

| MAMOKGETHI PHAKENG |



TOP THREE AWARDS

- Order of the Baobab in Silver: Republic of South Africa, 2016.
- Most Influential Woman in Education and Training (Academic): *CEO Magazine*, 2014
- Most outstanding Senior Black Female Researcher over the last five to ten years: National Science and Technology Forum, 2011

DEFINING MOMENT

Getting her doctorate. Phakeng was amazed by how much more people paid attention to what she had to say. She doesn't believe that a doctorate necessarily makes someone a success, but she does acknowledge that without a doctorate many of the things she has accomplished would have been more difficult.

WHAT PEOPLE DO NOT KNOW

Phakeng is addicted to plain fat-free yogurt. It is her comfort food and she eats about 2kg a week.

MATHS MADE EASY

Mathematics does not always come easy to people. Many a learner has struggled with mathematics in school. Many more have had to learn mathematics in a language that is not their own. For these students, instruction can be obscured by their own fluency in the language of learning and teaching, or by the fluency of their teachers. However, Prof Mamokgethi Phakeng's research has led to a reimagining of how to value multilingualism in a mathematics classroom and how it can be used to facilitate learning and teaching.

Phakeng was born in 1966 in Eastwood (Pretoria) and started school under a tree in 1972 in Marapyane, a rural village in the Mpumalanga province of South Africa. She remembers loving school. "There was never a time when I hated school or dreaded it." Her love for mathematics began in grade 10 during a week-long winter school. "I'm not sure if I was just ready, or if the teacher was that good, but I got hooked." Back at school, her mathematics grades jumped from 60s to 70s and 80s. She obtained a university entrance pass and registered at the University of Bophuthatswana (now part of the North-West University).

When she started at university, she had no idea that mathematics was considered to be a difficult discipline. "At home there was never any conversation about maths being special. My parents never talked about specific subjects, they only talked about being excellent at what you do." For Phakeng, mathematics was just another subject in which she was expected to do well. But from the auditorium full of students in the first year, only a handful of mathematics majors remained by the third year. In the fourth year, she was the only girl in a class of nine.

At the University of Bophuthatswana, BSc and BA degrees included education as a major. Education was taught in tandem with the science and arts degree from the first year through to the fourth year. As part of the education component of the degree, students spent two or three weeks teaching in schools for work experience. Phakeng loved it. "I'm an extrovert, I love talking to people and teaching people." Although she could

have taught other subjects, schools only ever asked her to teach maths. She enjoyed teaching so much that when she finished her BA (Ed) in 1988, she asked for a job as a mathematics lecturer at Hebron College of Education. They were running short of maths lecturers so they took her on. She spent a year there teaching students who were pre-service mathematics teachers.

That year, Phakeng got even more involved in mathematics education. "I was teaching them pure mathematics and mathematics education as well." She was intrigued by the challenges of teaching students mathematics in multilingual and multicultural classrooms. It was the first time she had engaged with what it means to teach mathematics to teachers. "When I did my degree, we did education and mathematics separately. We never did mathematics education." She started reading and thinking a lot about mathematics education, cementing her dedication to the field.

MATHEMATICS AND LANGUAGE

The connection between mathematics and language caught her attention while she was teaching at the college. "The students I was teaching had gone to township schools like I had and they were struggling with English like I had." Language was a challenge for both the teachers and the learners. Phakeng found herself reflecting on how she had coped as a learner in this situation. "Some of the time, I survived by memorising. When I couldn't get the language, memorising was the only thing I could do."

After her BEd in mathematics education in 1993 from Wits (her research project focused on group work in a mathematics classroom of second-language learners), she devoted her research to understanding the language challenges in mathematics classrooms. This was the focus of her research for both her MEd in mathematics education (1996, Wits) and her PhD in mathematics education (2002, Wits).

One aspect of language she studied was code-switching. In multilingual settings, speakers often use more than one language at the same time, alternating among languages within a dialogue, even within a sentence.



Historically, code-switching has been frowned upon in the classroom. “If you take any black person around my age, they will remember that teachers would often forbid home-language use in the class.” Not only was code-switching looked down upon in students, it was assumed that teachers who used code-switching had a poor grasp of English.

However, code-switching has benefits in the classroom. Code-switching can be used to provide added clarity for students who struggle with the language of instruction. Teachers of mathematics face an additional challenge. Mathematics is, in essence, a new language. It has terminology, concepts, symbols and representations that are unique or are borrowed from another language without retaining the same meaning. Teachers and learners in multilingual settings must incorporate this new language into their dialogue. They also have to navigate the challenge of writing mathematics, both in terms of the content and the calculations.

Phakeng studied code-switching and language use by recording and transcribing mathematics lessons taught in multilingual South African classrooms. She has interacted with dozens of teachers for her research and has observed thousands of learners during mathematics lessons. This has generated hundreds of hours of lessons and interviews with teachers and learners which have been transcribed and analysed.

Her analyses have revealed that code-switching does in fact ease the transition into a formal mathematics discourse. In using all languages at the learner's disposal, mathematical meaning is created by the learners themselves. This fosters a deeper understanding compared with teaching styles that deliver the ‘rule’ in English without using a familiar language or example to give the new information context. By allowing them to embrace and use their own languages, learners are also allowed to slowly develop a command of English in a way that is comfortable and unthreatening.

Phakeng has noticed a shift in the direction of her research over time. When she began, she thought of language as a benign tool for thinking and communication. However, language choices in a classroom are far more politically charged than she initially believed. Often, the language choices teachers were making had nothing to do with mathematics. "They chose particular tasks because they thought that learners' language proficiency was so limited that if you gave them more complicated tasks, they wouldn't be able to do it."

Other times choices were made to help learners get access to the English language regardless of the mathematical content. There are still teachers who demand that only English should be used in their classrooms in spite of both research and policy that encourages multilingualism. Phakeng found that English was often preferred by teachers, parents and learners because English allowed learners access to social goods even though it impeded the learning process. This revelation of the political aspect of language has led to a subtle shift in the way Phakeng analyses her data. "When I started, my analysis was very much descriptive, describing what is and what teachers are doing. I moved on to why it is that way. When I understood what is and why it is, I moved on to how we resolve this."

Phakeng's research has contributed to creating a new normal. The use of learners' home languages is now encouraged in multilingual mathematics classrooms in order to foster understanding. This is what makes Phakeng's research so important. By studying and showing how multilingualism can be productive, she has been able to develop a mathematics pedagogy and communicate these improved teaching methods to teachers and learners.

Phakeng has been recognised as a B2-rated scientist and has generated over 60 scholarly publications and presentations which have resulted in over 1 000 citations. She has successfully supervised four doctoral and 12 Masters students, many of whom now hold scholarly positions in South Africa or abroad. The tremendous value of her research has been recognised by the institutions in which she has worked. She entered Wits as a lecturer in mathematics education in 1999 and rose quickly to Associate Professor by 2004. She left Wits at the end of 2007 to become a full Professor in math-

ematics education at the University of South Africa (Unisa). Her roles at Unisa shifted from Executive Dean in the College of Science, Engineering and Technology (January 2008 to June 2011) to Vice-Principal in Research and Innovation (July 2011 to June 2016).

COMMUNITY INVOLVEMENT

While Phakeng sees opportunities to engage with the international community as an enjoyable luxury of academia, she remains deeply involved in her local community. She has run empowerment programmes for women in the rural villages of Matamanyane and Lenyenye in the Limpopo province and continues to conduct in-service training for mathematics teachers in townships and rural areas. She is the founder of Adopt-a-Learner Foundation which provides financial and academic support to black learners from townships and rural areas to access and succeed in higher education.

An integral part of her service to the community is her outstanding social media presence. Phakeng sees social media as a way to inspire young minds and challenge them to pursue bigger, better dreams. "Images of success can be misleading for young people. We need to say: this is what real life is. Not to make it sound impossible, but to make it real." She uses social media to share what success really entails, such as how early she wakes up and how much time she spends at the office. She also shares what bothers her, what she's thinking about and what advice she has for success. Advice she often gives is: "Be who you are, don't take nonsense, work hard, don't apologise for being fabulous, and stay the course".

In July 2016, she took up the position of Deputy Vice-Chancellor for Research and Internationalisation at UCT. In her new position, Phakeng will work to ensure UCT's international standing while at the same time encourage it to be a truly African university. "Having someone like me there is not only going to change me, it is also going to change the institution. The context will be shaped by my presence as much as the context will shape me." She expects a lot of learning and growth on both sides. She doesn't think it will be easy, but she is looking forward to this new chapter.

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ASSAf Research Repository

<http://research.assaf.org.za/>

A. Academy of Science of South Africa (ASSAf) Publications

C. ASSAf Policymakers' Booklets

2017

Legends of South African Science

Academy of Science of South Africa (ASSAf)

Academy of Science of South Africa

Academy of Science of South Africa (ASSAf), (2017). Legends of South African Science.

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