

Education post-COVID-19: customised blended learning is urgently needed

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Many well meaning [education benefactors and commentators](#) in South Africa have expressed that in the light of the [COVID-19 pandemic](#) online self-guided learning could solve some of the current teaching problems and address the educational backlog. What learners need, the reasoning goes, is to get [free internet access](#) to educational support materials on offer online.

Nothing could be further from the truth.

In fact, self-guided online learning is doomed to fail. [Research](#) shows an exceptionally high drop-out rate – even in developed countries. Learners simply have no incentive to keep at their studies without peer pressure, a teacher at hand or a structured learning environment.

In South Africa in particular, with socio-economic disparities and [related problems](#), the drop-out rate would be even higher. More so in key subjects like [mathematics and physical science](#) where prior knowledge, conceptual understanding and self-motivation to succeed are critical.

The only answer, in the country's unequal teaching environment, is a customised version of blended learning. Blended learning integrates computer-assisted online activities with traditional face-to-face teaching (chalk-and-talk).

When used by a trained teacher, this approach can add valuable new dimensions to the learning process. It can allow learners to work at their own pace and teachers to fill content gaps.

Blended learning in South Africa

In many developed countries, blended learning is a well-established practice. It has enabled these countries to adapt to the demands of the current pandemic. Digital remote learning and teaching is backed up by dependable infrastructure and skilled, motivated teachers.

By contrast, the differences between South African schools have been thrown into sharp relief. The binary system of a privileged minority of schools and the rest remains, despite the political changes more than 25 years ago.

More than [80% of public schools](#) are under-resourced. They are ill-equipped to respond to the teaching and learning challenges of the 21st century – let alone the latest [demands](#) of the pandemic.

The current lockdown has suddenly compelled teachers to adopt predominantly online, blended learning teaching practices. But [nearly 90%](#) of all households in South Africa are still without access to the internet at home. [Very few schools](#) had adapted to blended learning before lockdown and few schools would be able to adopt it during the lockdown. Therefore the schools that had fewer resources and skills will fall even further behind.

This is especially disappointing since the current cohort of pupils (born after 2000) have long [expressed](#) their preference for a blended learning model. Even the recent recognition by the South African government that science, technology, engineering and mathematics are important in the Fourth Industrial Revolution has had little effect on the skills development of teachers, infrastructure or modernisation of resources in schools.

Therefore, in the South African context, mainstream blended learning is not the complete answer. We need to go beyond blended learning.

Customised blended learning model

Since 2002, the [Govan Mbeki Mathematics Development Centre](#) in Nelson Mandela University in Port Elizabeth has wrestled with these challenges.

The bad news is that there's no way to make the teaching and learning of maths and science easy. But we've developed a number of interventions that have lifted the twin burdens of poor training and lack of infrastructure from the shoulders of teachers. Skills development linked to the use of user-friendly and interactive digital resources has allowed teachers to focus on attaining a high quality of teaching with subsequent learning successes.

Over the past decade, the centre has experimented with various combinations of online and offline self-directed teaching methods. It has worked specifically on blended learning for mathematics and physical sciences in secondary schools.

The [greatest success](#) has been a blended learning system that uses a combination of online and offline interactive resources with pre-installed apps that are aligned with the South African school curriculum. These can be used as a guide for teaching, home-schooling, after-school study and tutoring. We call it techno-blended learning: a structured approach, using mostly offline apps in an integrated way, with the full participation of a trained or experienced adult mentor or guide.

One of the centre's more recent interventions is a mini personal computer called the [GammaTutor™](#). This's an offline device pre-loaded with interactive learning material. These resources have been specifically designed for South African school conditions.



The GammaTutor: a tutor in your pocket.

The GammaTutor™ software package is primarily intended for teachers: when plugged into any data projector, a TV or digital screen, it doubles as a flexible maths and science teaching assistant in the classroom and a learner support resource for after school hours. It fits in the palm of a hand, requires no data and is navigated by the click of a mouse. Its small size makes the device easy to keep safe and to take where it's needed.

What needs to be done

It's well known that major educational challenges exist in schools as a result of the country's [multi-language society](#) – particularly in the teaching and learning of mathematics. The GammaTutor™ application offers mathematics concept explanations in eight indigenous languages.

The device covers the full curriculum for high school maths and physical sciences, presented in video, PDF or animated PowerPoint format – along with glossaries, exam revision support, translations from English into indigenous languages and many additional teaching support materials. It can be used for interactive teaching online and remotely.

The response from teachers, learners and stakeholders to this approach of teaching and learning has been overwhelmingly positive. Where these interventions have been applied, in pilot schools in the Eastern Cape province, the results have been [gratifying](#). Marks have improved significantly and successful learners have been able to [progress to university](#).

The new urgency for remote teaching caused by the COVID-19 pandemic has created an opportunity for the country to adopt policies to accelerate blending learning practices among teachers and learners. The Govan Mbeki Mathematics Development Centre offers lessons learned through more than a decade of research.

Using tech to make maths and science fun - and easy

Fifteen years ago, when Zakheni Ngubo was attending school, there was not a single maths teacher in the entire institution. Today, not much has changed. "We still have classrooms that are overcrowded, our students don't have access to textbooks and we have a shortage of maths and science teachers."

South Africa's National Development Plan, as well as the World Economic Forum's report on future jobs, have pointed out a need to improve the country's performance in these two subject areas.

Having been part of the system helped Ngubo understand what solutions were needed. He founded Syafunda Digital Libraries to help learners like him, bringing the classroom experience to mobile devices with content in a mix of Isizulu and English. "Examples are in Isizulu, and from the learners' lived experiences, which means examples are practical and relatable," Ngubo says.

His is one of two digital learning projects supported by Old Mutual. Old Mutual has been backing maths and science learning since 2013. The Govan Mbeki Mathematics Development Centre is the other. Both projects are suitable for rural schools, because a constant internet connection is not required. Old Mutual has supported the projects with almost R25-million so far, which has gone a long way to providing learners involved with loan devices on which to access their learning.

Syafunda Digital Libraries

Any learner with internet can access this online platform, but the digital libraries are specifically aimed at supporting rural and township schools, Ngubo says. Almost 50 000 grade eight to 12 learners in KwaZulu-Natal are part of this project, which Syafunda aims to roll out over the next three years to over a million learners in the whole of this province, and to the Eastern Cape and Gauteng.

Top teachers are sourced to create content. "We work with the Department of Education's subject advisors and curriculum specialists to identify the best teachers currently practising, and we go through a vetting, audition and training process," Ngubo says.

The learning platform is meant to supplement normal teaching, and to assist teachers to better navigate and improve their curriculum coverage. "Teachers can introduce a topic in class and learners can download videos and tutorials related to that topic to take home and learn at their own time and pace," he says. "The assessments and analytics help teachers gain an in-depth understanding of their students' capabilities."

How does it navigate the challenge of expensive data? Ngubo says the Syafunda Digital Library is set up to cover the whole school with a free WiFi network, giving learners access to video tutorials, books, past papers and workbooks. The network covers a bigger area than the school, allowing anyone within its radius to access the material for free.

Ngubo says when the Covid-19 lockdown struck, they had to get creative. "Part of this included heavily compressing the video materials and providing audio in MP3 formats to account for limited mobile storage capacity on user devices. Our platform is zero-rated," he says.

One important outcome of the pandemic is the focus it has placed on the role of technology in education, Ngubo says. "If as a country we are planning and talking about the fourth industrial revolution, we have to get everyone on board, including the communities and learners. We need sustainable solutions that also address the needs of the poor." These include having the tools required to access learning resources, such as smartphones, laptops and tablets, and making data and internet access more affordable for poor people so that they do not have to choose between buying bread and data.



Accessible devices and data are key for rural and township schoolchildren

The Syafunda team is young, but Ngubo says it's sheer coincidence. "It also speaks to who we are and our unwavering faith in the youth, and the idea that people closest to the problem should be given every opportunity to solve it," he says. "We were all brought together by our love for education and the difference it can make in changing lives. Each one of us brings their unique self and a set of unique skills."

Govan Mbeki Mathematics Development Centre

The Govan Mbeki Mathematics Development Centre (GMMDC) is situated at the Nelson Mandela University in the Eastern Cape and was established in 2002 when struggle stalwart Govan Mbeki realised that South Africa's future depends on innovation and fostering scarce skills. Although the programmes of the centre are accessible from anywhere, the focus has been mostly in the Eastern Cape. Part of the philosophy is that, when a subject is taught well with the use of appropriate assistive technologies, it is easy to learn.

The centre places interactive apps with digital content on handheld devices such as tablets for learners, and in resource centres in schools, while teachers get an innovative new plug-and-play GammaTutor device with pre-installed maths and science content. This presentation device can be plugged into any projector, digital screen or television and it fits into a pocket, which means teachers can easily take it to any point where they need it.

"The centre has different maths and science support programmes for different purposes and target groups," says

Professor Werner Olivier, GMMDC director.

During the Covid-19 lockdown the GMMDC continued to provide technology-assisted support to both learners and teachers. "Models had to be adjusted to accommodate the need for social distancing, so online platforms including WhatsApp and Zoom were used seamlessly to extend and supplement the offline techno-blended models that were used with great success before the lockdown period," Olivier says.

"Current project learners had their own personal project tablet with the TouchTutor Maths and Science app that covers the complete maths and science syllabi for secondary schools. This provided them with 24-7 assistance while at home. Structured WhatsApp and Zoom sessions provided extra support to ensure that their self-directed learning stayed on track."

Any learner is able to access the maths and science support in eight different indigenous languages, provided by the GMMDC via the TouchTutor app for tablets, and a free mobile phone app called MobiTutorZA.

The learner incubation project of the centre has had big successes, with more than 20% of learners showing improvements in maths and science by more than 10% (some up to 30%) in one year.

"Annually, between 600 and 1 000 learners are directly involved with the tablets-assisted incubation and Technology After School Peer Support (TAPS) programmes, and more than 5 000 maths and science learners have had access to special equipment and digital resources at project schools and public spaces," Olivier says. "More than 150 teachers are also directly involved in SACE accredited professional development programmes offered by the centre each year."

It's not all theory that is aligned with the school curriculum. The GMMDC also focuses on promoting Science, Technology, Engineering, Arts and Mathematics (STEAM) education in secondary schools, which connects mathematics to different subject fields in the sciences and focuses on the promotion of creativity when solving real-life problems — in line with the educational challenges of the fourth industrial revolution. The national MathArt school competition for example, which closed at the end of May, helped hundreds of project learners in lockdown stay in touch with creative ways to express themselves through mathematics and art.

Kanyisa Diamond, Senior Project Manager: Education at the Old Mutual Foundation, says the digitisation of learning has changed education significantly. "Literally, a learner can go back to the concepts they have not understood during the class, in their own time," she says.

Old Mutual itself has learnt major lessons in digitisation from the response to the Covid-19 pandemic. For the first time in its 175-year history, the group couldn't have a physical annual general meeting, and it had to be done remotely, using technology. There were also lessons learnt about quick decision-making and social responsibility. "It was necessary to be agile and responsive in the face of the crisis and remove red tape where possible," says Dianne Richards, Old Mutual Foundation's M&E Manager. Partnerships, especially in a crisis such as this one, have proved to be essential for greater impact and leveraging resources. The new normal holds many opportunities for improved ways of working in future, for everybody.



Mandela University model takes second-chance matrics closer to university

13 Oct 2020 09:58 News



Port Elizabeth - **School closures driven by COVID-19 have presented major challenges for learners everywhere – including a group of past matriculants who were hoping to use this year to improve their poor matric marks, to gain access to university.**

Thanks to the introduction of high-tech maths and science support platforms at their school – a joint venture between Nelson Mandela University, North-West University and the North-West Department of Education – more than 200 learners have a real chance at achieving their dreams to become future engineers, doctors and teachers.

“You have a really powerful set of instruments in your hands, so you can be prepared and have great success at the end of the year,” said North-West Province University’s Prof Hercules Nieuwoudt, addressing the group at the launch of the GammaTutor Resource Support Programme at the Mathematics, Science and Commerce Centre (Masccom), an upgrading centre for matrics in Mafikeng.

The technology-blended approach used in the new support programme is the brainchild of Nelson Mandela University’s Govan Mbeki Mathematics Development Centre (GMMDC) and is already being used in schools across the Eastern Cape and KwaZulu-Natal to help learners improve their maths and science marks during the COVID period.

Among the technology in the new programme are 80 GammaTutors, which are offline digitalized teaching and learning devices, which can be linked directly to any digital screen, data-projector or TV. Apart from specialized teacher resources, the GammaTutors are also loaded with GMMDC’s innovative TouchTutor app for learners, which includes video lessons, PowerPoint presentations, self-tests and multi-language support, all linked to the Grade 10 to 12 school curricula for maths and physical sciences. Learners can also use GMMDC’s MobiTutorZA app, which is an online version of the TouchTutor app, for use on mobile phones.

The centre will also make use of WhatsApp groups and interactive Zoom sessions to provide further support to teachers from the Masccom centre.

“The learners will be able to use the mobile plug-and-play support platforms after school, as part of a technology-assisted peer support (TAPS) programme. This essentially provides structured support at the school or anywhere else for self-directed learning,” said GMMDC director Prof Werner Olivier. Teachers at the school have also been trained to use the GammaTutors and MobiTutorZA as teaching aids in their classrooms.

“The Masccom project initially began as an emergency plan when the COVID-19 lockdown started in March,” said Olivier. It started as a separate learner support project, where North-West University used its eFundi teaching and learning support platform together with some of GMMDC’s GammaTutor resources, to enable prospective engineering students to prepare for successful access to university studies in 2021.

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“The new support platforms at the Masccom centre are similarly aimed at improving the maths, physical sciences or life sciences marks of second-chance Grade 12 learners, who completed matric in the past, but whose marks were not good enough to access professional degree programmes at university.

“We are also setting plans in motion to use this technology-based approach to help in-service health workers and other working professionals across the country, to gain access to university courses that need maths and science to upgrade their qualifications.”

“We have been waiting for [support such as] this for a very long time. We are very happy it has come,” said Masccom principal Nthabiseng Kawadza.

The Masccom project is sponsored by the Nedbank Eyethu Community Trust.



Lerato Segonote (left) and Breyton van Wyk, both learners at the Mathematics, Science and Commerce Centre (Masccom) in Mafikeng, learn how to use the Gamma Tutor – developed by Nelson Mandela University’s Govan Mbeki Mathematics Development Centre – to im





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Techno-blended approach to improve teaching and learning in rural schools

By Reuben Maahe - reuben.maahe@ul.ac.za



Prof Werner Olivier from the Govan Mbeki Mathematics Development Centre (NMU). Photo: Reuben Maahe

There is a need to technologically enhance the delivery of Science, Technology, Engineering, Arts and Mathematics (STEAM) learning areas in under-resourced schools to prepare pupils for the 21st-century knowledge demands, says Prof Werner Olivier - Director of the Govan Mbeki Mathematics Development Centre (GMMDC) at the Nelson Mandela University (NMU)

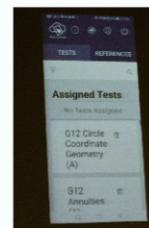
Prof Olivier was speaking during a demonstration seminar aimed at devising models and innovative ways to improve teaching and learning of mathematics and physical sciences in poorly resourced South African schools, colleges and universities. The event was hosted recently by the University of Limpopo (UL). With 30 years of experience as an educator, Prof Olivier says under-resourced schools are facing a bleak future in the STEAM subjects due to low, or a lack thereof, technological investment to provide teaching and learning aids to improve output. "The coronavirus pandemic is a testament that contact learning is not entirely effective, requiring the education sector to start seeking innovative ways to facilitate learning and teaching," he highlighted.

Prof Olivier added that his Centre has created two mobile applications - Gamma & GammaTutor App and the MobiTutor App - which come with a scientific calculator, capacity to store and view video lessons, PowerPoint, language support features, self-assessment and feedback, science experiments, electronic textbooks, career guidance, and maths graphs among other advanced features to assist in Grade 10, 11 and 12 teaching and learning. He said there was also a support programme called Geogebra, which has been developed to provide support through learner and professional learning networks.

Prof Olivier believes that developing the integrated approach is a learning curve on how to adapt to new environments whereby the education sector can actively respond to the global paradigm shift. "The emergence of the Fourth Industrial Revolution (4IR) means that the youth must be empowered with relevant skills that will develop them to become creative, critical thinkers and problem solvers while enhancing teachers' experiences of technology for tackling concepts such as financial mathematics," he envisioned. He is optimistic that the newly developed applications will help

enhance teachers' abilities in most under-resourced schools to tackle concepts such as financial mathematics and the highly touted online learning as the new normal. In September 2020, a Memorandum of Understanding (MoU) between GMMDC and UL was signed to expand the techno-blended models and devices in the Limpopo Province. According to Director for the Rural Development and Innovation Hub (RDIH) at UL, Alida van Dyk, there is a possibility that the model can be implemented during the last semester of the 2020 academic year at UL. "The project will be developed and implemented as a university project across disciplines and it will be coordinated by RDIH at UL," she explained.

Prof Jesika Singh - Deputy Vice-Chancellor for Research, Innovation and Partnerships at UL, highlighted that the initiative would help increase the rate of university admission for learners in rural, impoverished schools as many learners fail to gain university admission into science programmes due to poor performance. "The university's various units such as the Centre for Academic Excellence, RDIH and the Science Education Centre will be mobilised to collaborate with other external stakeholders to assist in developing innovative ways to improve the state of rural schools in the province," she concluded.



A screen grab of a MobiTutor mobile application which mathematics learners can use for self-assessment and other learning activities

NEWS

NMU app makes things easier for maths, science pupils across South Africa

BY HERALD REPORTER - 20 NOVEMBER 2020

Since Covid-19 forced distance learning on schools across the country, a maths and science app developed by NMU's Govan Mbeki Mathematics Development Centre has been providing critical support for pupils in every province.

The free and downloadable phone app – called MobiTutorZA – provides CAPS curriculum-linked content for grade 8-12 pupils in the form of self-tests, practice exam papers, and content explanations in eight languages.

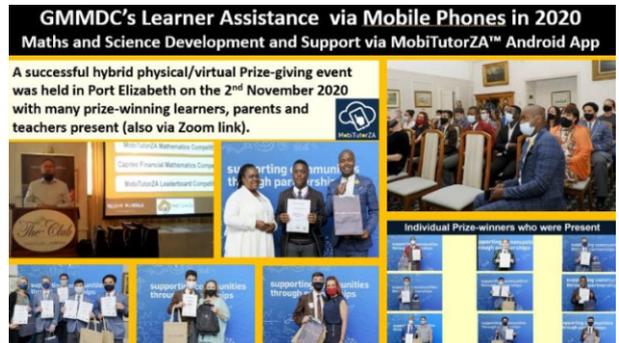
It also offers the MobiMatric revision programme, which prepares grade 12 pupils for a mock exam in preparation for their finals.

The app has also become the hub of three national competitions run annually by GMMDC.

This includes a mathematics competition where pupils compete over two rounds, a year-long “leader board” competition with monthly tasks, and a financial mathematics competition, where children tackle maths problems that have a financial component.

The winners of all three competitions, sponsored in 2020 by the Capitec Foundation, received prizes worth R30,000 at a recent function, which “We are trying to use technology and specifically, our MobiTutorZA app, to advance the problem solving-skills of learners, and to support their learning, particularly over distance as this is becoming more and more important,” GMMDC director Prof Werner Olivier said when addressing teachers, parents and pupils at the prizegiving.

The app is being used by more than 3,000 pupils with more than 400 entering the competitions.



Placed first and second in the grade 11 category of the MobiTutorZA leaderboard competition, run by NMU, were Evagelos Batsis, right, from Alexander Road High School and Mava Feni from Ethembeni Enrichment Centre.
Image: SUPPLIED

“ The app also allows teachers to set up their own unique tests for learners to complete over distance

“The app also allows teachers to set up their own unique tests for learners to complete over distance,” Olivier said.

GMMDC's Dr Phil Collett, who co-ordinated the competitions, said the app provided pupils with the opportunity to practise maths and science.

“Practice is an important component of

building competence.

“The app gives learners the opportunity to practice a range of skills, from the most basic to the most challenging problem-solving-type skills, allowing them to really get to know mathematics or science in a range of different ways, which is necessary for success.”

NEWS

Karoo student receives first Flip Potgieter Scholarship at NMU

BY HERALD REPORTER - 03 FEBRUARY 2020



IN HONOUR: Somerset East's Lonwabo Jacobs, 17, is congratulated by his mother Portia and stepfather Mziwoxolo Mbutho for becoming the first recipient of the Flip Potgieter Scholarship
Image: SUPPLIED

As Nelson Mandela University opened for the new academic year on Monday, first-year student Lonwabo Jacobs, 17, took his first steps towards a dream career in the sciences.

The Somerset East matriculant is the first recipient of the Flip Potgieter Scholarship, a legacy bursary honouring Potgieter, who was passionate about promoting the study of maths and science throughout his life. He died in 2018.

The scholarship will provide R100,000 a year for the three years of Lonwabo's Bachelor of Science degree at NMU.

"I feel very excited to be awarded the bursary," Lonwabo, who was raised by his mother Portia, a police officer, said.

"I would like to become a well-known forensic analyst."

Potgieter, who fought apartheid and was well-known in the Bay's political and cricket administration circles, lectured in maths at NMU from 1978 to 2006.

He was also responsible for co-founding the university's Govan Mbeki Mathematics Development Centre (GMMDC) in 2002, which aims to boost the maths and science marks of promising pupils from underprivileged schools to help them gain access to tertiary studies.

The centre also promotes Steam (science, technology, engineering, arts and mathematics) education in SA schools, as well as creativity in problem-solving to empower pupils with the skills they need to find work in the Fourth Industrial Revolution.

After retiring, Potgieter continued to be involved with mathematics education, helping in-service teachers to upgrade their qualifications.

After his death, Stellenbosch businessman and former Cadbury's director Piet Beyers, who became a close friend of Potgieter's while living in Port Elizabeth from 1987 to 1994, decided to set up the legacy bursary in his honour.

Potgieter loved the Karoo – frequently visiting a family farm near Jansenville – and was passionate about creating equal opportunities for all South Africans.

As such, the scholarship aims to create opportunities for Karoo-based candidates from financially-challenged backgrounds to study towards any degree in the science, technology, engineering and mathematics fields at NMU.

The scholarship will be awarded to a new recipient every three years, and preference will be given to those who plan to enter the teaching profession.

Beyers said: "Pottie and I often spoke about the challenges facing SA, and what the country's priorities should be.

"He always said: 'What is key is education, education, education'.

"He was passionate about maths and science.

"My hope is that the scholarship will help to preserve the legacy of a special man who had a big impact on a lot of people.

"It's a way to say: 'Thank you, Pottie'."

Lonwabo said he chose to pursue forensic science studies because he had a "keen eye for detail and an unquenchable thirst for research and investigation".

He was also keen to help others through a field that "increases public safety by contributing to the capture of criminals".

"It also helps the victims and their families to achieve justice and closure," Lonwabo said.

Lonwabo moved to Johnson Ngonqoza Senior Secondary School in grade 10 because his previous high school did not offer science as a matric subject.

While at Johnson Ngonqoza, he was part of a group of pupils who initiated maths study sessions.

He also attended the maths centre's incubator school programme (ISP), which played a key role in helping him to achieve his bachelor's pass.

"Every year, my marks improved," he said.

Potgieter's widow, Sally, who was on the scholarship selection panel, said: "I'm so excited about a gifted learner like Lonwabo having the opportunity to study further."

"Our country needs more scientists and engineers, these are fields that need to be developed."

Govan Mbeki Mathematics Development Centre director and co-founder Prof Werner Olivier said the centre would provide a mentor for Lonwabo for the duration of his studies.