

A man with dark skin and short, curly hair, wearing a dark suit jacket over a white shirt, is shown in profile, looking upwards and to the left with a slight smile. He is positioned in front of a dark chalkboard that is densely covered with white chalk drawings and mathematical formulas. The formulas include trigonometric identities like $\sin^2 \theta + \cos^2 \theta = 1$, $\cos 58^\circ = \cos 31^\circ$, and $\cos 1 = \frac{1}{2}$; algebraic expressions like $y = \sin$, $S = a^2 = \frac{d^2}{2}$, $(a+b)(a-b) = a^2 - b^2$, $Q = qm$, $F = mg$, and $\frac{6 \pm \sqrt{D}}{2a}$; and geometric diagrams including a sine wave, a right triangle, a 3D cube, a tetrahedron, and various circles and lines. The lighting is focused on the man's face, while the chalkboard is dimly lit, making the white chalk stand out.

One of the major factors impacting the findings is the unequal status of learners and their different backgrounds. Learners from households that lack basic amenities like running water, flushing toilets, electricity and access to the Internet, have the lowest educational outcomes. Conditions at home that are conducive to learning are crucial for improved learning and outcomes in maths and science.

Cultivating a curiosity through maths and science

Young people have a natural curiosity about the world around them. Learnings from maths and science 'plant the seed' in gaining an understanding of the order of things and how they work. These skills are honed on the education journey and applied in scenarios that go beyond the classroom, such as in the kitchen, garage, in nature and the rest of tangible reality.

"Maths and science give learners more choice when it comes to applying to study at university," says Muronga. "Without them, they would not be eligible for programmes and apprenticeships in the fields of science, engineering and even commerce, as many higher education institutions place a strong emphasis on maths and science."

Maths is also beneficial in other areas including problem-solving, quantifying and interpreting data, the comprehension of text, debating, project management, and personal finance. Science and technology can cultivate creativity, observation, analytical research, and can also have an impact on society such as sustainability and environmental conservation.

Improving the shortcomings in basic education in South Africa

"The ability of learners to creatively solve real-life problems is vital to address job creation and sustainable economic growth, particularly against the backdrop of 4IR. This underscores a dire need for skills development and support of mathematics teachers and structured programmes to incubate learners for access to and success with STEM study programmes at university," says Prof Werner Olivier, Director: Govan Mbeki Mathematics Development Centre.

Nelson Mandela University has made it a priority to improve shortcomings in basic education in South Africa. The Govan Mbeki Mathematics Development Centre (GMMDC) is a self-funded engagement centre within the School of Computing Science, Mathematics and Applied Mathematics, Physics and Statistics at the Nelson Mandela University for improving teaching and learning of mathematics and physical sciences in South African schools and colleges.

"The GMMDC has successfully developed customised techno-blended models and programmes to support the teaching and learning of mathematics and physical sciences in secondary schools," says Olivier. "These programmes assist hundreds of learners annually from rural and urban districts of the Eastern Cape, to obtain quality Bachelor passes in matric."

STEM in ACTION is a community engagement entity within the EBET Faculty. It supports learners, educators, and parents across the educational phases, through a hands-on, brains-on approach within the teaching and learning of physical science. "This constructivist approach, together with a dynamic and enthusiastic STEM in ACTION team, aims to excite learners and motivate them about the science and start considering possible careers paths," says Muronga.

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