this period actively reached more than 80 secondary schools in six districts of the ECP. Some new project links were established with the DBE at national level and also with key stakeholders outside the Eastern Cape. On the development side, several exciting new education support functionalities were added to the TouchTutor® Quiz application for mobile phones. A new and exciting teaching device called Gamma Tutor was also conceptualized and developed in partnership with an external IT company in semester 2 of 2018. This device, which will incorporate the use of TouchTutor® software, holds great promise as it will add new dimensions of educational innovation to the Techno-Blended T&L model of the GMMDC. Central Maths and Science resource centres supported by ICT support capacity at schools and public spaces were also launched for the first time in a number of rural project nodes. The value of the engagement work that the GMMDC does, received a vote of confidence as a number of key funding partners have extended their financial support for multi-year periods in the second half of 2018. As a result, the annual value of externally sponsored mathematics and science engagement activities of the GMMDC has grown for the first time to over R15 million in the second half of 2018.

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Province of the EASTERN CAPE
EDUCATION
Building Blocks for Growth

**TOP LEARNER: OR TAMBO INLAND
POSITION 1**

LEARNER: RADHAKRISHNAN ANJALI
SCHOOL: UMTATA HIGH SCHOOL

Results	Level	%
English Home Language	7	84
Afrikaans First Additional Language	7	88
Mathematics	7	90
Life Orientation	7	95
Accounting	7	95
Life Sciences	7	94
Physical Sciences	7	97

CONGRATULATIONS

NSC Results Release 2018

Province of the EASTERN CAPE
EDUCATION
Building Blocks for Growth

TOP LEARNER: POSITION 2

LEARNER: SHAIKH UZMA
SCHOOL: UMTATA HIGH SCHOOL

Results	Level	%
English Home Language	7	86
Afrikaans First Additional Language	7	87
Mathematics	7	96
Life Orientation	7	97
Accounting	7	98
Life Sciences	7	95
Physical Sciences	7	96

CONGRATULATIONS

NSC Results Release 2018

Left: Two Grade 12 learners from Umtata High School in the Eastern Cape who participated in the Incubator School Programme of the GMMDC from 2016 to 2018 received Top Achiever Awards from the Premier of the Eastern Cape after the release of the 2018 National Senior Certificate Results. Both these learners attained distinction in all 7 subjects.

Uzma Shaikh received an award as the Top Learner (Position 2) for the Province, while Anjali Radhakrishnan received an award as the Top learner (Position 1) in the OR Tambo Inland District

GMMDC
Govan Mbeki Mathematics
Development Centre
empowering young minds



Above: In-service Maths teachers of the Professional Learning Network (PLN) in King William's Town



Above: Professional Learning Network (PLN) Maths teachers in Mthatha

Winning Math-Art Competition Entries from Project Schools Exhibited at International Conference in Stockholm

The Govan Mbeki Mathematics Development Centre's first pilot Math-Art Competition in public schools in 2018 was a resounding success. Most of the 133 entries that were received were from previously disadvantaged secondary schools in the ECP and most of the artworks were locally exhibited at the Nelson Mandela Metropolitan Art Museum at St Georges Park from 19 – 25 May 2018. The competition has highlighted the wealth of hidden talent amongst school learners from different cultural and socio-economic backgrounds as far as creativity is concerned when mathematics and art are linked to real-life or abstract designs. The competition has also attracted the attention of the organizers of the International Bridges organization. This organization is the leading professional body worldwide to promote connections between mathematics and art. As a result, the organizers of the local MATH-

SACE accredited TPACK Mathematics Programme

In June 2018, the TPACK (Technological, Pedagogical and Content Knowledge) Mathematics Programme received SACE accreditation. The TPACK Mathematics programme is designed to deliver Mathematics content knowledge covering a range of FET CAPS aligned topics and training in the use of technology in the classroom. The programme is divided into eight full-day short learning programmes (SLP).

The teachers are assessed using Pre- and post tests as well as a self-study assignment. For the completion of the assignments, teachers encouraged to use technology and actually to photograph themselves whilst they used technology in their classrooms.

Through the existing Professional Learning Network (PLN), the teachers in the GMMDC project schools were invited to attend the TPACK Mathematics Programmes sessions and were awarded 10 SACE CPD (Continued Professional Development) points for each SLP they attended and completed the assignment. The first SACE accredited SLP on Trigonometry was held in July and the second on Probability and Data Handling, in October. The sessions were held in East London, King Williamstown, Queenstown, Bedford and Port Elizabeth and teachers from the sponsored projects were invited to attend the sessions.

ART competition were invited to exhibit a selection of learner MATH-ART entries from South Africa at the annual International Bridges Conference which took place at the National Museum of Science and Technology in Stockholm, Sweden in July of 2018. The 30 entries that were selected and exhibited during this event were well received by conference organizers and visitors from many parts of the world. Much praise was received for the creativity expressed in the art works and written narratives that accompanied the learner displays. Plans are in place to extend this engagement project to a National Math-Art competition in secondary schools in 2019 and the GMMDC has already received a follow-up invitation from the Bridges Conference organizers to bring an exhibition of winning artworks from South African learners to the Bridges conference in Linz, Austria in July 2019.

The MATH-ART competition is in line with the international trend of STEAM (incorporating Art into Science, Technology, Engineering and Mathematics) and is supported by both Umalusi and the National DBE in South Africa.



Above: A selection of learner artwork from the first MATH-ART competition held in May was exhibited at the International Bridges Conference at the National Museum of Science and Technology in Stockholm, Sweden.



Right: Prof Werner Olivier, Director of GMMDC at the Bridges Conference

GMMDC exhibit at National Science Week

In collaboration with the Faculty of Science, a GMMDC team travelled to Mvezo to exhibit at the National Science Week which took place from 28 July to 4 August. The theme for the 2018 NSW was "Deeping our Democracy through Science". The exhibit created awareness of the Centre's broad involvement in maths and physical sciences at FET and Senior Phase level and provided opportunity for learners and visitors to engage interactively with STEAM-related materials.

Seen below (left) are Mr Arnold Gwaze of the GMMDC and Prof Azwinndini Muronga (right), Dean of the Faculty of Science at the Nelson Mandela University. Below right shows a group of learners with GMMDC's interactive display. Donald Nzirawa (right) of the GMMDC is based in East London at the Duncan Village node.



GMMDC launches centralised maths and science resource centres

For a long time, Nelson Mandela University's Govan Mbeki Mathematics Development Centre (GMMDC) has been pioneering technology-based solutions to help learners in the form of tablet-based maths and science support, which they can access at Saturday incubator schools, at after-school sessions with peers, or at small maths and science resource centres set up at their schools or elsewhere. In September of 2018 GMMDC also launched a number of centralised resource centres which can be accessed by all the schools in the immediate area. These new centres, one in East London and two in King Williamstown, will give many more pupils a chance to improve their maths and science marks. In-service mathematics and science teachers will also benefit from professional skills development and resource support activities at the centres.

Sets of Tablets, onto which GMMDC's innovative teaching and learning resources have been uploaded, will be available at each resource centre. The digital package, called TouchTutor®, covers the entire maths and physical sciences curriculum from Grade 8 to 12, and includes PowerPoint lecture-driven presentations, video content, calculator tutorials, a multi-language glossary of maths and physical science terms, self-tests and old exam papers with memos. Mathematics learners will also have access to printed easy-to-follow TouchTutor® learner guides, to assist with self-directed learning. An on-site IT assistant will also be available to provide technology support to the learners who come to the resource centre.

Resource centres will also be places where GMMDC can run its unique Science, Technology, Engineering, Art and Mathematics (STEAM) hands-on workshops, where teachers and learners participate in practical experiential learning activities using science and maths to solve real-life problems in creative ways.

The new resource centre model has the full support of the Eastern Cape Department of Basic Education at district level, including the subject advisors and chief education specialists who have been working with the GMMDC over the past three years. Several senior officials from the National Department of Basic Education who have also attended the launch of the centre in King Williamstown, have expressed their support for this initiative.



Members of the DBE, GMMDC and learner representatives at the launch of the Maths and Science Resource Centre in King Williamstown.

GMMDC in the news

Mobile maths competition draws 'screen generation' pupils
6 DECEMBER 2018 BY ALAN STRATON



The top pupils in two mobile-based maths competitions – both run through the innovative TouchTutor® Quiz app, developed by Nelson Mandela University's Govan Mbeki Mathematics Development Centre – were (front, from left) Evangelos Batsis (Grade 9, Alexander Road), Riana Goussard (Grade 11, Nico Malan), Alison Adams (Gr 12, Alexander Road), Tyla van Huyssteen (Grade 12, Pearson), Brandon le Roux (Grade 10, Alexander Road), Likhona Mbele (Grade 12, Ndzondelelo High), Ukho Vokwana (Grade 10, KwaMagxaki Secondary), Kamva Mkroyiya (Grade 10, KwaMagxaki Secondary) and (back, from left) Tristan Venter (Grade 9, Nico Malan), Chase de Doncker (Grade 10, Alexander Road), Charl Pretorius (Grade 10, St Dominic's Priory), Darmhik Naicker (Grade 12, Pearson), Nkcubeko Sonjani (Grade 12, Ndzondelelo High), Erich du Plessis (Grade 12, Nico Malan) and Sakhumzi Mbuzo (Grade 10, KwaMagxaki Secondary). Pic: Natalie Wood

MATHS whizzes in high schools across the Eastern Cape competed against each other using an innovative app on their mobile devices.

The free TouchTutor® Quiz app – developed by Nelson Mandela University's Govan Mbeki Mathematics Development Centre and made available on the Google Play store earlier this year – offered pupils a wide array of content to boost their knowledge and understanding of mathematics, along with two unique options to achieve in the subject.

The first saw pupils across the province completing a series of competitions throughout the year, all the time accumulating "leaderboard" points for their achievements, while the second option saw 250 selected pupils competing in a two-round Maths Olympiad competition for the top positions.

The overall "leaderboard" winners in each grade were Khwezi Lomso's Anganathi Nombombo (Grade 8), Alexander Road's Evangelos Batsis (Grade 9), KwaMagxaki Secondary School's Kamva Mkroyiya (Grade 10), Nico Malan's Riana Goussard (Grade 11) and Nico Malan's Erich du Plessis (Grade 12).

Du Plessis also came tie-first in the Olympiad's Grade 11 and 12 competition, along with Pearson's Darmhik Naicker and Ndzondelelo High's Likhona Mbele. Nico Malan's Tristan Venter won the Grade 8 and 9 category, while Alexander Road's Chase de Doncker was top in Grade 10. In addition to province-based competitions, the app provides pupils with mobile access to both maths and science content, along with multi-language support, self-tests with feedback, and school-based competitions. All of these are linked to the Grade 8 to 12 school curricula for maths, and the Grade 10 to 12 physical sciences curricula.

The app is particularly useful for under-resourced schools, where pupils do not always gain the mathematical knowledge or skills they need to excel at school or to access universities.

TouchTutor® Quiz can be downloaded onto phones or android tablets – and can also be linked to data projectors for teaching use in classrooms.

"The app can be used by pupils, teachers and schools anywhere in South Africa. It builds on our existing programmes, which have led to improved understanding and real results in the classroom. Our hope for next year is that we will be able to significantly expand the participation of pupils across the country," said GMMDC's Phil Collett.

TouchTutor® Quiz is a spin-off of GMMDC's ground-breaking TouchTutor® package – which is an offline teaching and learning resource that covers the complete high school curriculum for maths and science. First introduced in 2012 and expanded each year until its 2017 completion, the package brings maths and physical sciences concepts to life for pupils through offline video lessons, PowerPoint presentations and innovative software called GeoGebra – while also boosting their understanding through past papers, interactive self-tests, and language support in several South African languages.

Before the launch of the quiz app in May this year, TouchTutor® was only available as a tablet- or desktop-based "personal tutor", reaching pupils in GMMDC's 100 project schools, and as a laptop-based teaching resource, accessible to teachers in those schools. The quiz is enabling TouchTutor® to reach many more pupils and teachers.

"Through all our programmes, we have been determined to find creative ways of harnessing accessible offline technology to reach today's 'screen generation'. We're also providing teachers with modern teaching approaches to address the aspirations and content gaps of pupils in South Africa," said GMMDC head Prof Werner Olivier.

Pupils discover the world of coding

22 OCTOBER 2018 BY ALAN STRATON



Mimi Mini, Deputy Director of Teaching and Learning Resource Development at the National Department of Basic Education, chats to pupils playing an innovative coding game called "Tanks", at a STEAM (science, technology, engineering, art and maths) workshop run by Nelson Mandela University's Govan Mbeki Mathematics Development Centre (GMMDC). The DBE recently proposed Coding as a new South African school subject.

Pupils from disadvantaged schools across the Eastern Cape are taking their first steps towards IT careers, by getting a feel for coding theory. Nelson Mandela University's Govan Mbeki Mathematics Development Centre (GMMDC) has included coding theory in its interactive STEAM (science, technology, engineering, art and maths) experiential-learning workshops, run in classrooms from East London to King William's Town, Queenstown, Bedford and Somerset East. The STEAM workshops are run in partnership with Capitec, Old Mutual, Cookhouse Windfarm Trust and BK Admin Services.

"STEAM typically looks at various geometric structures including 2D or 3D tessellations (patterns) to help pupils see the links between mathematics and careers in science, engineering, design and architecture. Now we are adding a new dimension – in the form of two coding theory games called 'Tanks' and 'Boats' – to introduce them to the world of IT as well," said GMMDC director Prof Werner Olivier.

"Coding theory is a precursor to programming and it's very important for setting oneself up for a career in IT," he said.

The introduction of coding theory is timely, given that the national Department of Basic Education (DBE) last month (September) proposed Coding as a new school subject. The Boats game links to a second proposed new school subject, Marine Sciences.

Senior DBE officials recently travelled to rural Dimbaza near King William's Town, to observe GMMDC's STEAM activity sessions with pupils at Archie Veille Senior Secondary School, gaining a first-hand glimpse of Tanks and Boats.

Both games were developed by postgraduate students in the university's Department of Computing Sciences, under the supervision of Prof Jean Greyling. In Tanks, pupils, in teams competing against each other, must piece together puzzle-piece instructions to guide a tank through obstacles to a pre-determined destination. They then take a picture of their puzzle-piece pattern using a tablet or mobile phone with the free Tanks app installed (available at Google Play stores). The app uses photo-recognition to execute the path they have coded – and determine whether their steps were correct. Once they have found the solution, they can proceed to the next level of difficulty.

"Tanks is very tricky because you have to know which pattern to put where. What I learnt was that no matter how challenging your situation, there is always a solution waiting to be discovered," said Esona Siphonombali from Alphanale Senior Secondary School at a STEAM workshop in Duncan Village, East London.

"I found the game a bit challenging but fun because of the many steps needed to complete each level," said Sitha Matshaya from Duncan Village's Mzokhanyo Senior Secondary School.

Boats takes the form of a board game, where pupils must navigate to pick up plastic pollution in the ocean and learn about critical environmental issues in the process.

"I liked this game because I learnt that when there are challenges in your life, [you must] keep moving forward," said Lutho Mgwanyibana, from Ebenezer Majombozi High School, also in Duncan Village.

"In order for you to win, you have to use your mind and have a strategy," said Anathi Gose, also from Mzokhanyo Senior Secondary School.

Olivier said teachers from schools participating in the STEAM workshops received Tanks and Boats sets, along with tessellation sets and guides to engage with other groups of pupils at their schools.



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