

News

Govan Mbeki Mathematics Development Centre

**Message from the
Director of the GMMDC
Prof Werner Olivier**

GMMDC

Govan Mbeki Mathematics
Development Centre
empowering young minds

During 2021 the GMMDC again managed to actively contribute to the NMU's strategic goal of engaging with societal needs, particularly as it manifested in the public education sector during the ongoing COVID pandemic. The centre was able to put its customized techno-blended models and cutting edge digital resources to good use in supporting mathematics and physical sciences learners and teachers at secondary schools to counter the impact of school closures and other challenges during this time. The change-over from predominantly face-face engagement to fully hybrid off - and online modes of delivery over distance was also tested with great success in 2021. Our learner incubation support programme last year included the first cycle of implementation with a cohort of out-of-school second-chance learners who have repeated



Prof Werner Olivier

"During the pandemic the GMMDC was able to effectively utilize its customized techno-blended models and digital resources to support teachers and learners"

their matric mathematics and physical sciences studies. The outcome of the Re-Matric pilot project was very encouraging and holds great promise to address a growing need to assist more than one hundred thousand learners nationally who have failed matric maths each year to get a second chance at improving their maths results. The GMMDC also managed to sustain and grow the national MathArt competition for schools in 2021 and even produced customized coffee mugs with learner artworks displayed to market and celebrate this exciting STEAM education project. The GMMDC management looks back on 2021 with great pride and thankfulness to all who have contributed to the successes of our engagement projects during a most challenging year.

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Learner Development Projects

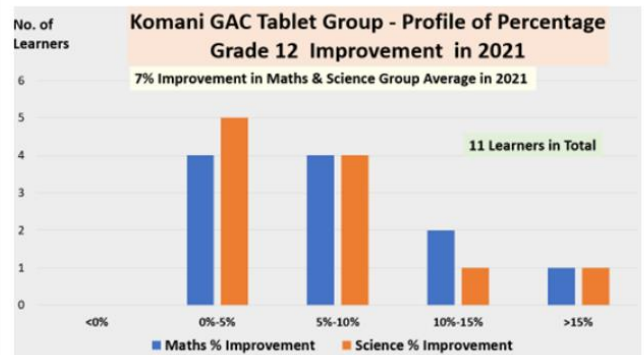
Continued Success with Hybrid Techno-blended Learner Incubation

Incubation Programme

In 2021, more than 300 selected Grade 11 & 12 learners with potential from more than 40 under-resourced schools in Gqeberha, Komani, Somerset East, Bedford, Mthatha and Adelaide participated in the GMMDC's structured mathematics and physical sciences learner incubation programmes. All learners were supported by structured hybrid offline-online support models that involved a combination of structures Zoom lesson support, WhatsApp group support, offline & online MobiTutorZA™ app support via mobile phones and content support via the GMMDC's YouTube channel. This approach was refined at the onset of the COVID-19 pandemic in 2020 to include learning support over distance. Overwhelmingly positive learner feedback about their experiences with the Hybrid Techno-blended approach were received from learners in all the project nodes. The programme again produced notable improved results. Some individual matric learners improved their mathematics and physical sciences marks in 2021 by more than 20%. Many project learners also received a reward tablets based on either improving both their mathematics and physical sciences marks by more than 10% or presenting distinctions for both subjects in the national matric exam in 2021.

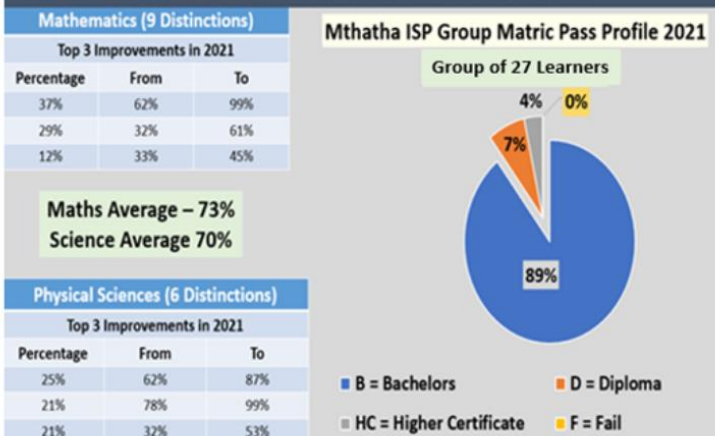
Re-Matric Programme

In March of 2021, eleven matric learners at Get Ahead College in Komani each received a Tablet pre-installed with the GMMDC's TouchTutor package for mathematics and physical sciences. This formed part of ongoing project collaboration with this school to improve learner results in this region. All the learners have improved their marks in both subjects in the final national exams in November 2021 - some by more than 10% as can be seen from the project results that are showed below.



Above: Learner results impact of matric Tablet support at Get Ahead College in 2021.

Mthatha Gr 12 Learner Incubation 2021



Above: Impact of 2021 the hybrid Techno-bended learner incubation programme. Results from one of the four project nodes in the Eastern Cape Province in 2021.

Word Cloud - Mthatha ISP Responses



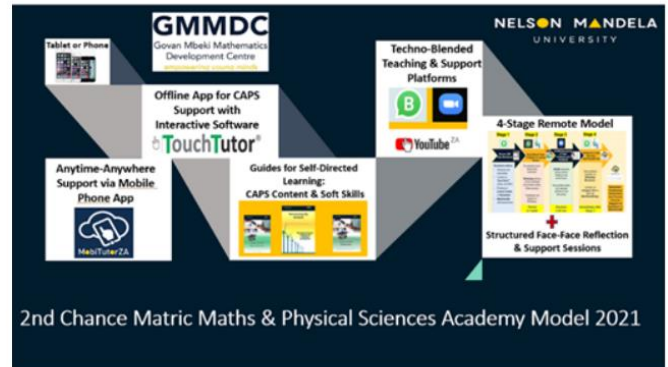
Learner Development Projects

Extension of Techno-blended Learner Support to Support Second - Chance Matrics

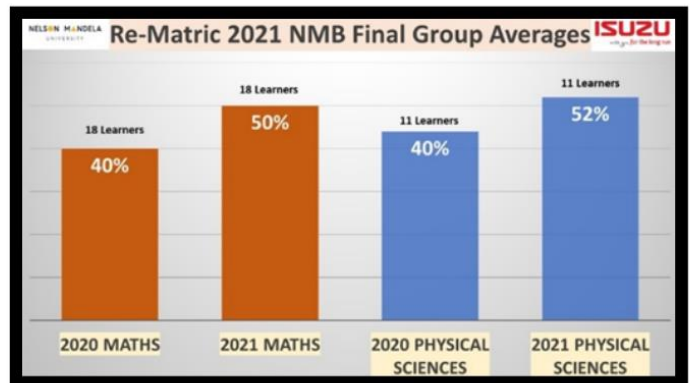
Successful Pilot Maths and Science Re-Matric Programme

More than 20 000 matric learners fail mathematics annually in the Eastern Cape Province alone. Although the DBE offers 2nd-chance examinations to these learners in the following year, no structured support programme exists for these candidates. To address this need and additional education challenges during the COVID pandemic, the GMMDC decided to adapt its successful in-school learner incubation programme to support out-of-school repeat learners who wish to pass or improve their matric Mathematics and Physical Science marks. A pilot Re-Matric programme for both subjects was implemented in Nelson Mandela Bay in 2021 with the financial assistance of Isuzu. A second project was also offered in Komani in collaboration with Get Ahead College. Project learners received a Tablet pre-installed with the GMMDC's offline TouchTutor package for mathematics and physical sciences. This hybrid distance programme also included lesson reflection via live Zoom sessions, WhatsApp broadcasts and group support, offline & online MobiTutorZA™ app support via mobile phones and more. This 7-month project which started in February was successfully completed in November 2021. The outcomes of the pilot Re-Matric programme represent a resounding success. Summaries of the learner results are presented in the figures alongside. The GMMDC plans to consolidate its successful in-school and Re-Matric incubation programmes into a single techno-blended development academy programme for school learners in 2022.

Alongside: *Haille Hutton, a Re-Matric learner, improved her Physical Sciences marks by more than 20%. She received a Tablet as award from the Dean of Science Prof Muronga in November 2021.*



Above: Re-Matric Model in 2021



Top Five Maths & Physical Sciences Improvements of the 2021 NMB Re-Matric Project					
	5	4	3	2	1
Maths	14% (41%-51%)	14% (42%-56%)	14% (45%-59%)	16% (36%-52%)	19% (33%-52%)
Physical Sciences	7% (38%-45%)	8% (38%-46%)	16% (45%-61%)	17% (45%-62%)	23% (27%-50%)

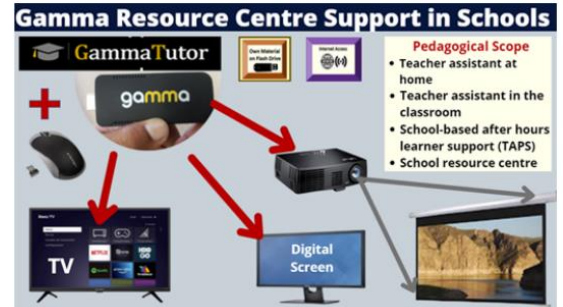
Above: Group Results & Top improvements from the 2021 Re-Matric programme in NMB.



Gamma Resource Centres & TAPS Support

Establishing Secondary Sites for After-School Self-Directed Learning

One of the biggest needs in the public secondary school system is for access to quality curriculum-aligned resources for teaching and learning - both in the classroom and after-school hours. In 2021 the GMMDC continued to establish curriculum-aligned offline Gamma Resource Centres at project schools as platforms for classroom teaching support or Technology Assisted After-school Peer-learner Support (TAPS). The GMMDC's innovative plug & play Gamma device & GammaTutor software again provided valuable STEM education assistance in many under-resourced schools. This customized offline Android educational device, which was developed by the GMMDC with support from an external ICT company, has generated keen interest amongst educators and key stakeholders in education. The Gamma and digital resources were used effectively by teachers to support and improve their teaching in classrooms and during after school support sessions. Project teachers who have used this device have also expressed strong support and appreciation for the added value that it brings to the 21st century teaching and learning of Mathematics and Physical Sciences at schools. The Gamma resource centre & TAPS model of the GMMDC has resulted in a number of new development project implementations during 2021 and is set to bring much needed and sustainable e-learning support to learners in project schools.



Above: Gamma Educational Device for flexible Teaching & Learning in Schools

Gamma Resource Centre Project Implementations 2021		
Project Partner(s)	Beneficiaries	No. of Gammas
EC Dept. of Transport & WSU	7 Schools in Mthatha, ECP	20
Outlook Foundation	11 schools in Peddie, ECP	11
SETH Academy, NWU	2 Schools, Potchefstroom, NWP	20
CHIETA (EL & Gqeberha)	10 Schools, ECP	80

Above and Below: Gamma Project Implementations and School Resource Centres in 2021



M-Learning Support Projects

Curriculum Support & CAPS Maths Challenges via Personal Mobile Phones

MobiTutorZA App Support Projects

In 2021 the GMMDC again used its innovative MobiTutorZA™ educational application for Android mobile phones to provide flexible after-hour learner assistance over distance and across provinces. This app provided valuable free interactive online and offline mathematics and physical sciences self-directed learning support to thousands of secondary school learners during another year of COVID-19 lockdowns. MobiTutorZA™ app, which was freely downloadable from Google Play Store in 2021, can be installed on Android phones or tablets to provide user-friendly access to curriculum aligned mathematics and physical sciences content, self-tests with feedback and multi-language support. The application was also used in 2021 to offer school-based online competitions via phones that were linked to the Grade 8 to 12 school curriculum for mathematics. The annual competition comprised of a mathematics tournament where learners competed in different grades

over two rounds. A successful awards function for top performing learners was held in November 2021. This event, which was also streamed via Zoom, was attended by parents of prize-winners and a number of project stakeholders. The MobiTutorZA app also provided monthly mathematics challenges over six months during the 2021 school academic year. A gamification function allowed participants to be placed on an in-app leader board with rewards being offered to top performers on a monthly basis. A pilot MobiMatric Exam Revision project, which offered practice-exam sessions via this phone application, was also introduced for the first time in October 2021. This afforded all matric learners an opportunity to test themselves against standardized mathematics and physical sciences practice exam papers with scoring and feedback before the final national matric examinations in November.

More than 2 000 learners, mostly from across the ECP, have actively participated in the GMMDC's MobiTutorZA™ projects in 2021. Through the above projects, the viability of using the MobiTutorZA™ app to provide innovative M-learning support via mobile phones to learners from under-resourced secondary schools across South Africa was confirmed.

GMMDC's Learner Assistance via Mobile Phones in 2021
Maths and Science Development and Support via MobiTutorZA™ Android App

COVID-friendly Support Model over Distance

- Flexible free app access via Android phones
- Curriculum support over distance for thousands of High School learners
- Paperless problem-solving competitions and challenges and support anywhere, anytime
- Dedicated MobiMatric Exam Preparation Projects in 2021
- > 2000 learner app registrations

Participant Locations

Participant Locations in 2021:
More than 2000 learners from more than 200 schools participated in 2021

MobiTutorZA

Above: M-Learning Projects of the GMMDC in 2021

Govan Mbeki Mathematics Development Centre
5 November
MobiTutorZA Awards Ceremony 2021

Congratulations to all the Award Winners

NELSON MANDELA UNIVERSITY | MobiTutorZA | GMMDC

Above: Mathematics Competition Prize-winners during a project function in November 2021

M-Learning Support Projects

Innovative Pedagogical Practice with Applets for Mobile Phones



GeoGebra for Innovative Pedagogy Practice (GIPP) Project

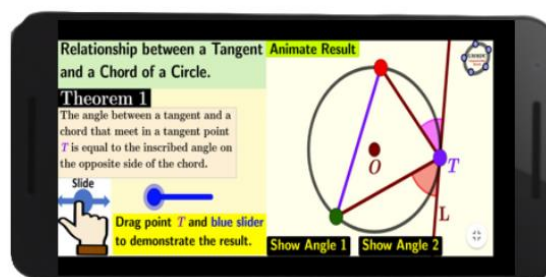
As part of its innovative techno-blended approach to STEM education, the GMMDC has incorporated the internationally acclaimed open-source software GeoGebra in its teacher and learner skills development programmes since 2015. A GeoGebra for Innovative Pedagogy Practice (GIPP) for 4IR project was launched in 2021 to extend the online use of this award-winning free software. The use of interactive applets that were customized for mobile phones is now possible. The GMMDC developed a series of mathematics applets for smart phones that supports the delivery of the school curriculum. These applets can be shared via QR codes or web links for flexible access by learners. This GeoGebra Maths applet series was incorporated in the teacher and learner support projects of the centre in 2021 and represents a new and innovative pedagogical approach to support teaching and self-directed learning in schools. The centre also developed a series of GeoGebra applets for promoting creative problem-solving and STEAM education in schools. Four successful GIPP online Zoom webinars for educators and education researchers were presented by the centre during 2021. The goal was to demonstrate the possible pedagogical use of mathematics and physical sciences GeoGebra phone applets. Positive feedback from participants were received about this innovative new teaching approach. GeoGebra phone applets can be used synchronously or A-synchronously in a number of learning environments settings to enhance understanding of mathematics or to engage with problem-solving in an interactive way. This new M-learning approach using GeoGebra applets for phones was also shared as an invited keynote address by Prof Olivier during the International Conference of Mathematics and Mathematics Education (ICMME) in August 2021.



Above: GeoGebra Applet Series for Mathematics was developed for mobile phones and introduced in 2021



Above: M-Learning Webinar series in 2021 to promote the use of GeoGebra Applets via Phones



Above: Interactive GeoGebra Mathematics applet displayed on a mobile phone screen

STEAM Education & MathArt Project

Celebrating Creative Real-life links between Maths and Art

National MathArt School Competition Project

Since its inception in 2018, the national Math-Art competition in schools has been a flagship STEAM education project of the GMMDC. The central focus of this project is to promote real-life connections between Mathematics and Art to foster creative problem-solving. In 2021 the competition was again successfully implemented as an online project with the theme "Beautiful Mathematics". As before, pupils submitted a photograph of their artwork online as well as a description of the connection(s) with mathematics. Each submission was authenticated, to ensure it was not plagiarized in any way from existing material on the internet. The competition in 2021 attracted over 300 entries from more than 60 schools. Grade 7 to 12 pupils across all the provinces in South Africa have entered. A successful hybrid in-person and Zoom awards function was held in November of 2021 at The Club which is located next to the Mandela University's Campus in Bird Street, Central.

The MathArt competition project was again self-funded in 2021. It enjoyed the support of international and local partners, including the Provincial Departments of Basic Education (Western Cape and Eastern Cape) and the Bridges MathArt Organization in Finland. Top entries from the national 2021 Math-Art competition were exhibited in the Art Gallery of the Art Department on the Bird Street campus of the Mandela University in June 2021.



Above: MathArt Competition 2021



Above: Teacher Workshops in preparation for the MathArt Competition in 2021



Above: Some of the quality MathArt learner entries received in 2021

STEAM Education & MathArt Project

MathArt Products to Market STEAM Education Projects

Math-Art Competition Products

The GMMDC again produced a calendar in 2021 which presents selected learner artworks from the previous year's competition. In addition, a coffee mug series was produced last year to celebrate and show-case a selection of special MathArt competition entries of learners over the period 2018 - 2020. These project mugs currently serve as valuable project reference items and STEAM education marketing products for the centre and the university. The Vice-Chancellor's office at Mandela University has also commissioned sets of these mugs in 2021 to be presented as farewell gifts to retiring university staff members. The GMMDC also plans to produce a coffee table book to celebrate the historic development and success of this project.

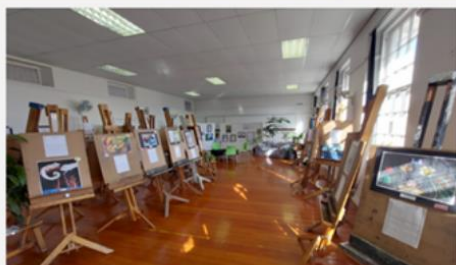


Above: 2021 MathArt Calendar

Although the competition participation levels in under-resourced schools were severely affected by the COVID pandemic in 2021, the novelty and exciting potential reach of the Math-Art competition again made the project outcome a great success. With growing interest and support from domestic and international stakeholders, this STEAM education school project is strategically positioned to become an important event on the national education calendar in the coming years. Anyone who wants to purchase MathArt mugs can get in touch with GMMDC project staff via links that are provided at the end of this newsletter.

MathArt Exhibition & Coffee Mug Series 2021

MathArt Exhibit Bird Street Gallery June 2021



MathArt Coffee Mug Series 2021



Above: GMMDC's MathArt Coffee Mug Series and local Exhibit in 2021

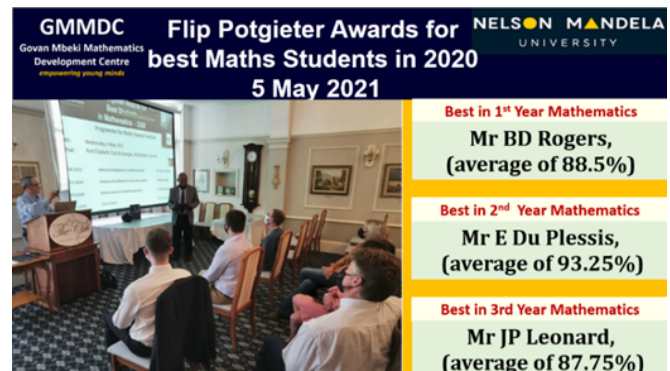
Other Maths & Sciences Development Projects

Advancing the Study of Mathematics & Science

Flip Potgieter Scholarship & Mathematics Prizes

The second instalment of the Flip Potgieter scholarship was handed to student Lonwabo Jacobs in May 2021. This scholarship offers an amount of R100 000 a year for three years to a needy student to study towards Bachelor of Science degree at Nelson Mandela University. Lonwabo, who is a product of the GMMDC's incubation programme in Somerset East, is the first recipient of this special scholarship. The Piet Beyers Trust funds the scholarship and also offers annual awards of R5 000 each to the top 1st, 2nd and 3rd year mathematics students at Nelson Mandela University.

The Mathematics awards and the Flip Potgieter scholarship were officially handed over at The Club in Bird Street, Central during a lunch function that was arranged by the GMMDC.



Above: Flip Potgieter Scholarship and Mathematics Awards Function 2021

Collaboration with NRF-SAASTA to Promote STEM Education

In 2021 the GMMDC presented a series of STEM teacher workshops in collaboration with the South African Agency for Science and Technology Advancement (NRF-SAASTA). The STEM awareness, information-sharing and teacher support seminars were held at venues in three different provinces. Each session consisted of a 2-hour interactive mask-mask workshop with the focus on showcasing innovative pedagogies, and digital resources that form part of the technoblended models that were developed by the GMMDC at Mandela University.

Demonstrations of the new Gamma device for education, the MobiTutorZA application for mobile phones and GeoGebra applets to support self-directed learning were included in workshop programmes.



Above: GMMDC STEM Seminars in collaboration with NRF-SAASTA in 2021

Getting in Touch with Us:



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[GMMDC NMU](#)



[MobiTutorZA at GMMDC](#)



[MathArt Competition at GMMDC](#)



[GEOGEBRA STEAM at GMMDC](#)