NMMU ENGAGEMENT EXCELLENCE AWARD APPLICATION

Name of Applicant: Prof. Werner Olivier

FRF Chair in Mathematics Education and

Head: GMMDU, School of Computing Science Mathematics & Applied Mathematics Physics and Statistics, Science Faculty, NMMU

1. Introduction:

The 2013 engagement portfolio of Professor Olivier that will be presented in the sequel is directly linked to his position as Head of the Govan Mbeki Mathematics Development Unit that is based in the Science Faculty of the NMMU. All the projects and collaborations that are reflected on in this engagement portfolio were conceptualized, initiated and managed by Prof Olivier and exclude funded Mathematics research and development activities that are directly linked to the FRF Chair in Mathematics Education programme in ten secondary schools and elsewhere in the NMM.

2. GMMDU Aims and Goals

The unit aims to:

- improve the content knowledge, problem solving and teaching skills of in-service Mathematics and Science educators at FET colleges and at previously disadvantaged secondary schools;
- improve the NSC CAPS Mathematics and Science results (pass rates and quality of passes) amongst learners in previously disadvantaged secondary schools;
- promote the integration of appropriate 21st-century techno-blended support models into the teaching and learning of Maths and Science at FET colleges and secondary schools;
- promote public awareness of the important role Maths and Science play in modern society.

3. Nature of Engagement Activities:

Engagement activities of the GMMDU that will be described are linked to all four broad engagement categories that are described in the NMMU Engagement Awards Policy Document.

For easy reference, the particular aspects of these engagement categories that are covered by one or more of the engagement activities that will be described in the sequel are summarized below:

3.1 Engagement through Profession/Discipline-Based Service Provision

- *Serving as an elected officer of a professional society/council/board/ association etc.*
- *Establishing and improving professional or academic standards within a profession or discipline.*
- *The provision of discipline-informed expert opinion to internal and external stakeholders.*

3.2 Engagement through Teaching and Learning

- *Continuing professional development and community-based education.*
- *Customised training and short learning programmes.*
- *Alternative modes of delivery to accommodate non-traditional students.*

3.3 Engagement through Research and Scholarship

- *Community-based research projects.*
- *Collaborative R&D projects.*
- *Joint commercialisation of new product.*

3.4 Community Service and Outreach

- *Engaging in sustainable community development activities.*
- *Participating in collaborative endeavours with schools, industry, Non-Governmental Organisations etc.*
- *Disseminating information in popular media.*

4. GMMDU Programme background and 2013 project descriptions

The Govan Mbeki Mathematics development unit was founded in 2002 and formally re-constituted as an engagement entity in the Science Faculty in 2008. The primary

academic thrust was always in the area of FET Mathematics with Physical Science a secondary focus area. The strategic approach to academic development always included the harnessing of modern technologies in an integrated way to create innovative modern T&L models and scaffolding support platforms for teachers and learners that are compatible with the secondary school system and broader environment in South Africa. This has resulted in the development of a unique off-line curriculum aligned techno-blended Maths and Science teaching and learning model for secondary schools and FET colleges. This T&L model has evolved over a period of eight years and is constantly being updated and extended via action research and further development.

The 2013 engagement activities of the unit that will be presented fall within the following project framework:

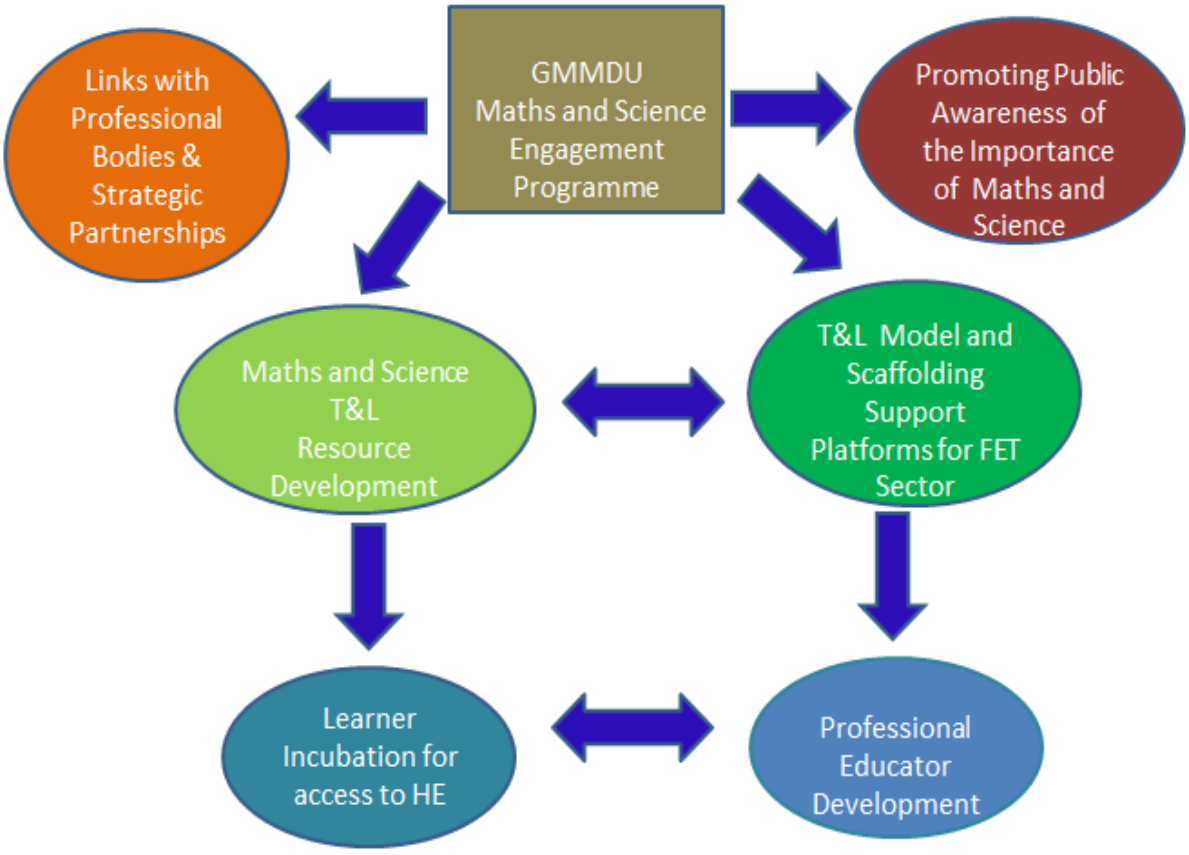


Fig. 1. GMMDU Engagement Activities Structure

4.1 Maths and Science T&L Resource Development

The basis of the techno-blended T&L models for Maths and Science that were used in all development projects in 2013 is a series of content video lessons, video experiments and related support video material (more than 150 hours) that completely cover the latest NCS Maths and Science school curriculum in a structured way. Specialized graphics software programmes were used with animated PowerPoint slides to create narrated multiple representations of content and dynamic visual effects during the recording of each video lesson.

In the five year period leading up to the end of 2012, the formats of teaching and learning support material that were used during teacher and learner development projects were always a combination of video, PowerPoint and PDF files that were mostly accessed via digital video disks (DVD's). Although the digital support material in DVD format was very popular amongst project learners and teachers during this period, the unavailability of and lack of flexibility of presentation equipment (DVD players & TV's/Laptops) sometimes impeded the full use of these educational resources.

TouchTutor™ Package:

At the beginning of 2013 three comprehensive video lessons, aligned learner workbooks and related support material that cover the curriculum areas of Geometry and Probability were developed to comply with the demands of the latest NSC Maths school curriculum. All the existing Maths and Science content resource material for Grades 10-12 were also combined with innovative and exciting additional support material for teachers and learners in an innovative way to form the TouchTutor™ Maths and Science resource package.

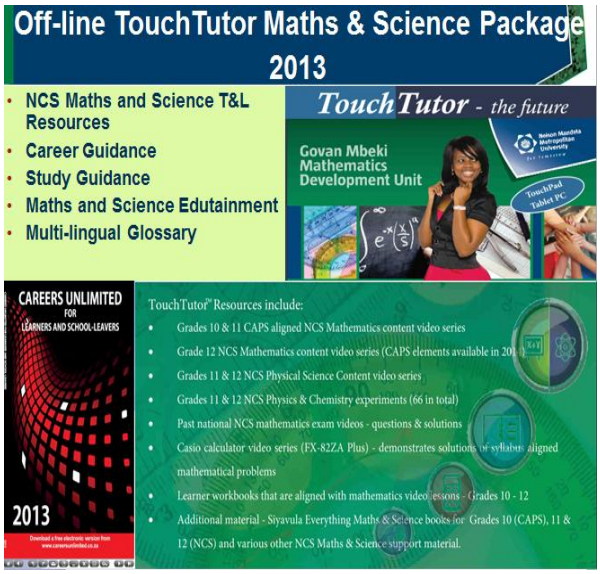


Fig. 2. TouchTutor™ Package

Lesson-aligned learner workbooks and solutions, information about good study methods, glossary of Maths and Science syllabus term explanations, edutainment and much more were included for the first time in the support package that was prepared for off-line use with both Windows and Android operating systems.

A flexible menu system within a local browser environment allowed the use of the TouchTutor™ package with Android Tablets , Windows Desktop PC's and Laptops. Users of the new package could, with the click of a mouse or touch of a screen, freely navigate to any component of the Maths and Science support material.

This development opened up a range of new opportunities to provide innovative curriculum-aligned Maths and Science teaching and learning support to educators and learners.

The development and use of the TouchTutor™ Maths and Science package also created the opportunity to explore new partnerships in the quest to provide broad access to quality T&L material that is aligned with the school and FET college curricula in SA.

A commercialization exercise with a leading IT company (Future Mobile Technology) was successfully implemented through the office of the director of innovation at NMMU in 2013. The popular Maths and Science video content material are currently being sold as the Scholar support package with Tablets marketed by Future Mobile Technology in leading retail stores including outlets within The Foschini Group (TFG).

Fig. 3. Commercialization

The TouchTutor™ package also includes a comprehensive set of NMMU marketing material in digital format for prospective students to peruse.

Curriculum Support via Mobile Technology:

A project was initiated in 2012 to adapt a mobile-system that was developed in the Science Faculty of the NMMU into a Mxit- based cell phone application for NCS Math and Science scaffolding support. The aim was to create a cell phone based platform that will provide affordable curriculum-aligned self-assessment and feedback for learners. After a number of successful trails during GMMDU learner programme implementations in 2012, an innovative Mxit based mobile learning platform with attractive features was developed to support the T&L of Mathematics (and Physical Science) at FET level.

The MATHWARS application on Mxit allows flexible learner access to pre-designed NCS Maths and Science multiple choice test questions and complete solutions via personal cell phones at virtually no cost. Test questions and distractors are presented to learners in a scrambled format as to protect the integrity of individual efforts. Test scores and complete solutions are immediately available to learners after submission of a completed test and all MathMxit project data are being tracked centrally by the GMMDU as part of on-going research and development.

A comprehensive database of NCS Maths and Science multiple-choice questions and solutions was developed in Semester 1 of 2013. This was done to create a series of test questionnaires for the Mxit application that is aligned with the Maths and Science content video series of the TouchTutor™ support package. Hence an affordable and exciting cell phone based Maths and Science content support layer for all Grades 10-12 school learners was created which added a new dimension to the techno-blended T&L model that are used by the GMMDU in a number of learner development projects.

Fig. 4. Maths and Science Support via Mxit

4.2 Maths and Science T&L Models and Support Platforms

The TouchTutor™ resource material was utilized together with a number of off-line techno-blended T&L models and support platforms during the 2013 development project implementations of the GMMDU. The following list of models and support platforms gives an indication of the scope of the Maths and Science development programme of the GMMDU:

- **In-service Maths teacher development**

  Sponsored laptops with the TouchTutor™ package, GeoGebra, CASIO Emulator and additional digital T&L resource packages pre-installed were provided to all teachers and formed an integral part of the T&L model that was implemented as part of teacher training programmes (see also section 4.4). Equipment and resources are assisting teachers to improve their teaching strategies in line with 21 century requirements for classrooms.

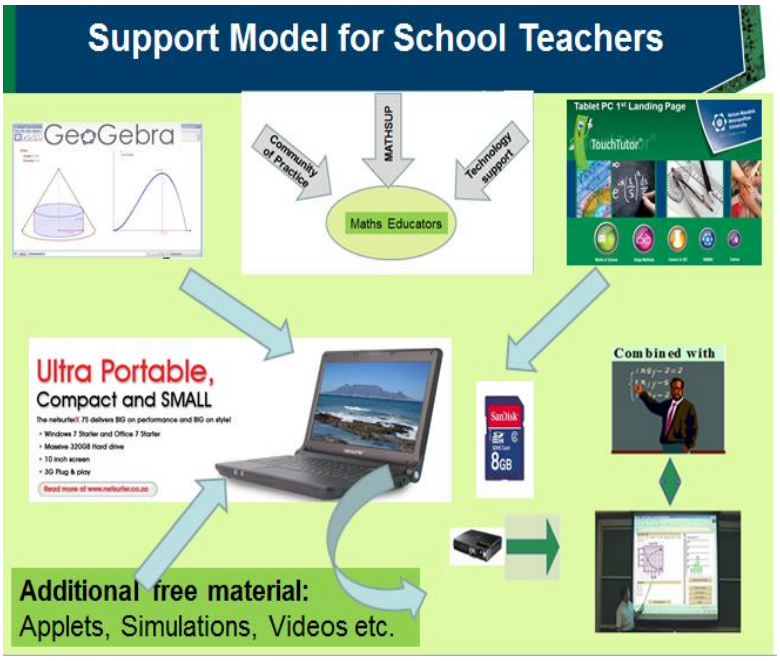


Fig. 5. Teacher Model

- **Focussed Learner incubation model**

All Maths and Science incubation project learners were provided with 24/7 access to a 7" Android Tablet with TouchTutor™ Maths and Science package pre-installed, a Casio Scientific Calculator, Video-aligned workbooks and Mxit self-assessment opportunities as part of a T&L model that was used in structured Saturday or after-school scaffolding support programmes (see also section 4.3).

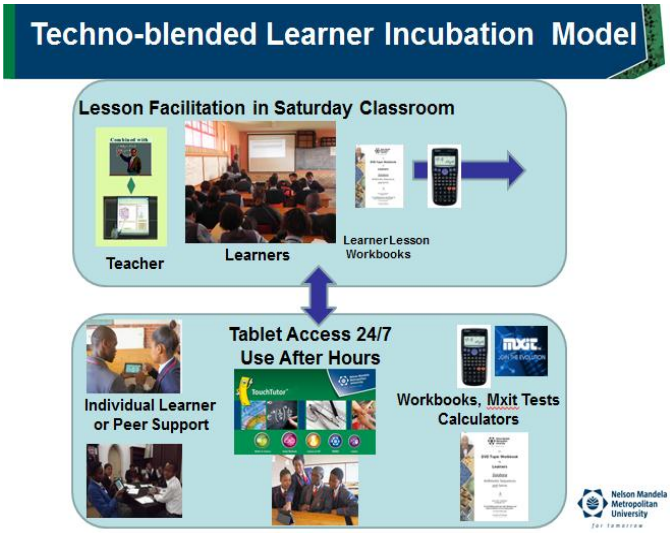


Fig. 6. Learner Incubation Model

- **School based learner support model**

Recycled desktop computers (two per school) with the TouchTutor™ Maths and Science package pre-installed were placed in forty project schools in the PE and Uitenhage districts in 2013. Copies of the video-lesson aligned learner workbooks were also distributed in schools to provide meaningful after-school learner scaffolding support opportunities through access to quality Maths and Science T&L resources.

Fig. 7. Desktop PC School Model

Desktop PC's were prepared exclusively for Maths and Science support and were placed in the care of Maths/Science educators at project schools. Special software to monitor the usage of the support model over time was also installed on all project PC's. This project was implemented in close collaboration with local officials of the DoBE who assisted with the identification of schools and the dissemination of information about this support project. The desktop PC's that were distributed to schools to serve as a Maths and Science support platform are old NMMU PC's that were written off as part of the 5-year replacement cycle of equipment. Special permission was obtained from MANCO at NMMU in 2013 to utilize these devices for the purpose of Maths and Science development in secondary schools.

4.3 Learner Incubation for Access to HE

A 15-week Mathematics and Science Incubator School programme (ISP) for selected Grades 11&12 Mathematics and Science learners with potential from previously disadvantaged schools in the ECP has been a flagship development project of the GMMDU since 2008.

The 2013 ISP programme represented the dawn of a new era of Tablet assisted incubation and support as the old DVD-based programme was phased out in 2012.

In 2013, more than 500 selected learners from more than 70 previously disadvantaged secondary schools in the ECP participated in this structured Saturday programme that focussed on content and skills that are aligned with the curricula that were taught in schools. A network of expert teachers were trained to facilitate content lessons and assessments on Saturdays for the first 13 weeks. A techno-blended T&L model was implemented (see Figure 6.) throughout the ISP programmes.

Fig. 8. ISP Groups 2013

A two week exam revision programme was also presented in August 2013 to all ISP groups in order to ensure that project learners have the best possible chance at success in the final Maths and Science school exams. All ISP learners retained 24/7 personal access to the Tablet & TouchTutor™ resource support until the last day of the November school exams in 2013.

The scope of the successful 2013 ISP programme implementations is reflected in the table below. Two new nodes of the ISP programme were started in 2013 which added more complexities to what has been a huge administrative, technical and logistical undertaking.

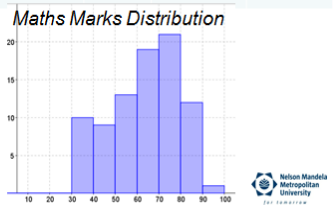
ISP Node	No. of Schools	Grades	No. of ISP Learners	No. of previous Implementations
NMM	35	11&12	170	7
Uitenhage	10	11&12	80	New
Humansdorp	4	11	50	New
Somerset East	4	10,11&12	60	3
Graaff Reinet	8	11&12	80	2
Cradock	10	11&12	80	2
		Total:	520	

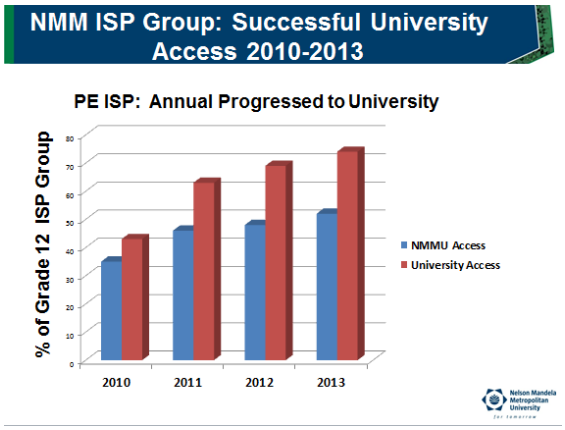
Table 1. ISP Groups & Profile - 2013

Outstanding results were presented by the Grade 12 ISP group in PE at the end of 2013. This can, at least partly, be attributed to the introduction of a Tablet assisted T&L model. More than 50% of all the Grade 12 ISP learners successfully accessed study programmes at the NMMU in 2014 which makes the 2013 ISP project the most successful up to date. Most encouraging was the number of quality passes in Mathematics and Science in comparison with similar results in the district, the province and nationally. A reflection on these ISP statistics over the past three years is presented in the graphs alongside and below.

ISP Grade 12 Results from the 2013

Subject	Passed > 50%	Passed > 30%	District Pass >30%	Provincial Pass > 30%	National Pass >30%
Mathematics	77.6%	100%	62.2%	43.4%	59.1%
Physical Science	71%	95%	66.9%	55.8%	67.4%





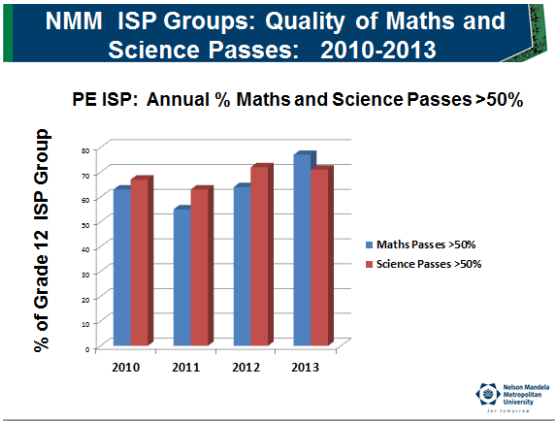


Fig. 9. ISP Results

Feedback from structured surveys amongst ISP learners in 2013 clearly indicated that the overall Tablet & TouchTutor™ - based education support experiences of learners were well received and appreciated. The GMMDU management has learnt many invaluable practical lessons from the initial Tablet assisted ISP implementations in 2013. As a result, a number of changes were introduced to the programme design in 2013 to improve the overall impact of the ISP project that was subsequently implemented in 2014.

The GMMDU received a national award (gold class) in 2013 for the Maths and Science incubator school programme from the **Impumelelo Social Innovations Centre.**

After the three-phased evaluation process, including a site visit and a project presentation, 26 programmes

Fig. 10. Impumelelo Award 2013

were awarded prizes out of approximately 200 applications across South Africa. The Awards, five platinum, nine Gold and 12 Silver, were handed over in December 2013 at the Baxter Theatre in Cape Town by Prof Jonathan Jansen, Rector and Vice-Chancellor of the University of the Free State and Mr Derek Hanekom, Minister of Science and Technology at the time.

4.4 Professional Development of In-service Educators

A second flagship project of the GMMDU over the past five years was the accredited professional skills training programme for in-service FET Mathematics educators.

The Mathematics Skills Upgrade Programme (MATHSUP) consists of two NMMU accredited short learning programmes which are normally presented over a period of six-months each.

A similar, but more informal, Science Skills Upgrade Programme (SSUP) was also offered to a group of in-service FET Physical Science educators over the same period.

Both the MATHSUP and SSUP programmes focus on curriculum content and pedagogy skills linked to the integration of modern technologies to improve the teaching in FET classrooms. The TouchTutor™ resource material formed the basis of the techno-blended T&L model that was utilized during the MATHSUP, SSUP and other informal educator skills development programme deliveries in 2013.

All the content and skills upgrade programmes for educators in 2013 were officially commissioned by the Department of Basic Education (DoBE) management in the ECP or Free State provinces. The groups of in-service educators to be trained were also identified by DoBE officials. Skills development programme implementations also always included the distribution of a laptop, with the TouchTutor™ and other support packages pre-installed, to all project educators.

A list of all the 2013 educator skills development programme implementations is given below:

MATHSUP and SSUP programme implementations:

A MATHSUP programme was commissioned in 2013 for the training of 110 in-service Mathematics school teachers and 30 Mathematics lecturers from FET colleges in the ECP. In-service school teachers were identified by the DoBE from under-performing schools in four education districts (Dutywa, Libode, Fort Beaufort and Butterworth) and in-

Fig. 11. MATHSUP & SSUP Training 2013

service FET college lecturers were selected from three rural colleges in the province (KSD, Ingwe, King Hintsa).

At the same time a SSUP programme was commissioned by the DoBE for the training of 50 in-service Physical Science teachers from underperforming schools in the same four education districts that the MATHSUP teachers were selected from.

The MATHSUP & SSUP programmes, which started in January 2013, were delivered at Trinset College in Mtatha via a series of contact sessions during school holidays and weekends. A successful completion of the MATHSUP & SSUP programmes was celebrated in November 2013 during a certification ceremony that was held in Bisho where the Provincial MEC of Education officiated. Structured course evaluation surveys amongst MATHSUP and SSUP participants reflected an overwhelmingly positive response from educators towards these critically needed professional development and support interventions (see Figures 12. & 13.).

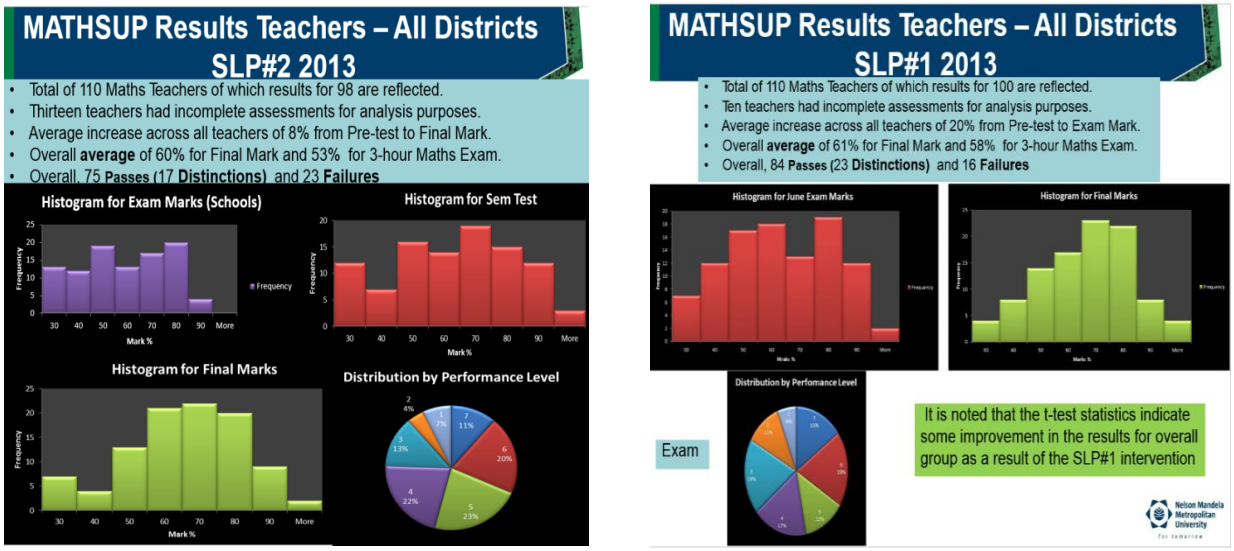


Fig. 12. MATHSUP Results 2013

Govan Mbeki Mathematics Development Unit

Faculty of Science
Discovering tomorrow

Nelson Mandela Metropolitan University
for tomorrow
Port Elizabeth & George

(MATHSUP) Mthatha 2013

Period January 2013		INDICATE BY CHECKING THE APPROPRIATE BOX					
		Below expectations	Minimum expectations	Average	Good	Excellent	NA
FEEDBACK ON TRAINING PROGRAMME							
1,1	Clarity of MATHSUP training outcomes	0	0	0	49	25	0
1,2	Relevance of programme contents to the training outcomes	0	0	1	43	30	0
1,3	Relevance of subject content material to the actual Maths classroom	0	0	1	31	42	0
1,4	Appropriateness of content examples/activities that were discussed	0	0	2	35	35	0
1,5	Cognitive demand of the MATHSUP programme	0	0	7	53	15	0
1,6	Nature and degree of difficulty of assessments	0	0	12	47	11	0
1,7	Pace of programme presentation	0	3	14	40	14	0
FEEDBACK ON PRESENTERS							
2,1	Use of appropriate presentation methods	0	0	4	39	31	0
2,2	Effective use of Maths teaching strategies	0	0	5	36	33	0
2,3	Use of a variety of presentation tools	0	0	6	38	30	0
2,4	Integration of relevant technologies during presentations	0	0	4	37	33	0
FEEDBACK ON TEACHING AND LEARNING RESOURCE MATERIAL							
3,1	Quality of content VIDEO resource material	1	0	4	33	34	2
3,2	Quality of support VIDEO material (CASIO & Past Exams)	0	0	3	30	41	1
3,3	Course material (Study guide, calculator & exam support etc.)	0	0	0	36	37	0

Fig. 13. MATHSUP Educator Feedback

As a result of the implementations of the two credit-bearing SLP's of the MATHSUP programme, the NMMU has earned 1st stream FTE income over the past three years as part of the RAM. The following table summarizes the MATHSUP FTE income that was generated in this way over the past three years:

Year	Un-weighted FTE	Weighted FTE	Rand Value
2011	13.5	33.75	R345 803.00 (claimed by NMMU in 2013)
2012	30.2	75.5	R790 787.00 (will be claimed by NMMU in 2014)
2013	24.8	62	R668 856.00 (will be claimed by NMMU in 2015)

Table. 2. FTE Income as a result of MATHSUP programme implementations

Grade 9&10 Maths Educator Skills Development

A special curriculum-aligned Mathematics Skills Upgrade Project (MSUP) was delivered in Bloemfontein in 2013 for 120 Grades 9 & 10 Mathematics educators. The format of the MSUP programme was similar to that of the MATHSUP programme that was described earlier. This project was commissioned and paid for by the Free State DoBE in the wake of a very successful accredited MATHSUP programme implementation for 120 in-service Mathematics educators in the Free State province in 2012. The MATHSUP and MSUP programmes represented an attempt by the DoBE management in the Free State to strengthen the professional capacity to teach CAPS Mathematics effectively in this province. The techno-blended T&L model was used during the training programmes and the equipment and resource distribution to teachers again included personal laptops and the TouchTutor™ packages.

Fig. 14. Free State Educator Project 2013

A successful completion of the MATHSUP & SSUP programmes was also celebrated in November 2013 during a certification ceremony in Bloemfontein with top DoBE officials in attendance.

Subject Advisor Training and Dinaledi Schools Support in the ECP

On request by the management of the DoBE in the ECP, 3-day CAPS Mathematics and Physical Science skills training and resource distribution programmes were conducted at the NMMU South Campus for 77 subject advisors from 23 districts in the province in February 2013. The aim of this training was to familiarize subject advisors with the scope of the MATHSUP and SSUP programmes, inform them of the techno-blended model that was used during such teacher training sessions and to distribute the same equipment and resources as were done during MATHSUP and SSUP implementations. These interventions empowered subject advisors to support in-service teachers in their districts in the wake of the MATHSUP and SSUP programme implementations.

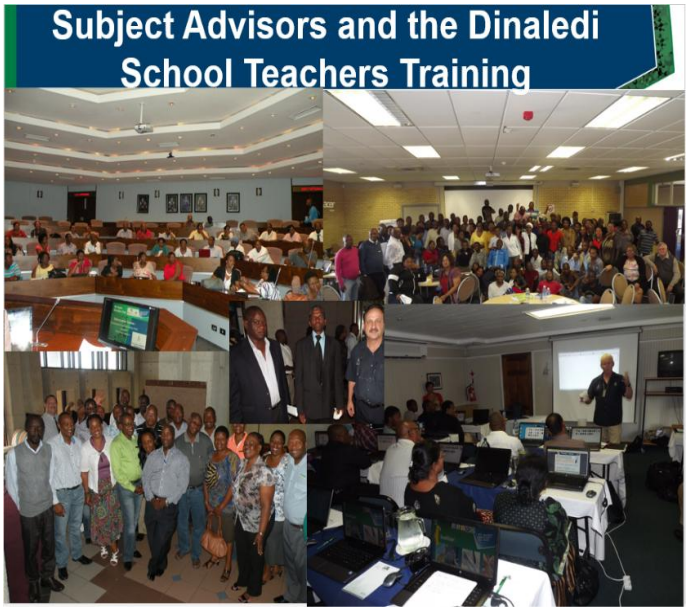


Fig. 15. Subject Advisor Support – February 2013.

A group of 120 in-service Mathematics teachers from 60 Dinaledi schools (special secondary schools in the province that were identified as potential centres of excellence) were also resourced and given a 3-day training during the month of September 2013. The training, which were presented at the Summerstrand Hotel in PE and at the Leadership Institute in East London, included content training which focussed on the new topics in the CAPS Mathematics syllabus, scientific calculator and special exam revision workshops. CASIO scientific calculators and various resource support materials were also distributed during the training period.

Fig. 16. Dinaledi School Support – July 2013.

GeoGebra: Conference, Workshops and Basic User Certification

GeoGebra is an open-source dynamic graphics Mathematics software programme, which allows teachers and pupils to visualise and experiment with geometry, algebra, tables, graphing, calculus, statistics and many other areas of Mathematics. It has proved to be a hit worldwide in facilitating on-going professional skills development of Mathematics educators.

In 2011 a virtual GeoGebra Institute was started at NMMU (second of its kind in SA) which is affiliated to a worldwide network of such institutes that aim to support in-service Mathematics educators and facilitate communities of practice around the use of GeoGebra for teaching and learning Mathematics in classrooms.

The following list of GeoGebra–related engagement activities of the GMMDU contributed to teacher skills development of Mathematics in-service teachers in 2013:

GeoGebra regional Conference

A 2-day GeoGebra regional conference was hosted for the second year by the GMMDU in September 2013. The aims of the conference, which was held on the South Campus of the NMMU, were to enhance the professional identity of Mathematics teachers, extend their pedagogy of teaching problem-solving and to strengthen their skills to teach effectively in technologically rich learning environments. A number of Mathematics educators from outside the Eastern Cape province attended.

Fig. 17. GeoGebra @NMMU Conference

The conference also attracted attendance from more than 70 local in-service Mathematics teachers and DoBE officials. Two plenary speakers, Dr G Stols (UP, Pretoria) and Mr Balasz Koren (Maths Institute, Budapest, Hungary), delivered plenary talks. This successful two-day event consisted of structured GeoGebra workshops and academic talks by delegates on the use of GeoGebra in the classroom.

GeoGebra Workshops for Educators

Two 1-day GeoGebra workshops formed part of the official MATHSUP programmes for in-service Maths teachers that were implemented during 2013. The GeoGebra software and support material were pre-installed on laptops that were distributed to all MATHSUP teachers in 2013. This allowed ordinary MATHSUP teaching venues to be transformed into computer laboratories for the duration of GeoGebra workshop sessions.

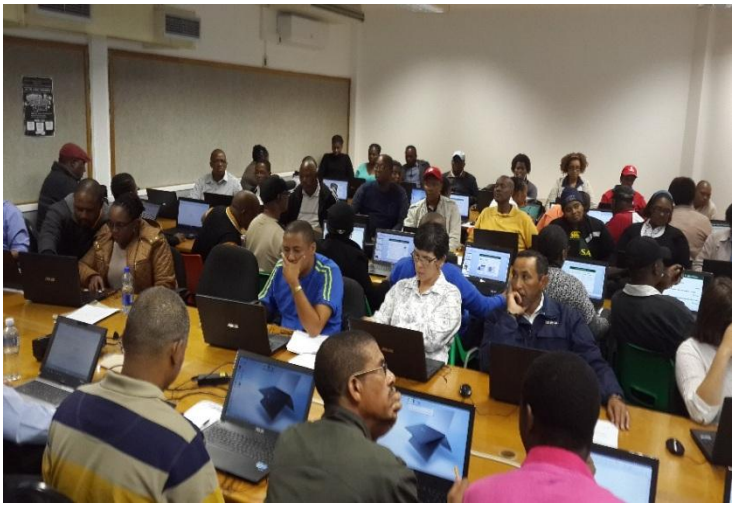


Fig. 18. GeoGebra Educator Workshop

A number of ad-hoc 1-day GeoGebra workshops were also held on request from groups of in-service Mathematics teachers including one in April 2013 in George which was arranged in collaboration with the Western Cape DoBE.

GeoGebra user certification

A pilot basic GeoGebra user certification programme was presented over five 3-hour afternoon contact sessions in PE during October 2013. Eighteen local educators from schools in PE participated in the pilot certification training.

Fig. 19. Pilot GeoGebra Certification Group - 2013

The aims of the pilot programme were to strengthen conceptual content knowledge linked to key areas of the Mathematics school syllabus and to establish professional learning communities around the use of dynamic graphics software to teach and learn Mathematics. Structured feedback from participating teachers was very positive and informed the GMMDU management of a possible improved format for subsequent GeoGebra certification programmes. These interventions are important as part of the desperately needed on-going professional development of in-service Mathematics teachers in the province.

4.5 Awareness of Maths and Science through Mobile Technology

For more than 10 years the Govan Mbeki Mathematics Development Unit has successfully implemented a Mathematics competition over two rounds for school learners of various grades in the Eastern Cape Province. On average, more than five thousand learners took part in the project on an annual basis. The format of the competition was a formal multiple choice questionnaire in hard copy format that was completed at participating schools in round one and at central venues by invited learners during round two. The main aim of Maths competition project was to promote Mathematical problem solving at school level and to promote awareness of the important role that Mathematics play in society. The competition project, which had become a popular fixture on the academic calendar of many schools in the province, was discontinued in its current format in 2012 due to the growing operational demands of other GMMDU projects at the time. Recent developments in the GMMDU that were linked to the use of modern mobile-systems (m-system) to assists with the teaching and learning of Mathematics have produced new and exciting possibilities to re-introduce a Mathematics competition project in the province.

Mobile Mathematics on Mxit Competition

An m-system with innovative features to support the T&L of Mathematics was recently developed through a joint project of the GMMDU and the Department of Computing Sciences at the NMMU. This m-system runs as an application on the Mxit platform and was used as a basis for the introduction of an exclusively Mxit-based pilot Mathematics competition over three rounds for Grade 9&11 learners in the Eastern Cape in 2013. This project was the first of its kind in SA.

Fig. 20. MATHMXIT Competition 2013

Rounds one and two of the competition focussed on syllabus aligned Mathematics questions and round three saw the use of Olympiad type problems. All the rounds of the competition were free, with rounds two and three reserved for invited learner who were selected according to performance criteria. Structured Mxit Maths tests consisting of multiple choice Mathematics questions were completed interactively during each round. The tests were conducted via cell phones in controlled school environments on pre-assigned days. The Mxit application presented test questions and distractors to learners in a scrambled format as to ensure the integrity of individual efforts. Test scores and complete solutions were made available to project learners immediately after submission of a completed test and all MathMxit project data were tracked by the GMMDU.

Fig. 21. MathMixit 3rd Round Competition

The aims of the 2013 MathMxit competition were to:

- promote Mathematical problem solving at school level;
- popularize the study of Mathematics in schools;
- promote awareness of the important role that Mathematics play in society;
- identify Mathematical talent in schools of the ECP.

The successful pilot MathMxit competition, which saw more than 700 learners from 45 schools participate, was implemented in partnership with Mxit Reach and the DoBE in the ECP. The viability of the concept of using mobile phones to popularize the study of Maths and Science in a user-friendly and cost effective way was confirmed. Many lessons were learned to improve project implementations of this type in the future.

HERALD (Morning Final)
06 Dec 2013, p.7

IN THE MIX: Stirling High Grade 11 pupils Kevin May, 17, top achiever for Grade 11 in the MathMxit olympiad, left, and Jaison Zachariah, 17
Picture: NICKY WILLEMSE

Bright pupils Mxit up in hi-tech maths olympiad

Nicky Willemse

MXIT added a thoroughly modern twist to the Eastern Cape's maths olympiad this year – with top achievers fittingly rewarded with top technology as prizes.

Six hundred pupils from 40 schools in 11 districts of the province put thumb to button or screen to answer 20 curriculum-aligned multiple-choice questions in the first round for grades 9 and 11 in August.

A second round followed in September until just a handful of the province's most talented young mathematicians were left to sweat it out in the third round in October.

Among the Grade 11s, Stirling High's Kevin May came first, winning an HP laptop. Pearson's Nikisha Lalloo placed second, taking home an Android tablet, and Alexander Road High's Cara Bez Geduld in third place won a Casio watch. Among the Grade 9s, Grey High's Bradley Moorcroft and Jonathan Southwood took first and second place respectively, with Pearson's Justin Tulleken coming third. They received the same prizes as the Grade 11s.

The Capitee-sponsored competition – called MathMxit – was the brainchild of Nelson Mandela Metropolitan University's Govan Mbeki Mathematics Development Unit (GMMDU), which has for many years been pioneering technology-based interventions to support maths and science education in South Africa.

GMMDU head Professor Werner Olivier, who also occupies the university's First Rand Foundation chair in Mathematics Education, said the idea behind the Mxit-based competition was to make it more attractive to today's "screen generation" teens and also more accessible to pupils throughout the province, including those in rural districts, who had previously not participated in the competition.

"We live in a totally different era. Young people today can't imagine a world without a remote control or a mouse. They are highly connected to technology and see technology as an essential part of their lives. ... It's time we responded to their needs and expectations in the context of the education system. This should be part of the approach to address the crisis."

Pupils who achieved platinum (more than 85% in all three rounds), gold (between 75% and 85%) and silver (between 65% and 75%) attended the prize giving.

May, 17, the top Grade 11 pupil, said: "[The olympiad] was very different to ordinary pen and paper olympiads. It was more modern and felt good for the environment."

Olivier, who worked hand in hand with the Department of Basic Education and the Association for Mathematics Education of South Africa (Amesa) on the olympiad, said the competition was also being used to build awareness about the leading-edge techno-blended teaching and learning model the unit had developed to assist schools.

Fig. 22. MATHMXIT in Media

A successful awards ceremony was held in November 2013.

This function was also attended by the Director of Maths Science and Technology in the Department of Basic Education who presented prizes and certificates to a number of learners who excelled in round three of the MathMxit competition.

Plans are in place to extend this competition project in 2014 to also include Physical Science and to have the first two rounds open on a national basis. The management of the Mxit company has already agreed to host this project on their Stellenbosch servers and to assist with the further development of the Mxit application and database.

Fig. 23. MATHMXIT Certification & Prizes

5. Strategic Partnerships, Leadership and Funding

The management of the various engagement and development projects of the GMMDU in 2013 involved a range of activities including stakeholder liaison, proposal and report writing, project planning and reflection, financial planning and HR management. Project activities of the unit were reported on at a number of provincial and national education forums in 2013. The following table also gives an overview of the project funding that was leveraged to implement the 2013 engagement activities of the unit.

2013 Project and Location	Partner/Funder	Funding Amount
Desktop School Support, Learner Workbooks, Mxit Database, Exam preperation	BankSeta	R850 000
ISP, Humansdorp	MMI	R215 000
ISP, Port Elizabeth	Sasol	R650 000
Maths and Science Subject-adviser training	DoBE ECP	R500 000
MATHSUP and SSUP Mthata	ETDP Seta; DoBE; ECP	R1 730 000
ISP, Somerset-East	MerSeta	R650 000
ISP, Graaff-Reinet and Cradock	Chevron	R500 000
ISP, Uitenhage	Rand Merchant Bank	R350 000
MATHSUP grade 10 educators training in Bloemfontein	FS DoBE	R1 623 000
Dinaledi Schools Maths and Science Educator training	DoBE / Dinaledi	R490 000
Cofimvaba Maths and Science learner intervention	CSIR MERAKA	R178 000
Vosloorus Maths & Science support project	BASF	R100 000
Math Mxit Competition Project	Capitec Bank	R50 000
	Total:	**R 7 886 000**

Fig. 3. Engagement Partners and Funding Amounts

Keys:

ECP Eastern Cape Province

DoBE Department of Basic Education

ISP Maths and Science Incubator School for Learners

SSUP Science Skills Development Project for Educators

MATHSUP Maths Skills Development Project for Educators

In 2013 Prof Olivier was appointed to also serve on the Advisory Committee for Mathematics (ACM) which is a committee appointed by the South African Mathematics Foundation (SAMF). The ACM reports to the SAMF board and acts as a voice for the mathematics community in the country on mathematical issues, seeking to

- improve the quality of Mathematics education at all levels (schools, colleges and universities)
- support the development of Mathematics and Mathematics education research
- promote the use of mathematical tools in commercial, industrial and research applications.

The ACM drafted several reports in 2013 on the state of Mathematics Education at the FET level which were accepted by the SAMF executive for distribution in the public domain.

Prof Olivier also presented several papers at local conferences in 2013 on the engagement work of the GMMDU at NMMU. A paper entitled: "*On the development of an uber-modern techno-blended teaching and learning model for mathematics in SA* " was also delivered at the *ATCM* international conference in Mumbay, India in December of 2013. Prof Olivier was also invited to take part in an international panel discussion during the same conference on the integration of modern technologies in the teaching of Mathematics in developing countries.

6. Summary

The goal of the GMMDU to be a leading provincial role player in Maths & Science skills development of in-service educators and incubation of FET learners with potential became a reality in 2013.

This is mainly due to the maturation of the modern techno-blended T&L model and accompanying digital support material that was developed through a sustained process of R&D over the past few years. The successes of the current Tablet based ISP programme and the escalating demand (more than 250 educators are registered for MATHSUP in 2014) for quality professional Maths and Science skills development programmes underscores the important role that the GMMDU is playing in the light of the deepening crisis in Maths and Science Education in the province and elsewhere.

The innovative approaches to educator/learner scaffolding support via modern techno-based platforms that are employed by the GMMDU during engagement projects hold great promise to make a contribution of significance to Mathematics and Science education in under-resourced schools in the Eastern Cape Province and beyond.

In this regard, the enabling engagement policy of the NMMU which allows its entities to engage with and assist stakeholder communities in need should be acknowledged.

Annexure: Selection of newspaper clippings related to GMMDU Projects 2013

GRAAFF-REINET ADVERTISER & KAROOHUIS
10 Feb 2012, p.15

Great opportunity for Mathematics and Science learners

The top learners will also take part in a Mathematics Olympiad later on in the year

GRAAFF-REINET — Last Saturday saw the launch of the 2012 Incubator School Project at the Spandau Secondary School.

This project, funded by the Chevron Corporation that is ranked as one of the world's leaders in integrated energy, at a cost of R530 000, was presented by the Govan Mbeki Mathematics Development Unit (GMMDU), an arm of the Nelson Mandela Metropolitan University (NMMU).

At the helm was professor Werner Olivier, First Rand National Chair of the GMMDU, assisted by retired Doctor Hennie Boshoff and Peter Weiswange.

The project's focus is on Mathematics and Science, and the aim is to empower young minds and to build academic confidence, plus to increase the numbers of Grade 11 and 12 learners succeeding in these subjects. Similar incubator schools now exist in PE, Somerset East, Cradock and now Graaff-Reinet.

A total of 90 learners will receive DVDs, top-of-the-range Casio calculators, resource material, certificates, meals, transport, bursaries and prizes. Tuition will take place at Spandau Secondary School for 14 weeks from 8am to 1pm. Learners will be tested every week and have to sign a 'Memorandum of Understanding' as part of their commitment to give of their best.

"Share the material with other learners as this is an opportunity of a lifetime" said Olivier.

The top learners will also take part in a Mathematics Olympiad later on in the year.

Olivier also expressed his wish that many of the learners taking part in this project would actually qualify for a bursary at NMMU.

In response to a question from the floor, Olivier stated that tuition for Grade 10s is also in the pipeline.

Peter Weiswange, who is responsible for the Science tuition stated that success is the sum of small efforts, repeated day in and day out.

■ The Graaff-Reinet staff appointed to see to the efficient running of the programme consists of AV Christoffels (co-ordinator), R Diza (Mathematics), B Koeberg (Mathematics) and E Lewis (Science).

Pierre de Villiers from the Department of Education thanked the presenters of the project and the service providers for their effort in making the launch a success.

Peter Weiswange, prof Werner Olivier and dr Hennie Boshoff, instigators of the incubator School Project seen here with Pierre de Villiers from the Department of Education and Michael Lepotha, principal of Spandau Secondary School.

FREE STATE NEWS - 5 30 Nov - 06 Dec 2012

MATHS TEACHERS GARNER LAPTOPS

By Nthabiseng Lisele

It was a lucky day for mathematics teachers from Motheo, Thabo Mofutsanyana, Xhariep, Fezile Dabi and Lejweleputswa districts as the department of Education recognised their hard work by bestowing them with gifts.

About 120 teachers graduated in Mathematics Skills Upgrade (MATHSUP) programme which the department spent about R 700 000 on, with the Mec for Education, Tate Makgoe personally congratulating them.

A total number of 13 teachers scored HP laptops as they were chosen to be the best maths teachers at their schools and in the district and the rest of the teachers got away bags filled with goodies. The purpose of the programme was to convert maths literacy teachers into pure maths teachers, also to increase the number of learners doing pure maths from 10% to 60% in the province as well as raising the number of grade 12 learners to qualify studying in the fields of science and accountancy at tertiary level.

This skills training programme focuses on improving mathematical content, knowledge and relevant skills of teachers and integrate the use of relevant modern technology to teach maths.

The MATHSUP programme is part of 'Maths for all Campaign' that is also used to popularize pure mathematics and demystify the myth the subject is difficult.

Mec Makgoe said: "Through this campaign, learners will have a better understanding and appreciation of the subject especially that in the province we have crisis of shortage of learners doing mathematics".

According to Mec Makgoe, out of 8 faculties at the University of the Free State only 2 faculties acquire maths subject therefore maths students are scarce.

"Black and coloured students have a large number of students doing maths literacy instead of pure maths according to the stats and in the Free State we are the 3rd in the country regarding grade 12 performance", said Mec Makgoe.

WEEKEND POST (Sunrise)
08 Feb 2014, p.5

Maths package boosts results

Alexandria farmer brothers' initiative, plus high-tech aid, puts girl into varsity

Nicky Willemse

DID YOU KNOW?

MATHWARS DEVELOPERS

Heroes of the day

PORT ELIZABETH EXPRESS (Metro)
08 Jan 2014, p.2

NMMU, tech company take maths and science to scholars

REPORTER

SOUTH African tech company, Future Mobile Technology (FMT), has teamed up with the Nelson Mandela Metropolitan University's Govan Mbeki Maths Unit to develop and market the technology needed in the drive towards better results in maths and science.

The result of this partnership is the netsurfer® SCHOLAR, a tablet developed by FMT that comes embedded with 183 hours of preloaded CAPS aligned maths and science educational content developed by the NMMU's Govan Mbeki Maths Development Unit.

FMT joint CEO, Tracy Andersson, said embedding the content on one of their netsurfer® tablets means students in remote areas or lower LSM households without broadband at home don't need to go online in order to access the learning materials.

Graham Davies, joint CEO of FMT, said the company believes in harnessing for the collective good the talents of public and private sectors.

"The university had spent five years developing this fantastic content and because they rely on grant funds and aid from blue chips or NGO's to make it available to learners and teachers, it was limited in scale and was only benefiting a select few.

"Our public private partnership with the NMMU is a first of its kind in South Africa. We approached the NMMU with our commercial model that ensures its continued success and that it is both scalable and sustainable. Profits are re-invested to ensure that content is kept up to date, functionality is continuously improved and it is available on a national scale," said Davies.

Professor Werner Olivier, head of the Govan Mbeki Mathematics Development Unit at the NMMU, said partnerships between private and public sectors "can play a pivotal role to ensure that potential educational benefits of cutting edge technologies are made accessible to aspiring school learner communities."

Professor Olivier believes that, as in the rest of the world, "tablet and mobile technologies combined with quality teaching and learning material could play a critical role to bring content rich virtual classrooms closer to the brick and mortar classrooms.

"Innovative learning platforms that could render independent maths and science learner scaffolding support in South Africa are vital. Especially if viewed against the background of the teacher crisis and lack of access to quality maths and science resource materials in many schools," he said.

FMT's corporate social responsibility bent is to close the digital divide that exists between South Africa's few 'haves' and many 'have not's'.

"It's hugely important to redress the inherent imbalances in our education system," said Andersson. "That's why we've invested in creating technology for the mass market, and have actively sought ways of using that technology to boost education."

Davies concurs. "Technology should help level the playing field, not increase the gap between learners in urban areas and those in rural schools. The pilot study carried out by the NMMU has proved this product works."

The netsurfer® SCHOLAR maths and science content is CAPS-aligned and is based on the National Curriculum Statement (NCS) for grades 10, 11 and 12. It features term-by-term video lessons, experiments, workbooks, solutions and past exam papers taught by highly qualified mathematics and science professors and teachers. Students can pause, rewind and watch video lesson as many times as they wish.

The netsurfer® SCHOLAR has been launched nationwide with The Foschini Group and comes pre-loaded on FMT's netsurfer® Pro 7 Inch Tablet; a high spec, embedded 3G tablet with 16GB built in storage space, for R2990 all-in.

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Project upgrades maths teachers' skills

CAPS-aligned maths, science video incubation programme awarded top prize by Impumelelo Social Innovations Centre

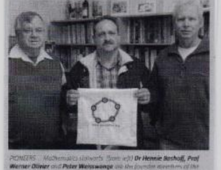
Johannesburg, 5 Mar 2014

Prof Jonathan Jansen, Rector and VC of the University of the Free State; Margot Collett, GMMDU; Lynn Husselmann, Liberty Foundation; Maxwell Pirikisi, Liberty Foundation; Prof Werner Olivier, Head, GMMDU; Derek Hanekom, Minister of Science and Technology

The Nelson Mandela Metropolitan University's TouchTutor education content, which is now pre-loaded on Future Mobile Technology's netsurfer SCHOLAR Android tablet under an exclusive licensing agreement, has been awarded one of the coveted Gold Awards for the Maths and Science Incubator School Programme from the Impumelelo Social Innovations Centre. The award was presented by Derek Hanekom

Technology provides excitement to mathematics at all levels

Maths magic



MATHS AT NMMU HAS HIGH-TECH APPEAL

Nicky Willemse
WEEKEND POST CORRESPONDENT

30 November - 7 December 2012

DoE awards maths teachers

TABLET MAAK JOU SLIMMER

New blow for E Cape pupils

Tablette help met onderrig en leer