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National Science and  
Technology Forum

## Media Release

*S.E.T. for socio-economic growth*

## STEM Education: Disruptions and the future

STEM – Science, Technology, Engineering, Maths – education has become increasingly significant to the world, and invaluable as it offers advantages in a myriad of fields. It is changing as countries embrace new technologies for teaching and learning. There are also new expectations from the Department of Basic Education (DBE) as robotics and coding have been added to the national curriculum. This is because all learners should be exposed to digital technologies. At the same time, there have been many major disruptions to education in South Africa in the past three years: the COVID-19 pandemic with school closures and rotational teaching, the riots in KwaZulu-Natal (KZN) and Gauteng in 2021, and the flooding over a large part of KZN during April 2022, which destroyed houses and schools and killed more than 430 people. [proSET](#) (Professionals in science, engineering and technology), a membership sector of the [National Science and Technology Forum](#) (NSTF) hosted an online [discussion forum](#) on 29 and 30 August 2022 to unpack STEM education, the effects of disruptions, innovative initiatives, challenges and solutions.

The discussion focused on five key areas of concern, including: the effects of recent disruptions on STEM education; remote learning, the urgent need for awareness of STEM subjects; creativity and STEM education (or STEAM); and exposure to 4IR technologies such as robotics and coding.

The event also had three core objectives: raising concerns on behalf of the science, engineering, technology (SET) [professional associations](#) in the NSTF; approaching STEM education from the perspective of various stakeholders and experts; and collating the best ideas for dealing with the huge challenges to STEM education.

### The NSTF provides neutral collaborative platforms where issues and sectors meet

- One of the National Science and Technology Forum's (NSTF) functions is to hold [discussion forums](#), bringing the [private and public sector](#) together in a quadruple helix of stakeholders to address important issues and engage with government policy.
- Information and videos from these [discussion forums](#) are publicised and made accessible.
- Recommendations are made as part of the [SET community's](#) (science, engineering and technology) efforts to give feedback on policy-related matters.
- [proSET \(Professionals in SET\)](#) represents the professional societies and councils in the NSTF and has about 40 member organisations participating as key professions of the SET and innovation community. The proSET Committee plans and hosts an annual discussion forum.

### Keynotes: Inclusivity and innovation in STEM education

**Dr Nnditshedzeni Eric Maluta**, Vuwani Resource Centre and Head: Department (Dept) of Physics, University of Venda; and [2022 NSTF-South32 Communication Award winner](#), was

the keynote speaker on Day 1. He unpacked the importance of awareness of STEM subjects among learners and the role of the Vuwani Resource Centre. He [opened the discussion](#) with a deep dive into the value that the centre offers the community. Maluta explained that the centre is surrounded by four secondary schools and six primary schools that are within walking distance and its focus is to centre education with a more rural lens, particularly in light of the fact that some children reach Grade 12 without having touched science equipment. He says it's a painful reality that needs to be addressed so learners can understand the world around them and use technology to engage with it. For Maluta, the Vuwani Resource Centre plays an invaluable role in providing interactive, hands-on experiences with science that's both relevant and understandable. He concluded with an emphasis on collaboration with industry and organisations to create awareness and connections and drive engagement with learners in rural areas and push the advancement of STEM.

### Doing digital offline and finding creative solutions

**Dr Derek Fish**, Director: Unizulu Science Centre, University of Zululand, (also an NSTF Award winner some years ago) discussed '[Doing digital offline and finding creative solutions to bridging the digital divide in South Africa](#)'. He believes that the children of South Africa need to have access to good science and maths teaching. He says that in some ways, the pandemic was a disruption which allowed us to break the digital divide in more ways than before and making learning more accessible to rural communities. Not all children have the same opportunities, most are "looking through the window" at STEM education. If learning is done with offline digital materials, all learners can have access. It can be the use of innovative technologies that brings education to everyone. He shared many examples of digital learning materials that are included on a USB stick for distribution to schools, which he and Unizulu Science Centre have compiled. These are exciting and interactive materials presented in a way that will assist teachers to incorporate the material in their teaching.

### Disruptions due to COVID-19

**Dr Andrew Paterson**, Innovation and Research Specialist, JET Education Services, spoke on the [COVID-19 impact on education](#). The research was undertaken during the most acute period of COVID-19 and while it has dated in some respects, he used the insights to identify what may still be considered relevant today. The report, published in partnership with the Commonwealth Secretariat in 2021 and commissioned by Rhodes University and the Open Society Foundation, found that it's important to engage with, and support, parents so they can engage positively with the learners, their children. There appears to be a gap between parents and schools with parents needing guidelines to assist them. Parents have an important role to play, even now after the pandemic and lockdown.

**Ms Ellie Olivier** of the South African Mathematics Foundation (SAMF) talked about the '[Challenges in mathematics education from the perspective of a mathematics Olympiad organiser](#)'. She started with an overview of the challenges in mathematics (maths) education – overcrowded classrooms, poorly qualified teachers, few matric distinctions, and schools without maths teachers. As Olivier highlights, it is essential that learners master their content at each level so they can grasp the next level. Many learners are unaware of how interesting maths can be, or how they can expand their knowledge. She has found that through Olympiads, learners discover a love of maths and these competitions can become an invaluable learning resource with research showing that schools regularly competing show improved performance. Awareness of the importance of maths is advanced through competitions, engagement and making it fun for learners so they can expand their understanding and grow their skills.

## Remote schooling and digital learning

**Mr Bez Sangari**, Sangari South Africa, talked about '[Education technology solutions for remote schooling](#)'. For Sangari, there hasn't been as great an innovation in teaching and learning since the printing press as online learning, but that requires a change in the strategies that shape learning. He says that content, learning methodologies and training are key to ensuring the success of online learning and engaging with both learners and educators.

### Other presentations

- [STEM education innovations, including remote learning, robotics and coding, and any other innovations](#), by **Dr Kgadi Mathabathe**, Deputy Director: Education, University of Pretoria.
- [Career guidance and awareness of the importance of STEM](#) by **Ms Kgaugelo Pule**, [STEMulator](#) Research Assistant, NSTF-proSET
- [Enabling innovation through creativity and collaboration](#) by **Ms Kathryn Kure**, CEO: STEAM Foundation NPC.

**Ms Kgaugelo Pule** of the NSTF shared the NSTF/proSET's digital learning tool, [STEMulator.org](#) and demonstrated how it provides STEM career information in context. The application can be used offline and is distributed to high school teachers on USB sticks.

## STEM education and creativity

**Ms Tshidi Morabi**, the owner of Ginini Consulting, an IT business consulting and IT training company, examined '[How to teach learners to be innovative? Does it make sense to include creativity as an aspect of STEM teaching and learning?](#)' She highlighted how she had seen a need for STEM education and established her company to inspire learners and teach them how to become innovative within STEM. Morabi believes that by adding creativity, learners enter the classroom to collaborate and are stimulated by engaging with teachers. It is a way of building confidence and enthusiasm that blends the different disciplines and allows for curiosity, exploration and sound learning.

## Skills: both practical and cognitive

**Prof Ian Moll**, School of Education, University of the Witwatersrand (Wits), spoke on the '[Pedagogy of technical and vocational skills: robotics and beyond in the South African school curriculum](#)'. Prof Moll believes that it is important for learners to acquire skills but he is critical of the way in which robotics and coding have been included in the curriculum without thinking through and explaining the context and pedagogy. Learners should understand why these aspects are taught and they should not be approached merely from the perspective of practical skills. Understanding and critical thinking skills are essential to education. The meaning and societal implications of what is called the 4<sup>th</sup> Industrial Revolution should be approached critically.

## The future unpacked

The speakers, the discussion and the event raised important points around skills development, learning, education equality and STEM, as well as STEAM. The discussions were intense and focused, drilling down into the essentials of the topic and finding inventive ways of approaching these challenges to effect real and lasting change.

## Recommendations

1. Education should be aligned with the skills needs of industry, entrepreneurial skills, 21<sup>st</sup> century skills and societal needs.
2. STEM educators must be capacitated on both pre-service and in-service levels.

3. Good STEM teaching should be modelled for teachers and not only taught.
4. The national curriculum should be revisited on a regular basis and teacher training provided when new aspects are added.
5. All learners need to have the basics of STEM subjects and awareness of the future choices these subjects can open up.
6. A 30% pass mark is not enough.
7. Learners who intend going to university need to be better prepared, while others have an urgent need for practical and vocational skills.
8. Systems thinking skills are very important, and lead to making connections across various subjects and with real-life applications, e.g. climate change and sustainability.
9. Critical skills are essential to learning and prepare learners better for their future. They counter the misinformation spread by social media, politicians and news media.
10. Good practice in education includes: well managed team work, independent learning, hands-on learning, creative and critical thinking, the building of understanding and learners' confidence, exposure to technologies, cross-disciplinary work, and opportunities to participate in competition and Olympiads.
11. Parental support is always important, and is critical during remote learning.
12. Initiatives to improve STEM education and well-made, educationally responsible digital learning materials should be supported.

The speakers or the spokesperson, [Ms Jansie Niehaus](#), Executive Director of the NSTF, can be contacted through [media@nstf.org.za](mailto:media@nstf.org.za). Further information can be found on the [NSTF website](#) and the [NSTF YouTube channel](#).

Read about previous NSTF Discussion Forums on related topics:

- [Creative economy, science and the 4IR](#) – 24 March 2022
- [STEM education and maths reform](#) – 6 August 2018
- [Language and STEM education at school – policy and research](#) – 3 October 2017
- [School education: Holistic solutions to the education crisis, and ICT assisted education solutions](#) – 2 April 2014

## About the NSTF

The National Science and Technology Forum (NSTF), established in 1995, is a broadly-representative stakeholder body for all science, engineering and technology (SET) and innovation organisations in South Africa, which seeks to influence policy formulation and delivery.

The NSTF Awards are unique in SA, recognising the outstanding contributions of individuals, teams and organisations to SET and innovation.

The science bursaries page provides information on bursaries and bursary providers for science, engineering and related studies.

STEMulator.org attracts learners and students to the exciting world of science, technology, engineering and mathematics (STEM). It provides a virtual world full of stimulating content to excite and inform the youth, including STEM career guidance. Established under the auspices of the NSTF proSET membership sector (Professionals in *science, engineering and technology*).

### Disclaimer

The NSTF has taken all practical measures to ensure that the material contained in this newsletter is correct. The NSTF reserves the right to make changes as it deems necessary.

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