SAASTEC

Southern African Association of Science & Technology Centres

Programme & Book of Abstracts

17th Annual Conference

16 - 19 November 2015

North-West University
Mafikeng Science Centre

It all starts here®

NORTH-WEST UNIVERSITY
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Contents

Word of welcome from the SAASTEC Chair	3
Programme	5
Abstracts of talks	11
Abstracts of posters	36
Delegates	43
Tips for chairing a session well	47
Notes	48

Word of Welcome from SAASTEC Chair

Dear Delegate

On behalf of SAASTEC and the organisers of SAASTEC's 17th Annual Conference, I would like to welcome you to Mafikeng. Thank you for being here!

This is the first time that SAASTEC has held its conference in the North West province. Our conference theme focuses on the Department of Science and Technology's recently published Science Engagement Framework. So I hope that we will be able to explore new landscapes and that we can navigate some interesting and exciting new spaces, literally and figuratively.

There is no doubt that science centres, museums and festivals are all important components of any national science engagement process and that they are now widely recognised as effective vehicles for improving interest and understanding not only of science and technology but of how they impact on our lives and on the world we live in. As we, and particularly our children, strive to for a secure and healthy planet and as our education system struggles to achieve quality and meet the expectations of our communities, we must contribute to these important goals.

For these reasons, I am excited that SAASTEC's community has gathered together again to share ideas, concerns and experiences. Let's try to use the next few days to strengthen our understanding and skills and our resolve to strengthen our own institutions, SAASTEC and its collective contribution to national science and technology engagement.

I would like to thank the Department of Science and Technology for their generous and continued support. I would also like to thank the North West University Mafikeng Science Centre for hosting SAASTEC in 2015.

I wish you a stimulating, thought-provoking and enjoyable conference.

David Kramer
SAASTEC CHAIR
CEO : SCI-BONO DISCOVERY CENTRE

SAASTEC
Southern African Association of Science & Technology Centres

17th SAASTEC Conference

Programme

Sunday & Monday 16th November 2015

Time	Activity
.	
09:00-16:00	Sunday – SAASTA Workshop on Nanotechnology – presented by MJ Schwartz Education Officer, UNIZULU SCIENCE CENTRE
09:00-14h00	Monday – SAASTA Workshop on Nanotechnology (cont.)

Monday 16th November 2015

Time	Activity
16:00-17:30	Registration @ Mmabatho Palms Hotel
17:30-20:00	**Icebreaker – "Pimp your Hoop" Workshop** **Followed by finger supper and networking opportunity (Leopard Room)**

Tuesday 17th November 2015

Time	Activity	Delegate	Mins
08:00 08:45	**Registration at Conference Venue** Morning Tea / Coffee		30
08:45 10:00	**Opening Session** (Chair : David Kramer) (Leopard Room)		
08:45-08:50	Welcome by David Kramer (SAASTEC President)		5
08:50-09:00	Welcome by North-West University Mafikeng Prof. Helen DrummondDean of Faculty of Agriculture, Science & Technology.		10
09:00-09:05	Introduction of Keynote Speaker		5
09:05-09:35	"Science & Cocktails: Bringing science, art and entertainment closer together".	Prof Konstantinos Zoubos, Dept of Physics, University of Pretoria	30
09:35-09:45	Welcome by DST	Isaac Ramovha, Department of Science and Technology	10
09:45-10:00	Questions from the audience		15
10:00-10:30	Tea & Poster Session		

10:30-12:00	Session 1 (Chair : Shadrack Mkansi)		
10:30-10:45	Introducing the South African Repository for Astronomy Educational Material (SARAEM), Sefalana sa kitso ya dinaledi	Prof Thebe Medupe, North-West University Mafikeng	15
10:45 11:00	Reade, write, count, code - Africa Code Week 2015	Busi Maqubela Cape Town Science Centre	15
11:00-11:15	The NSTF's Share 'n Dare Programme	Jansie Niehaus and Hendra van Zyl, National Science and Technology Forum (NSTF)	15
11:15-11:30	**Panel Discussion, with questions from the audience**		15
11:30-13:00	Session 2 (Chair : Tebogo Habedi)		
11:30-11:45	Lessons learnt for successful Science Engagement	Rudi Horak, SciEnza	15
11:45-12:00	The impact of training presented to science centres as part of the science centre capacity building program.	Thandi Mtsweni and Shadrack Mkansi, SAASTA	15
12:00-12:15	Developing SET Potential - SA's Got (SET) Talent!	D Kramer, Sci-Bono Discovery Centre	15
12:15-12:30	**Panel discussion, with questions from the audience**		15
12:30 13:30	Lunch		60
13:30-16:00	**Careers in Science** Session 3 (Chair : MJ Schwartz)		
13:30-13:45	It's a career path, not a walk in a park".	SD Dichabe & LY Molebatsi, NWU (Mafikeng) Science Centre	15
13:45-14:00	The impact of competitions on career choice: SAASTA coordinated AstroQuiz and the National Science Olympiad as examples.	B Kgwadi, S Mkansi & A Binneman, SAASTA	15
14:00-14:15	Directing Lives and Shaping Career Choices through Science Engagement Activities.	Akash Dusrath, Sci-Bono Discovery Centre	10
14:15-14:30	Adding an "A" in STEM=STEAM.	Silindile Mthembu, Unizulu Science Centre	15
14:30-14:45	What a journey to a science centre.	Joseph Taetsane, Moipone Academy - Tembisa	15
14:45 14:55	Does the visit to the science centre have any impact on learners performance and career choices?	Thato Majele & Naledi Seheri-Jele	10
14:55 15:00	Leg stretch		05
15:00-15:15	Optimizing teaching and learning techniques for science centre visitors with disabilities through use of technology. A case study of hard of hearing learners (deaf).	N.Z. Manzi & P.M. Kwinana, FOSST	10
15:15-15:30	The power of light to promote STEM careers.	Buzani Khumalo, SAAO	15
15:30-15:45	Robots, rockets and reactions – effective partnerships with industry.	Michael Ellis, SAASTA	15
15:45-16:00	Role of ICT in popularizing career choices in science and technology for agricultural transformation in South Africa.	Lindiwe Ngcobo & Phumezo Kwinana, FOSST	10
16:00-16:30	**Questions to the panel**		30
16:30-16:45	**Tea/Coffee & Poster Session**		15
16:45-17:40	**Continuation of Pimp Your Hoop Workshop : "Rock your Hoop" (the knockouts)**		55
18:00-21:00	**Depart for Evening Function – Braai @ Gaabo-Motho Resort (own transport)**		

Wednesday 18th November 2015

Time	Activity	Delegate	Mins
08:00 08:30	**Registration at Conference Venue** Morning Tea/Coffee		30
08:30- 09:00	Are there any other planets out there	Thebe Medupe, North-West University Mafikeng	30
09:00- 09:15	Report back: REDPOP Conference and 8th SCWS	Derek Fish	15
09:15- 10:15	**Science for the Public** Session 4 (Chair : Mondli Mnguni) (Leopard Room)		
09:15- 09-45	Seeing the light: the SPECUP educational spectrophotometer	Patricia Forbes, University of Pretoria	30
09:45- 10:00	The quality of science communication through the media 2014 to 2015.	Anton Binneman, SAASTA	15
10:00- 10:15	Fact or Faith, Religion or Reality?	Derek Fish, UniZulu Science Centre	15
10:15- 10:30	Communicating science during public celebration days	Daniel Motsapi, ArcelorMittal Science Centre	15
10:30- 10:45	**Questions to the Panel**		15
10:45- 10:55	Housekeeping		
10:55- 11:15	Tea & Poster Session		20
	Science for the Public (continued) Session 5 (Chair : Anton Binneman) (Leopard Room)		
11:15- 11:30	The possibility of a science centre in rural Taung, the place of the lion?	Mirriam Tawane & Ian McKay, Evolutionary Studies Institute, Wits	15
11:30- 11:45	The Story African Time: The sense of time before clocks	Mdumiseni Nxumalo, Unizulu Science Centre	15
11:45- 12:00	Life's history at the cutting edge: education and outreach at the evolutionary studies institute	Ian McKay, Evolutionary Studies Institute, Wits	15
12:00- 12:15	Science Communicator Autopsy	MJ Schwartz, Unizulu Science Centre	15
12:15- 12:30	Various iterations of science awareness	Nemabaka Khumbudzo, Sebitsiwa Mathipa, HartRAO	15
12:30- 12:40	Powerful vehicles for popularization of science	Eaton Shirindza, NYS Volunteer @ Sci-Enza	10
12:40- 13:00	**Questions & Panel Discussion**		20
13:00- 14:00	Lunch		60
	PARALLEL SESSIONS		
	Session A		
14:00- 15:10	**Science for the Public (continued)** Session 6A (Chair : Rudi Horak) (Leopard Room)		
14:00- 14:15	Science for the public: Getting science to the township	Mosa Rametse JCP & Zoo; based @ Dorothy Nyembe Environmental Education Centre	15
14:15- 14:30	Sparking the science fuse in the community	Manqoba Ndhlela, Njabulo Mpanza & Mthobisi Mhoni, ArcelorMittal Science Centre Newcastle	15
14:30- 14:45	A comparison between the impact of a mobile planetarium and sky viewing at a science festival.	Hubert Mathebula, Anton Binneman & Shadrack Mkansi, SAASTA	15

14:45-15:00	Exposure to the electronic future.	Mahlatse Mthetwa, Sci-Enza	15
15:00-15:10	**Questions to the Panel**		10
	Session B		
14:00-15:10	**Science for the Public (continued)** Session 6B (Chair : Daniel Motsapi) (Bogosing Room)		
14:00-14:15	Are museums and museum education becoming irrelevant?	Theshnie Naidoo, Durban Natural Science Museum	15
14:15-14:30	Taking the museum to the people	Sindi Nzama & Busi Gumede, Durban Natural Science Museum	15
14:30-14:45	Giving the Blind community access to Indigenous Knowledge (IK): Mobile Library for the Blind.	Tebogo Mohlakanae-Mafereka; Museums Marketing & Outreach Programmes (KZN Dept of Arts & Culture	15
14:45-15:00	To measure or not to measure scientific literacy?	Kogie Govender, Joburg City Parks	15
15:00-15:10	**Questions to the Panel**		10
15:10-15:30	Tea & Poster Session		20
15:30-16:15	**Working with Exhibitions (Plenary)** Session 7 (Chair : Derek Fish) (Leopard Room)		
15:30 15:45	Building an interactive Early Childhood Development extension.	Stuart Hopwood, SciBono Discovery Centre	15
15:45-16:00	Keeping exhibits in check	Myself Mngomezulu, SciBono Discovery Centre	15
16:00-16:10	**Questions to the Panel**		10
16:20-17:30	**Workshops - delegates to choose from:** **Bionics : Learning from Nature (Thami Mangena, Sci-Bono Discovery Centre)** **Naledi Discovery : Human Evolution (Ian McKay, Wits)** **Robotics : Patricia Gous (UNISA)**		70
19:00 22:30	**Evening Dinner Dancing @ Mmabatho Palms** **(with music from the 4 Seasons Mobile Disco)**		

Thursday 19th November 2015

Time	Activity	Delegate	Mins
	PARALLEL SESSIONS		
	Session A		
08:30-10:00	**Science Education Support** Session 8A (Chair : Puleng Tsie) (Leopard Room)		
08:30-08:45	The pan-African Solar Eclipse of 2016	Claire Flanagan, Moonshadow Mix	15
08:45-09:00	Teacher development support in natural science education: Advancing Science literacy through astronomy	Sivuyile Manxoyi & Buzani Khumalo, South African Astronomical Observatory	15
09:00-09:15	Cultivating an Interest in Mathematics and Science; the Botswana International University of Science and Technology's Experience	Haniso Motlhabane BIUST, Botswana	15
09:15-09:30	Our maths mind set doesn't add up	Diloshni Thambaran, Unizulu Science Centre	15
09:30-09:45	Kenyan Science Centre Capacity Building through intensive Tour to Centres in SA, USA & Canada/ASTC conference.	Ken Monjero, E. Kimani, P. Wangare, R. Gitonga Kenya Agricultural & Livestock Res. Org. Kenya	15
09:45-10:00	**Questions to the Panel**		15

	Session B		
08:30-10:00	**Science Education Support** Session 8B (Chair : Thami Mphokela) (Bogosing Room)		
08:30-08:45	Ways to engage and inspire! Understanding the gift of science	Sanda Soqinase, Arcelormittal Science Centre (Sebokeng)	15
08:45-09:00	Academic pressure; too much to handle	Onalenna Ernest Mosiane, Arcelormittal Science Centre (Sebokeng)	15
09:00-09:15	Training the trainers, how valuable is it for educators?	Daniel Motsapi, Arcelormittal Science Centre	15
09:15-09:30	The role of science centres in schools.	Joseph Sibiya Mondi Science, Career Guidance & FET Skills Centre	15
09:30-09:45	From acquisition-oriented to participation-oriented learning approach: effect of technology-enhanced science experiments to students' performance	P.M. Kwinana, FOSST Discovery Centre	15
09:45-10:00	**Questions to the Panel**		15
10:00 10:30	Tea & Poster Session		30
10:30-11:30	**SAASTEC AGM (Leopard Room)**	All	60
11:30 12:00	Framework for promotion of excellence in a national network of science centres: Policy background and process forward following the pilot project"	Isaac Ramovha, DST Anton Binneman, SAASTA	30
12:00-12:15	**Questions**		15
12:15 13:00	**Hula Hoop-Off Heats** **With judge panel of learners (who are included for lunch)**		45
13:00-14:00	Lunch		60
	PARALLEL SESSIONS		
	Session A		
14:10-14:55	**Science Education Support (continued)** Session 9A (Chair : Ulric Oberholser) (Leopard Room)		
14:00-14:15	The Use of Animals to Support Science Education	Armstrong Mashakeni, NZG	15
14:15-14:25	Community Garden: Re Ja Mmoho (We Eat Together)	Dikeledi Khutsoane and Naledi Nalane, Sci-Enza	10
14:25-14:35	Innovation and technology using recycling and recycled materials	Chrisencia Moatshe, Mothibistad Science Centre	10
14:35-14:45	Use of Graphic Calculators in rural-based schools to enhance interactive teaching and learning: Case study in the Fort Beaufort District science schools, Eastern Cape	S Xanga, V. Kwinana and P Kwinana, FOSST	10
14:45-15:55	**Questions to the Panel**		10
	Session B		
14:10-14:55	**Science Education Support (continued)** Session 9B (Chair : Lerato Molebatsi) (Bogosing Room)		
14:00-14:10	Making science fun: Inspiring foundation phase learners to follow STEM careers through the performance of fun experiments	Yolanda Jali and P.M Kwinana, FOSST	10
14:10-14:20	Crossing the Digital Divide: E-Learning as a vehicle to mitigate digital divide effects in rural-based science schools of the Eastern Cape	Phumzile Nomnga and PM Kwinana, FOSST	10

14:20-14:30	From traditional laboratory to virtual space: Shaping the days of our lives to enhance laboratory experiment	Mncedi Rani and PM Kwinana, FOSST	10
14:30-14:40	Enhancing understanding of scientific concepts for STEM FET learners: The role of informal education by Science Centres.	Nwabisa Takata, FOSST	10
14:40-15:55	**Questions to the Panel**		15
15:00 15:15	**Conference Wrap-up** (David Kramer / Mondli Mnguni) (Leopard Room)		
15:15	Tea /Coffee (Posters Down)		
People who are not staying for SAASTA workshop on Friday are free to leave. FREE EVENING			

Friday 20th November 2015

Time	**Post Conference Workshop** (SAASTA)
	Financial Management Workshop

Travel home safely.

Abstracts

Invited Keynote speaker

1. **"Science & Cocktails: Bringing science, art and entertainment closer together".**

Prof. Konstantinos Zoubos
Physics Department, University of Pretoria

Is it possible to create a night culture revolving around science and knowledge? And why would one want to do that? The Science & Cocktails initiative aims to bring science, art and entertainment closer together by bringing science out of academia and into the cultural life of the city. It has been running in Denmark since 2010, where it has developed into the most successful science outreach project in the country.

Science & Cocktails Johannesburg, which combines science talks with jazz music and specially crafted cocktails, was launched in July 2015 and has already been warmly embraced by an audience eager to be introduced to the best of South African science. I will discuss the philosophy and goals of the project and argue that, by creating a relaxed platform for researchers to present their results directly to the public, one can make scientific research as accessible and appealing as any other form of human culture.

Session 1

(Chair : Shadrack Mkansi)

2. **Introducing the South African Repository for Astronomy Educational Material (SARAEM), Sefalana sa kitso ya dinaledi.**

Prof Thebe Medupe
North-West University Mafikeng

South Africa has become a major hub for Astronomy multiwavelength research in the world. We have seen the launch and successful operation of the Southern African Large Telescope (SALT), an optical telescope hosted in Sutherland in the Karoo, and the successful bid for South Africa to co-host the Square Kilometre Array (SKA), also to be built in the Karoo. All these major developments need to be matched by strong support for the already existing astronomy curriculum in our education system. Furthermore, we need to educate our communities about how these facilities are used to advance our knowledge of the universe we live in. Ultimately we want to build a scientifically literate nation that can fully take advantage of the good things that science and technology will bring to us. My talk is about a new initiative by the Department of Science and Technology to develop Learner Teacher Support Material (LTSM) that complement the learning of Mathematics, Science and Technology (MST), mainly by providing real-world examples to unpack curriculum MST concepts using astronomy. New material will be developed especially on topics that are not easily available, and mostly on (new) discoveries that are being made by South African Astronomers. The project has representatives of stakeholders in Astronomy and Education fields, and is considered another building block of the DST-led initiative to contribute to quality

basic education through informal means that make the learning and teaching of MST exciting and stimulating by promoting science.

3. **Reade, write, count, code - Africa Code Week 2015**

Busi Maqubela
Cape Town Science Centre

Coding is the literacy of the digital age indeed: A whole new language for children to speak fluently and express themselves in the 21st Century.

Besides just being centres to support education in South Africa, science centres are established to be leaders in stimulating curiosity, develop inquiring minds and exposing children and adults to positive new experiences and this includes helping people to cope with the rapidly changing technological environment. Science Centres should strive to be relevant.

This is the first year of Africa Code Week, a continent wide initiative across 17 countries in Africa, with a goal to reach 20,000 children. The Cape Town Science Centre hosted the first pilot event in Africa and serves on the Global Steering Committee. This paper will unpack the following areas of this initiative: What is this initiative all about, the importance of such initiatives and why science centres should take part, relevance to the school curriculum, resources available, case studies of workshops that worked, success, failures and lessons learnt thus far in the first year of implementing this initiative.

4. **The NSTF's Share 'n Dare Programme**

Jansie Niehaus and Hendra van Zyl
National Science and Technology Forum (NSTF)

NSTF's major flagship project is the NSTF Awards that promote and reward excellence in scientific research, technological innovation, education, capacity building, science communication and management in South Africa.

Under the NSTF Awards, there is the Share 'n Dare Programme, which allows the Award Winners to be 'ambassadors' for science, engineering, technology (SET) and innovation, as well as role models for the youth, during the year that they receive their award. The programme creates platforms for sharing knowledge with the youth and communities, and inspiring young people to pursue studies and careers in science, engineering or technology.

Through the Share 'n Dare Programme NSTF works closely with Science Centres, and we want to introduce ourselves to them, and build relationships. This paper will be a report on ongoing research about aspects of this programme.

(Plenary)
Session 2
(Chair : Tebogo Habedi)

5. **Lessons learnt for successful Science Engagement**

Rudi Horak
SciEnza, University of Pretoria

Working for nearly 25 years in the oldest science centre in South Africa, I have experienced joy, success, growth, fulfilment but also failure and disappointment in achieving the goals set in the Mission and Vision of Sci-Enza. In the context of the Science Engagement Framework, this paper will reflect on the lessons learnt, achievements as well as challenges that resonates with the Strategic Aims of the Framework. Examples of interventions and projects to popularise science, engineering, technology and innovation amongst different age groups to ensure positive interest and engagement, will be discussed. Challenges to address the financial stability of science centres, as well as building capacity for science promotion personnel and science communicators will be addressed. This paper will also reflect on the critical role that higher education institutions and science centres have to play in the professional development of science communication training and to showcase scientific research and local science achievements in the science centre milieu.

6. **The impact of training presented to science centres as part of the science centre capacity building program.**

Thandi Mtsweni and Shadrack Mkansi
SAASTA

This presentation will highlight the short term, medium term and long term impacts of the capacity building training presented to science centres. The presentation will reflect on a tracing study that was done by SAASTA and correlated with monitoring findings done by SAASTA as part of the science centre accreditation process. The data will provide insight in to best practices in capacity building programs like the Science Centre Capacity building program. The presentation will indicate if the trainings provided are aligned to the Science Engagement Framework and if science communication is being addressed as required.

7. **Developing SET Potential - SA's Got (SET) Talent!**

David Kramer
Sci-Bono Discovery Centre, Newtown, Johannesburg

Developing SET talent is one of the 4 roles that the Science Engagement Framework defines for science centres.

There are many existing programmes that set out to do this but there is one programme that has proven to be successful, cost-effective and able to be implemented in any part of the country. The presentation explores how the model works and how science centres can to adapt it for their own use in their own context. The approach includes MST academic support, life skills development, career education and help in closing the school-to-post school and school-to-work gap. It also reflects on what has made donors happy to support the programmes.

The presentation ends with a reflection on what has made the programme succeed or fail the past 30 years in different areas of South Africa in order to distil a formula that will guarantee success for anyone that wants to try it out.

Careers in Science
Session 3
(Chair : MJ Schwartz)

8. **It's a career path, not a walk in a park"**

SD Dichabe & LY Molebatsi,
North West University (Mafikeng) Science Centre

North-West University Mafikeng Science Centre runs a career guidance programme for grade 9 learners throughout the year. The centre realized that there is a dire need to assist learners in grade 9 with information about different careers in STEM (Science, Technology, Engineering and Mathematics) before the do grade 10. Choosing a career can't be easy as you think since it's a life time decision. Therefore it is very important for individuals to do research before making a choice. Our interaction with schools around Mahikeng made us aware that learners need assistance with their subject choices. Several schools participated in this programme for both in-house and outreach activities. This is one of the programmes where we recruit learners into STEM careers. Early this year from 26th - 30th January we hosted a Career Guidance Week for grade 9 from 22 different schools around Mahikeng, with a total number 1936 learners and 37 educators. Eighteen of the schools were from rural areas, two from township and two from an urban area. At the end of the activities, evaluation forms were given randomly to the participants. The results revealed that majority (60%) of the learners coming from rural areas were not informed about STEM careers. Furthermore, they did not know where to seek information about financial aid and which institutions to apply for when they complete grade 12. We have realized that we need to involve more schools in this programme throughout the year.

9. **The impact of competitions on career choice: SAASTA coordinated AstroQuiz and the National Science Olympiad as examples.**

B Kgwadi, S Mkansi & A Binneman
SAASTA

North-West University Mafikeng Science Centre runs a career guidance programme for grade 9 learners throughout the year. The centre realized that there is a dire need to assist learners in grade 9 with information about different careers in STEM (Science, Technology, Engineering and Mathematics) before the do grade 10. Choosing a career can't be easy as you think since it's a life time decision. Therefore it is very important for individuals to do research before making a choice. Our interaction with schools around Mahikeng made us aware that learners need assistance with their subject choices. Several schools participated in this programme for both in-house and outreach activities. This is one of the programmes where we recruit learners into STEM careers. Early this year from 26th - 30th January we hosted a Career Guidance Week for grade 9 from 22 different schools around Mahikeng, with a total number 1936 learners and 37 educators. Eighteen of the schools were from rural areas, two from township and two from an urban area. At the end of the activities, evaluation forms were given randomly to the participants. The results revealed that majority (60%) of the learners coming from rural areas were not informed about STEM careers. Furthermore, they did not know where to seek information about financial aid and which institutions to apply for when they complete grade 12. We have realized that we need to involve more schools in this programme throughout the year.

10. **Directing Lives and Shaping Career Choices through Science Engagement Activities**

Akash Dusrath
Sci-Bono Discovery Centre

For decades science centres' have been effective playgrounds for informal learning and improved conceptual understanding in particularly with regards to scientific principles and phenomena. Certainly, igniting an interest in science is one way of creating a thirst for scientific knowledge and exploration however the physical interaction with science and technology can also assist and influence an individual's choice of career path. This lasting impact on the life of an individual is of crucial importance as it provides career direction on a level in which a better perspective is gained and in turn can ultimately decide an individual's future career path. In this paper I will look at some of the programmes run at the Sci-Bono Discovery Centre and how these programmes are incorporating the element of career guidance both directly and indirectly. I will also attempt to find out the impact of such interaction in influencing career choices.

11. **Adding an "A" in STEM=STEAM**

Silindile Mthembu
Unizulu Science Centre

Many educational trends have come and gone (and some had been relegated to the back burner). Our main focus as Science Centres is in STEM (Science, Technology, Engineering & Maths) education. In dealing with STEM, many people insist the arts should not be ignored (I am one of them) and therefore the acronym should be STEAM to make sure the arts are present. However, one could argue that every classroom should be a STEAM classroom.

Although some may regard art education as a luxury, simple creative activities are some of the building blocks of child development. The presenter's involvement in the ECD programs and links with the USA Early Learners Collaborative has strengthened the importance of adding arts in every STEM classroom. Therefore arts must be introduced at an early age as it can serve as introduction to scientific processes.

This paper looks at the correlation between arts and science. It will also look at how science centres can add arts in the promotion of STEM education and will showcase examples of how arts can be used in exhibitions, workshops and science show demos. The paper also looks at the benefits of this art-science relationship and how it will help stakeholders in the promotion of science and science engagement

12. **What a journey to a science centre**

Joseph Taetsane
Moipone Academy – Tembisa

From zero to a shack to a science shuttle. Science career awareness was the order of the day during my early days of acquiring freedom from the dusty roads of Tembisa. Moipone Academy (MA) was established to help and encourage learners from disadvantaged communities to pursue science, engineering and technology careers in order to address South African's technological skills shortage. Our future leaders are today's youth with capabilities that include critical thinking, creativity, innovative, assertive and confidence. MA has become the ideal shuttle for the learners to acquire and develop skills through informal science education. Opportunities created by the centre include collaboration with research institutions

and partnership with industries to increase broader understanding and participation of public in science, technology, engineering and mathematics. This long journey to a science centre has empowered the learners with self-motivation skills using science as education platform despite all the obstacles – In our presentation we will highlight the outcomes of the achievements, the challenges and constraints and of course the lessons learned.

13. **Does the visit to the science centre have any impact on learners' performance and career choices?**

Thato Majele & Naledi Seheri-Jele

The purpose of the national school science curriculum (South African context) is to provide every learner with sufficient understanding of science. This can assist the learner with skills that will enable them to participate confidently and effectively in the modern world and to supply detailed scientific knowledge and expertise. Learning science should involve one's senses (that is seeing, handling and manipulating real objects and materials). When well-planned and effectively implemented, science education laboratory and simulation experiences stimulate the learners' learning in various levels of enquiry requiring them to be both mentally and physically engaged in ways that are not possible in other science education experiences. A range of studies has produced evidence that practical work increases the learners' sense of ownership of their learning and increases their motivation and enjoyment of the subject.

In 2015, the North-West University (Mafikeng Campus) Science Centre collaborated with the Department of Chemistry (Faculty of Agriculture, Science and Technology) in assisting Grade 12 learners from disadvantaged schools without science laboratories, with experiments based on the national Grade 12 curriculum-syllabus. The aim of this study was to determine the effect of these student visits and whether these visits had an impact in terms of the academic performance of the learners based on their assessment and on the career choices of the individual learners. The research involved the use of questionnaires, individual student interviews and educator interviews.

14. **Optimizing teaching and learning techniques for science centre visitors with disabilities through use of technology. A case study of hard of hearing learners (deaf).**

N.Z. Manzi & P.M. Kwinana
FOSST

The paper presents a study aimed at testing the impact of use of technology in enabling deaf and hard of hearing learners to understand concepts relating to Mathematics and Science. The initiative was driven by the fact that there less numbers of learners with disabilities venture into STEM education as a result of being historically excluded from education. In addition, both special and general schools have inadequate resources to teach these learners. Technology instruction was used to teach hard of hearing learner's concepts in Mathematics and Science. This technology includes Eureka educational software, computer based instruction, and virtual technology instruction. The learners were given the same short test before and after they were exposed to teaching using the technology. A significant increase in understanding of concepts by the learners and an improvement in their performances was observed. Also, a questionnaire was given to both the learners and teachers. The teachers supported technology based instruction.

The use of technology as a teaching and learning tool yields better results as it acts as a multimodal aid to enhance imagery and familiarity more thoroughly within the STEM. The study endorses technology based instruction for hearing learners. Moreover, it is recommended that workshops be implemented that assist teachers to use appropriate image-based and iterative strategies necessary for effective instruction for hard of hearing learners.

15. **The power of light to promote STEM careers**

Buzani Khumalo
SAAO

Collaboration with various institutions is one of important key in promoting STEM education. South African Astronomical Observatory in collaboration with university of Stellenbosch Light Science Institute used road show science experiments to promote STEM careers and to celebrate international year of light

The project initiative intended to raise awareness of the importance of light in STEM and light based technologies as well as laser light science as one of the scarce skill. Light plays a crucial role not only in our everyday lives but also in the development of new solutions to global challenges. At the heart of these new solutions: science and experimentation.

The project provided great opportunities to the disadvantaged learners to be exposed to light science careers, curriculum light experiments, science literacy, STEM careers and the awareness of the importance of light in our daily life. The target audience were grade 10 – 12 science students to encourage and inspire them to consider taking STEM careers at the Higher education level and most importantly to consider science scarce skills careers. The project promoted STEM careers through career talks, light experiments, presentation on the role played by stem careers in our daily life.

The presentation will highlight the impact of road show science in the understanding of light experiments in the curriculum, how to use house hold material to perform light experiments and the change in perception about light in our daily life as well as STEM careers. How learners developed interest in science careers, they also had opportunity to understand photonic science and the dangers of pointing laser light to the eyes.

16. **Robots, rockets and reactions – effective partnerships with industry**

Michael Ellis
SAASTA

South Africa's key economic sectors, in order of their contribution to the economy, include finance, manufacturing, retail, communications, mining, construction and agriculture. These sectors comprise various industries and as an example, the manufacturing sector includes automotive manufacturing which makes up about 10% of this sector. There is often a disconnect between what learners and the public understand about science, technology, engineering and mathematics (STEM) and their understanding of whether these STEM principals are applicable in industry. During this talk I will share some of the ways that Sci-Bono is bridging the knowledge gap between science concepts and industry. How does a centre establish effective partnerships with industry and where do future opportunities lie?

17. **Role of ICT in popularizing career choices in science and technology for agricultural transformation in South Africa**

Lindiwe Ngcobo & Phumezo Kwinana
FOSST

South Africa has experienced the growth in the telecommunications market, especially due to the wonderful growth of the mobile telecommunications sector. The strategic application of ICTs to the agricultural sector, which is the main economic sector in the Eastern Cape Province, has been seen as a positive policy option to guarantee sustainable development. While the youth have embraced the internet age and enthusiastically adopted the tools of ICT, this has been mostly recreational and for purposes of entertainment.

The main objective of the study is to determine role of ICT in popularizing career choices in science and technology for agricultural transformation. The study analyses the socio-demographic and socio economic characteristics of youth, and determines the challenges faced by youth in opting careers in ICT. The study area was purposively chosen due to high unemployment rate at Nkantolo location which is located in Mbizana Municipality. Descriptive statistics and the stochastic frontier analysis (SFA) were used in the analysis. SFA indicated that career choices vary substantially amongst youth.

The results suggest that certain socio-economic characteristics such as higher education levels and skills are prerequisites for effective improvements in agricultural production due to the adoption and utilisation of new technologies. The study concludes that science and technology hold the key to agricultural transformation, so youth adoption of science and technology will have beneficial effects on national agricultural development.

Science for the Public
Session 4

(Chair : Mondli Mnguni)

18. **Seeing the light: the SPECUP educational spectrophotometer**

Patricia Forbes
Department of Chemistry, University of Pretoria

Spectroscopy is a cross-cutting analytical technique, which finds use in disciplines ranging from chemistry to pharmacy, biochemistry, food science and physics. The SpecUP (Spectrophotometer of the University of Pretoria) is an educational spectrophotometer which was developed so that students could build their own instruments from components in a kit, and then utilise it to generate analytically useful results. This initiative allows for institutions to have more spectroscopy equipment available, as the SpecUP costs ~R600 as opposed to ~R30 000 which is the cost of an entry-level commercial instrument. This is of importance in a developing country context, where student numbers are typically high and resources are scarce. The SpecUP has moving parts and an open design, therefore it can be a useful aid in communicating the principles of this light based technology to the public and school children. The SpecUP allows users to understand what is inside the “black box” of commercial instruments and to discover what happens when they adjust components, allowing for inquiry-based learning. To date the SpecUP has found application in a number of African institutions, as well as a school in Italy. The development of the SpecUP, examples of experiments for which it can be used, and the current status of the SpecUP project will be discussed, and opportunities for utilising the SpecUP in science and technology centres will be presented.

19. **The quality of science communication through the media 2014 to 2015.**

Anton Binneman
SAASTA

This paper will reflect on the quality and quantity of science communication through broadcast, print and online media in South Africa. The paper will focus on the key strategic focus areas as identified by the Department of Science and Technology. Quantitative analysis will be done on all media where the DST, SAASTA, the NRF and its facilities were mentioned for the financial years 2014/15 and 2015/16. The qualitative analysis of the media will investigate the quality of the content of the media based on a randomly selected sample from the same data. The findings of this research will give direction in terms of strategically placing media and collaborating with media houses in placing science content, as well as the role of science centres in this strategy.

20. **Fact or Faith, Religion or Reality?**

Derek Fish
UniZulu

Many Science Centres battle with clashes between religious views and scientific ones. Following from concern about the perceived gap between science and belief, a series of science shows was designed to be presented on Sunday evenings in a church, in the place of the usual service. Derek Fish is Director of Unizul Science Centre and an elder at Mtunzini Christian Fellowship. The shows covered various aspects of Physics, including electrostatics, optical illusions and perception, sound and music, colour and light, maths and astronomy (all presented to date). Each presentation involved a number of exciting physics demonstrations, appropriate (for a family audience) explanations of the phenomena and a discussion about issues of faith surrounding the topic. As an example, the electrostatics presentation focussed mainly on lightning and a discussion followed on whether lightning can be considered an “act of God”, something controlled by humans or merely an electrostatic phenomenon. The “God of the Gaps” philosophy was also discussed as a world view in this regard. The Optical Illusions and Perception talk contrasted the practices of science (“seeing is believing”) with faith (“believing is seeing”).
Response to the series has been excellent with the church hall filled out on every occasion. It is hoped that the series will establish more dialogue between science and faith and allow the two sides to establish some common ground. Robust debate and discussion on this idea is welcomed!

21. **Communicating science during public celebration days**

Daniel Motsapi
ArcelorMittal Science Centre

Public holidays are often used as an escape from everyday life. In previous years even retails outlets would be closed to accommodate their employees. Recently this has taken a turn where retail outlets would open for extended hours to accommodate people who are escaping from work life to spend time shopping. This study focuses on the work done by our science communication team during days which were traditionally used for other business rather than learning. The focus was traditional celebrations versus introduction of learning opportunities which in this case are specifically in line with science and technology. It also looked at employing Indigenous Knowledge at these celebrations. The paper focused more on the events for June 16 and July 18 which are celebrated for remembrance of 1976 youth and former president Mr Nelson Mandela’s heroics respectively. Reference is also given to days or weeks which are of national importance such as

Arbour Week. Adopted theme for July 18 “Make everyday a Mandela day” became clearer for the events of the day. On both dates the team spent the whole day exhibiting at areas with people such as in this case a soccer ground where there was a tournament and retail areas such as malls. Results show that people are more willing to learn when in their comfort areas, but most importantly people felt that using such media for outreach was outstanding because they are used to celebrating these event with traditional ways of going to an area, singing and chanting and then going back home having forgotten what it meant. So the use of these days to promote science and technology makes them learn something and associate the days with education which in turn can make everyday a Mandela day or youth day.

Science for the Public (continued)
Session 5
(Chair : Anton Binneman)

22. **The possibility of a science centre in rural Taung, the place of the lion?**

Mirriam Tawane and Ian McKay
Evolutionary Studies Institute, Wits

Taung is a town rich in culture and history located 140 km northwest of Kimberly in the NW Province. The area became famous in 1924 with the discovery of a fossil skull, named Australopithecus africanus and nicknamed the Taung child, with features intermediate between humans and apes. The area was declared a World Heritage Site in 2005, as an extension to the Cradle of Humankind.

Ten years later development at the site has taken a rather slow pace. Our recent study indicated the local community lacks the correct scientific information about the site and its overall significance. Local schools are underfunded, lack science equipment and there are few opportunities for learners to receive enrichment in science and technology related topics. Furthermore the area, in general, is in dire need of economic development.

Some of these problems could be resolved by creating a hands-on science Centre in the area to promote awareness and stimulate curiosity amongst the youth, and promote social engagement across generations and cultures. Such a Centre covering a broad range of science and technology related themes with a focus on palaeontology, the significance of the Taung site, and the history of the Tswana people would service the education and recreational needs of the Taung Community as well as stimulate job creation and economic development. Initial studies suggest that the local community and schools would fully support such a development and also that finding a suitable piece of land adjacent to the World Heritage Site would be no problem.

23. **The Story African Time: The sense of time before clocks**

Mdumiseni Nxumalo
Unizulu Science Centre

Mankind has from ancient times always been fascinated by the passing of time. Long before watches and other time devices existed people observed the sunrise and sunset, summer and winter or the movement of stars at night. The moon and its phases was another trusted heavenly phenomenon that people followed to keep track of time.

Apart from looking up to the heavens people observed different components of the environment around them. Among those, life cycles of plants and animals as well as behaviour patterns of some animals gave people a sense of progression of time in a

single day, a month and through different seasons of the year. Time can be understood as a series of revolutions, repeating itself with a start of each new day, week, month or a year.

What this paper will try to highlight are different indigenous knowledge based observations of the African people, their sense of time and their closeness to the environment around them. This highlights their connectedness with their surrounding environment and the universe which led to their dependence on many of its components for their existence and beliefs. This discussion emphasises the centrality of observation to indigenous knowledge, while observation is the bases of all scientific investigation.

24. **Life's history at the cutting edge: education and outreach at the evolutionary studies institute**

Ian McKay
Evolutionary Studies Institute, Wits

In 2013 the Bernhard Price Institute of Palaeontology and the Institute for Human Evolution combined to form the Evolutionary Studies Institute (ESI) a hub for the NRF Palaeosciences Centre of Excellence (CoE). The CoE is a consortium of palaeoscience researchers at the University of the Witwatersrand, University of Cape Town, Iziko Museum of Natural History, National Museum of Bloemfontein, Ditsong National Museum of Natural History, and the Albany Museum. The ESI has one of the largest fossil preparation laboratories and largest collections of fossils, including mammal ancestors, African dinosaurs, plants, insects, fauna from the Cradle of Humankind, a cutting edge Micro CT scanner and 3D printer, and the Phillip V. Tobias Fossil Primate and Hominid Laboratory, a state of the art secure vault containing one of the largest collections of fossil human ancestors in the world. Accompanying the ESI is a thriving public education and outreach programme which collaborated with partners such as Sci-Bono and Media 24 to reach over 200 000 people in 2014. In addition, we are upgrading our curriculum support workshops in line with overseas models to include a forensic laboratory, genetics lab, and a human evolution and DNA laboratory. We are also developing the Kitching Galley museum into a modern interactive museum of palaeontology in the Origins Centre, facilitating palaeotourism development at sites in the Eastern Cape and Northwest Province at Taung, initiating a programme of research into free choice education within the CoE, and welcome collaboration with other science centres and outreach programmes.

25. **Science Communicator Autopsy**

MJ Schwartz
Unizulu Science Centre

If you had to 'dissect' a science communicator, what would you find? What functional 'organs' do they contain? What 'diet' do they live on as a science communicator? What feeds them and keeps them going? What diseases plague them? How has their body of work changed (aged) over time?

In this autopsy the diversity of science communication will not go 'un-dissected'. Specifically that science communicators are diverse in both their style and approach to communicating science. Each bringing their own unique scent! With this diversity in style and approach I am compelled to ask: Why do they what they do? What are they doing? Why are they doing that? How do they know what they are doing is working? What have they done that they know hasn't worked? These questions and more will be posed to science communicators from around the globe. The results will be presented at SAASTEC. From Dr. Derek Muller of

Veritasium to Dr. Graham Walker of ANU, no science communicator will be spared!

26. **Various iterations of science awareness**

Nemabaka Khumbudzo and Sebitsiwa Mathipa
HartRAO

Science awareness and outreach by the same facility is usually done with the same aims but inevitably there are variations in outcomes and results.

There are variations in the level of engagement when research facilities host schools and public groups versus when communicators go out to festivals and even remote areas to do outreach. The premise might be to share the same information but differing conditions have an influence on the extent to which the information is shared.

Context demands adaptability on the side of the communicators to achieve the most effective approach.

The study tries to explore the best methods to achieve high results in all contexts.

27. **Powerful vehicles for popularization of science**

Eaton Shirindza, NYS Volunteer
Sci-Enza, University of Pretoria

Science shows contribute to effective communication of science concepts for the learners and the public. The public and school groups visit science centres in anticipation of unique insights into the latest scientific research and seek an atmosphere different from monotonous classrooms. A science show is performed with the intention of raising awareness of a scientific theme dedicated to a specific theme or topic. The purpose of a science show is not only to entertain but also to attract the public into science by simplifying scientific ideas and puts scientific theory into practice. Demonstrations with everyday use equipment - such as recycled bottles and baking soda - which the public can easily access is key. Involving the audience is one employable method that can challenge them to be interactive. The results show that the audience learn and understand quicker when a concept is explained with demonstrations and their involvement.

PARALLEL SESSIONS
Session A

Science for the Public (continued)
Session 6A

(Chair : Rudi Horak)

28. **Science for the public: Getting science to the township**

Mosa Rametse JCP & Zoo; based @ Dorothy Nyembe Environmental Education Centre

Taking physics and chemistry to the community plays a big part at the Dorothy Nyembe EE Centre (DNEEC) during the month of August when National Science Week (NSW) takes place. The objective of the week is to reach as many community members and school learners as possible through sharing and raising awareness about science.

The week is different to normal operations of the centre where school programmes are run for 60 learners a day to having on average 580 learners a day. With NSW exhibitions and science shows are conducted to raise awareness about science and make science fun and exciting to the community. The time spent at each attraction is measured as a “hit” as the beneficiaries are engaged in topics that they would not necessarily come across in their normal settings such as mall and parks as well

as schools unfortunately. According to a research done by the Institute of Race Relations conducted during the years 2012/13 20228 from 24000 public schools do not have science laboratories in South Africa nor do they perform experiments.- NSW is the one of the ways for school learners to attain such experiences and for the community to grow an interest in science by realising that even the everyday things that we take for granted were made using some science.

NSW is a key factor in running marathon awareness with schools and communities and it makes science accessible and likeable thereby making it possible for learners to want to venture into the sciences.

29. **Sparking the science fuse in the community**

Manqoba Ndhlela, Njabulo Mpanza & Mthobisi Mhoni,
ArcelorMittal Science Centre Newcastle

Communicating science at all levels is one of the ArcelorMittal Science Centre's objectives. As the pace of technology advancement and science research accelerates, the average citizen is faced increasing with having to grapple with matters of science and technology in their everyday life.

The public engagement program which is aimed to improve public understanding and appreciation of science and the usefulness of science in their everyday life. This holiday programme to the general public contains a variety of hands on science activities to make science learning easy and fun.

30. **A comparison between the impact of a mobile planetarium and sky viewing at a science festival.**

Hubert Mathebula, Anton Binneman & Shadrack Mkansi
SAASTA

The science engagement community, including science centres, make use of different approaches to communicate science to the public, including learners. The different approaches used in science communication include, amongst others, interactive exhibits, science shows, workshops, presentations, etc. Two prominent approached used by SAASTA to communicate Astronomy are the Mobile Planetarium and sky viewing. This study will compare the impact of the two types of interventions on the change in knowledge and perceptions of participants on astronomy. The methodology that will be used is experimental in nature where two random samples of 100 participants will be requested to complete a questionnaire before and after each intervention. This data will be analysed and compared to determine if these interventions have any impact and how the two types of interventions compare. This data will then be generalised to other exhibits and contribute to best practices in the sector.

Session B

Science for the Public (continued)

Session 6B
(Chair : Daniel Motsapi)

31. **Are museums and museum education becoming irrelevant?**

Theshnie Naidoo
The Durban Natural Science Museum

Museums are viewed as educational institutions however; in this epoch of social change; museums are struggling to connect with their audiences. With the number of visitors to the museum showing a trend of decline, it has become integral for

museums to redefine their missions, functions and strategies to adopt the expectations and engage with their audience in this shifting sphere. Education is seen as critical for the development of institutions that can be used to enrich the school curriculum in various disciplines. Marketing strategies implemented would play an integral role in influencing visitor numbers and showcasing the museum as a free resource that should be utilised to its full potential. A shadow budget associated with a decline in visitor numbers shows the impact it would have on the daily operation of the institution.

The Durban Natural Science Museum (DNSM) has made huge strides in increasing the body of information relayed to the public in a more engaging approach. DNSM has developed both in reach and outreach educational resources for various tiers of the schooling system. This aims at sensitizing groups on the goals of DNSM and the better understanding of biodiversity, conservation and heritage. The guided gallery tours and behind the scene tours allows for a more personal approach and engages the needs of the public and learners. Learner targeted programmes that have been developed is a practical tool to assist learners in the Life Sciences. As we approach new challenges, innovation plays a role in Museum Education and our marketing strategies.

32. **Taking the museum to the people.**

Sindi Nzama & Busi Gumede
Durban Natural Science Museum

Museum education is devoted to developing and strengthening a museums' role as public institutions, with one of the purposes of museum education being to enhance the visitor's ability to understand and appreciate museum collections. However the majority of individuals, both old and young, from mostly previously disadvantaged communities, know very little about museums because of financial and social barriers. The Durban Natural Science Museum (DNSM), have delivered on their mandate to make museums more accessible, by taking museum specimens and information to rural communities, implementing outreach programmes that cater for communities members as a whole, as well as programmes that are designed specifically for schools. To increase service delivery, which has seen a reach to different areas of eThekwini Municipality over the years, using small museum vehicles, DNSM recently introduced eThekwini Municipality's first Mobile Museum. This falls under a wider programme of newly developed curriculum based educational programmes that are targeted at Life Science learners – "GO-WILD". The development of a mobile museum was motivated by the number of schools and communities already being serviced by small museum vehicles, as well as the large number of disadvantaged schools that find it impossible to visit the museum's public galleries due to financial barriers. The GO-WILD Mobile Museum programme was developed in conjunction with environmental education consultants, with input from learners and educators, to shape a resource that serves as a school's practical tool to strengthen and increase learners' understanding of the Life Science curriculum.

33. **Giving the Blind community access to Indigenous Knowledge (IK): Mobile Library for the Blind.**

Tebogo Mohlakanae-Mafereka
Museums Marketing & Outreach Programmes (KZN Dept of Arts & Culture)

Unemployment remains a fundamental problem affecting the majority of people with disabilities and their families. Many people have encountered persons with disabilities either in their personal lives or working environments. The result is an abundance of myths and misconceptions about the potential, abilities and skills of

people with disabilities. Negative images of disability and incorrect assumptions about people with disabilities have hampered the progress of people with disabilities towards equal opportunities in the society.

34. **Exposure to the electronic future.**

Mahlatse Mthetwa
Sci-Enza, University of Pretoria

Workshops facilitated by science centres are opportunities for physical interaction with the respective audience to link known theory to practical applications. Modern society heavily relies on technological advancement most of which is electronically based. The objective of the electronics workshop to the advanced learner is to construct fairly sophisticated circuits used in homes such as lamps connected in a combination of series and parallel connections, industry and research such as the SKA project while to general public and the beginner learner is to introduce the basic electronic components and their functions. The method applied is once the basic components can be identified simple illustrative diagrams are used to build the respective circuits, observations are noted and discussed. The result of the workshop is the identification of basic electronic components, secondly the function and operation of the respective components, lastly their practical application and usage.

35. **To measure or not to measure scientific literacy?**

Kogie Govender
Joburg City Parks

Scientific literacy is defined as, "knowledge and understanding of scientific concepts" that empowers people to make decisions on personal and public issues (www.nap.edu). Scientific literacy is vital amongst the general public so that they will be able to contribute towards the public policy debates. There is no consensus on how to measure scientific literacy amongst the general public (Miller, 1998).This paper discusses scientific literacy and the methods that can be used to measure scientific literacy amongst the general public. There-after we analyse scientific literacy using Johannesburg City Parks and Zoo as a case example of measuring scientific literacy through biotechnology outreach programmes in previously disadvantaged communities. Finally we review, is it important to measure scientific literacy?

Working with Exhibitions (Plenary)
Session 7

(Chair : Derek Fish)

36. **Building an interactive Early Childhood Development extension.**

Stuart Hopwood
Sci-Bono Discovery Centre, Newtown, Johannesburg

With generous funding from SAASTA Sci-Bono Discovery Centre is building a 12 exhibit exhibition for early childhood development. The process of prototyping, testing and fine tuning will be shared with the actual exhibit samples show in the process.

37. **Keeping exhibits in check**

Myself Mngomezulu
Sci-Bono Discovery Centre, Newtown, Johannesburg

Sci-bono Discovery Centre has well over 300 working interactive exhibits. A check

list is done three times a week where all exhibits are tested and checked. The system used will be shared and explained with real examples.

PARALLEL SESSIONS
Session A

Science Education Support
Session 8A
(Chair : Puleng Tsie)

38. **The pan-African Solar Eclipse of 2016**

Claire Flanagan
Moonshadow Mix

On Thursday 1st September all of Africa except the very far north will experience a partial or annular eclipse of the Sun. For all except far Western Africa, the eclipse will be visible during school hours.

We will discuss how to watch the eclipse safely, and suggest some eclipse-viewing activities such as pinhole-projected eclipse art and public-viewing sites.

39. **Teacher development support in natural science education: Advancing Science literacy through astronomy**

Sivuyile Manxoyi & Buzani Khumalo
South African Astronomical Observatory

The revised curriculum statement moved earth and beyond strand from Human and Social Sciences to Natural Science which posed a great challenge to Natural Science educators especially those who never specialised in HSS. Natural Science teachers are struggling to teach earth and beyond, the astronomy part in particular.

The teacher development intervention project of earth and beyond implemented by South African Astronomical Observatory started at Umtata district in 2013. It made a huge impact in the teaching of Earth and beyond. The demand from Natural Science educators from other districts in Eastern Cape who struggle to teach earth and beyond and the support is poor has seen the project expanded to various districts in the disadvantage schools in Eastern Cape. The project has now expanded to other provinces, Mpumalanga, Eastern Cape and KwaZulu Natal. The project has now grow into its third year.

The project consists of teacher workshops, hands on activities, practical investigation and teacher resource material for the teaching of earth and beyond. The project clarifies the misconceptions in astronomy in particular and offer hands on material and workbook for classroom activities.

The initiative of this project is to support natural science education curriculum in the strand earth and beyond and encourage learners to pursue careers in Astronomy, space science and cosmology. This presentation will highlight the conceptual and alternative conceptions that teachers uphold and will suggest roles that science centres can play in mitigating and addressing conceptual difficulties and misconceptions that teachers experience and hold respectively.

40. **Cultivating an Interest in Mathematics and Science; the Botswana International University of Science and Technology's Experience**

Haniso Motlhabane
BIUST, Botswana

The Botswana International University of Science and Technology (BIUST) is the second university in Botswana which is sponsored by government. While the first national university, The University of Botswana deals with a wide spectrum of educational disciplines, BIUST's focus is science and technology.

The challenge of scarcity of Mathematics and Science students in Botswana.

There is abundant evidence globally that science and technology are engines of economic development and growth. Through scientific research, new generated knowledge translates into innovation leading to industrial production, hence economic growth. Botswana International University of Science and Technology (BIUST), having been established to spearhead economic revolution through capacity building in science, engineering and technology, is a major vehicle for transforming Botswana's economy from a resource-based to a knowledge economy through technology development and transfer leading to solution of problems.

However, there is plenty of evidence showing that Mathematics and Science are problematic particularly at the pre-tertiary levels of Botswana's education landscape. While there could be myriad causes, such as a learning environment devoid of adequate support for excellence in Mathematics and Science, one of the obvious causes is the phobia for Mathematics and Science that leads to a myth that mathematics and science are killer subjects with a potential for thwarting a student's future. The Botswana International University of Science and Technology through its Directorate of Pre-University Academic Programs (PUAP) endeavors to demystify Mathematics and Science .

The PUAP Approach

The PUAP undertakes to ingeniously and deliberately present Science and Mathematics as inherently basic to our everyday life which every person is effortlessly living. It endeavors to demystify Mathematics and Science and cultivate interest of learners and the general populace in the subjects through exposure, play, interaction with natural phenomena, nurturing and mentoring thus building the needed confidence. This outreach program is aimed at creating an appreciation of the existence of mathematics and science in all life phenomena. This is aimed at causing a paradigm shift in the perception about Mathematics and Science by the general populace and in particular the pre university population.

This paper therefore seeks to share BIUST's experiences as the program was rolled out over the last year and half, to different parts of the country. The main approach has been through conducting science shows and science circuses for leaners and the public.

41. **Kenyan Science Centre Capacity Building through intensive Tour to Centres in SA, USA & Canada/ASTC conference.**

K.Monjero, E. Kimani, P. Wangare, R. Gitonga
Kenya Agricultural & Livestock Research Organization, Kenya

KALRO science centre corner is rooting very fast and has already make an impact on the community through youth engagement with science.

The main aim which was achieved after visiting 17 science centres in the USA and 3 in South Africa was capacity building on science exhibits, shows and displays, as well as communication skills, programming and management and above all networking and collaborating.

Finding funding opportunities for single exhibits, constructions, more capacity in communication skills of the group and finding volunteers to visit Kenya with the same goal.

42. **Our maths mind set doesn't add up.**

Diloshni Thambaran
Unizulu Science Centre

A corresponding lack of ability in mathematics- innumeracy- has received increasing attention in the last few years. South Africa's mathematics pass rate in the year 2014 was 53.5 % dropping by 5.6 % from the previous year. With our mathematics pass rates being exceedingly low and children having the perception that mathematics is extremely difficult, we as science centres need to ask ourselves these questions:

- Are we doing our best to help resolve the low mathematics pass rates in our country?
- Are we trying to introduce maths education in a more fun way?
- Are our science centres tackling the mathematics curriculum?
- Can we use (NEWS), the National curriculum, exhibits, workshops and shows to teach mathematics in a more fun and easily understood way?

With these questions in mind we aim to explore a variety of ways that mathematics education can be taught at our science centres. This presentation provides an overview of the Unizulu science centres journey to help make mathematics education less challenging and more fun, not only to scholars but also to our teachers.

Session B

Science Education Support
Session 8B

(Chair : Thami Mphokela)

43. **Ways to engage and inspire! Understanding the gift of science.**

Sanda Soqinase,
Arcelormittal Science Centre, Sebokeng

Today, education remains a crisis in Africa. Failure to tackle the learning deficit has deprived the young generation a chance out of poverty and to develop. The Vaal Triangle at which the Science Centre is housed is a better vantage point to illustrate the detrimental effects the education crisis has on our generation. In a typical class, lack of financial resources, few textbooks, students receiving a monotonous recitation as rote of learning are common situations of a wider malaise. Science has been regarded as a locomotive for development and progress. It has also been acclaimed for the pivotal role it plays on the economy and human prosperity. This is where the Science Centre has played its paramount role in creating platforms that enhance cognitive ability of students by use of communication technologies for purposive uses. The use of media as a support platform is to counteract the learning challenges of sciences. An example of using technology to reach to schools is the Eureka educational software which basically uses e- content and comprises of

3D videos, simulations, virtual laboratory etc. This software results in increased educational effectiveness by using 3D to conceptualize curriculum based topics. It also assists learners to visualize complex topics and has yielded improved grades. Moreover, educators have been equipped with high quality content this has consequently improved the quality of teaching and learning Science and Mathematics in schools.

44. **Academic pressure; too much to handle**

Onalenna Ernest Mosiane
Arcelormittal Science Centre, Sebokeng

We are living in a diverse and dynamic world, where skills shortage becomes a worrying factor in the society and the country at large. Now the question is, how do we address such a problem? The existence of our Science Centre aims at closing that gap in doing the so called "Educational support in schools". Maximum resources are used to improve lives of all those within the reach of the Science centre. As Edutainers, we inspire young minds to ensure the survival of future generations. Our commitment to education, we contribute a lot to the alleviation of the national skills crisis in the sciences and especially in the field of engineering. We anticipate in improving mathematics and science performance at schools, stimulate interest and curiosity in these fields and provide information, knowledge and skills training to teachers, learners, school leavers and the general public in the communities surrounding our centre. The country-wide shortage of skills is addressed in engineering fields which is exacerbated by the fact that learners do not follow the science discipline, inadequate facilities in schools and insufficient qualified teachers. We expose students to science and technology in a fun and relaxed environment by providing them with classrooms, fully equipped science laboratories, interactive science exhibitions that enhance their thinking skills and curriculum-linked science and mathematics instruction. Apart from the schools programme which learners attend at The Science Centre fun science shows are presented to generate interest in Science amongst learners from primary school level.

45. **Training the trainers, how valuable is it for educators?**

Daniel Motsapi
Arcelormittal Science Centre, Sebokeng

Science Centres have long been involved with community outreach, learner development and teacher training. But how reaching can teacher workshops go? How can teachers be mentored to offer learners the best of contact sessions and practicals? The current setup in Gauteng schools requires that teachers be techno savvy, therefore training teachers on aspects of experiments is key in this process since most work will be virtual and more simulations. This paper looks at the work that was done by the science centre to involve more teachers in practical work. The centre constantly help learners with practicals, but it was discovered with the help of department trainers that the reason most teachers do not conduct experiments is that, they themselves are not familiar with them, they fear the use of chemicals or they do not feel competent to conduct them.

A roll out plan was conducted with the help of NYS volunteers to, first familiarise themselves with those experiments and secondly to conduct those experiments with the teachers. The centre sourced the experiment material for the entire district, then two teachers from each grade from all the 50 schools in the district were invited, based on their demarcation area. Therreafter two experiments were conducted on each of the meetings. The meetings were conducted after school, which is from 2pm to around 6pm on each meeting. As a form of evaluation

teachers were required to develop a memorandum and those were fused to develop a standard for the entire district. Results will also show that not only was the method effective but the plan is currently being rolled out the life sciences.

46. **The role of science centres in schools.**

Joseph Sibiya
Mondi Science, Career Guidance & FET Skills Centre

Science centres are not science schools nor are they supposed to duplicate the duties of science educators. What role do science centres play in schools? To teach the science curriculum? If yes, then they (science centres) are science schools and they have to teach the science curriculum in totality. If no, then what role do they play in schools: foundation, intermediate and FET phases in particular?

A lot of schools have a majority of their enrolment in foundation, intermediate and senior phases. These are critical phases of learning (formal and informal) in which learners' interest of science, science awareness and science related careers can be developed. Most of the time science centres focus their attention, help and awareness of science more on the FET phase than the lower phases. This has a minimum impact as far as science awareness is concerned because most of these learners have already made their decisions as far as career choices are concerned. If science centres could spend more time in the lower phases of schooling doing science awareness campaigns, teaching them about careers in science, demonstrating applications of science in daily life activities and model learners around science, there is more to achieve than is achieved now.

47. **From acquisition-oriented to participation-oriented learning approach: effect of technology-enhanced science experiments to students' performance**

Phumezo Kwinana
FOSST Discovery Centre

In early times, experiments were used to prove theoretical knowledge but lately they have turned into environments where students freely discover knowledge as an individual or in groups. This paper presents studies conducted in the rural-based Alice science schools with the aim of augmenting teaching and learning of science using virtual reality technology instruction. The initiative was triggered by the fact that the majority of these schools have inadequate or no laboratory equipment. Participants' performances on the understanding of scientific concepts were analyzed before and after use of virtual reality technology instruction; such as, computer-interfaced experiments, interactive virtual laboratory activities, and eureka educational software. They were also given feedback forms to complete based on the activities.

The research findings strongly supports the use of technology instruction as a catalyst for learners' achievement. It has also been found as a catalyst for improving performance and to stimulate participation among learners. It can be concluded that the technology-enhanced model is effective in helping learners to be active participants in class and in comprehending scientific concepts. Also, it is a cost-effective alternative for the lack and/or absence of science laboratories. This model is recommended to be adopted by schools that lack or have no laboratory equipment.

Science Education Support (continued)

Session 9A
(Chair : Ulric Oberholser)

48. **The Use of Animals to Support Science Education**

Armstrong Mashakeni
National Zoological Gardens, Pretoria

Animals involved in education programmes are usually not used to discover, prove or develop new ideas or techniques, but rather to demonstrate principles which are already well-known or to learn manual skills and techniques. The use of animals in education is not new and has always been surrounded by controversy. Organisations like the NSPCA have developed alternative techniques to using real animals. There are, however, situations where the involvement of animals is necessary to achieve educational goals. In these circumstances, guidelines have been developed which focus on strategies to minimise the possible negative impact on the welfare of these animals. Many education facilities do not comply with the ethical principles and are thus using animals for education without proper procedures. This has raised questions in the public eye.

This presentation looks at the effectiveness of using animals to enhance lesson quality, the impact it has on the animals and also on the learners. The presentation explains how unintended outcomes of a lesson could emerge and how to avoid these. The presentation also investigates if learners are learning what the programme developers intended them to and, in the case of wildlife education programmes, whether the desired attitudinal and behavioural shifts are being made.

The presentation also explores the personal and interpersonal growth that may occur as the learner makes use of the opportunity to overcome fear and resistance to the touching of animals - learners are able to acquire skills such as accountability, responsibility, cooperation and sharing when interacting with animals.

49. **Community Garden: Re Ja Mmoho (We Eat Together)**

Dikeledi Khutsoane and Naledi Nalane
Sci-Enza, University of Pretoria

The UN has declared 2015 as the International Year of Light and Soil. In the spirit of theme, Sci-Enza science centre together with the SNAPP (Student Nutrition and Progress Programme) of the University of Pretoria's feeding scheme established the Re Ja Mmoho project. Re Ja Mmoho is a student nutrition programme which assist students from financially disadvantage backgrounds with a daily allowance provided the students participates in community projects. The aim of the garden community project is to provide students with practical experience in food production and natural resource management while also increasing their knowledge of nutrition to reduce the incidence of malnutrition among students. The students were taught agricultural skills such as soil tillage before planting; transplanting seedlings and the maintenance of the crop. Furthermore, they were taught how to set up a vertical garden. To date the garden has produced a range of crops (e.g. lettuce, beetroot, spinach, onions etc.) which the students planted and harvested themselves. The programme has also given students basic agricultural skills which they can now practice at home. And at the end of the programme the

students will be awarded volunteer certificates as an encouragement for them to continue participating in community projects.

50. **Innovation and technology using recycling and recycled materials**

Chrisencia Moatshe
Mothibistad Science Centre

Education could be achieved in voluntary, joyful, playful, communication and learning. Technology is a lifetime experience which extends to expansion of the mind and senses. Techno-youth programme gives platform to learners to explore and experience that technology can be used in an interesting way to develop models, and learn optimally so and being innovative. Hands on activities (practical part of models) and theoretical knowledge enhance each other in a positive way. It is evident enough that techno-youth programme improves learner's performance and their research skills.

There are three important innovations of 21st century learning visualization, democratization of knowledge and participatory cultures for learning, that

- Keep students interested and engaged
- Meet the needs of different kinds of learners
- Develop the critical thinking skills of learners

Learners design models on the topic given to them to research on. They use the recycling and recycled materials to develop the models. Hands on activity helps learners with barriers of learning without visualising what they are supposed to do. The hands on activities promote good communication, be good listener, share ideas, demonstrators and presenters. Learners acquire skills that they did not have when they come to the centre. All typed of learners are accommodated in the programme. Group work is a strategy that encouraged and helps learners to share ideas. Teach them to respect one another's ideas.

51. **Use of Graphic Calculators in rural-based schools to enhance interactive teaching and learning: Case study in the Fort Beaufort District science schools, Eastern Cape**

S. Xanga, V. Kwinana and Phumezo. Kwinana
FOSST Discovery Centre

South Africa is a developing country that is currently producing low quality and quantity of learners who have majored with mathematics and science-based subjects. A GC is an easy interactive tool designed to assist learners to visualise and understand mathematical and scientific concepts. It is also an important apparatus meant to trigger critical thinking and problem solving skills among learners. Research has shown that the teaching and learning using GC has been proven to succeed in making learners understand STEM concepts in other developed countries.

Research was conducted in the surrounding rural-based science schools to examine its efficacy. Both quantitative and qualitative research methods were employed to collect data. Research was conducted on random selection of 10 rural-based science schools in Fort Beaufort District. HP-50g GC were used as research tools to carry out the objectives. The results were based on the tasks of plotting graphs (linear, curves, etc.) and dimensions before and after the use of HP-50g GC. This was done to evaluate the learner's ability to understand these concepts. Results reflected an average increase in student performance when the GC was used. More importantly, learners found the learning using GCs being interactive and catered for many student learning preferences (kinaesthetic, visual, multimodal, etc.). They

were also able to understand how graphs are being constructed. Based on the outcomes attained, it can be concluded that the GC can be used as a supplemental teaching and learning tool to enhance the level of understanding among learners.

Science Education Support (continued)
Session 9B
(Chair : Lerato Molebatsi)

52. **Making science fun: Inspiring foundation phase learners to follow STEM careers through the performance of fun experiments**

Yolanda Jali and Phumezo Kwinana
FOSST Discovery Centre

This paper is aimed at convincing foundation phase learners that science can be fun, thus encouraging them to follow careers in Science, Engineering and Technology (STEM). It is imperative that learners encouraged at an early age to follow STEM careers which has been losing popularity steadily over the past years. The study was motivated by the fact that learners start thinking about which field/subject streams to follow in Grade 9 whereas early years are imperative for conditioning their minds towards a specific career.

Science experiments (kitchen chemistry and other easier experiments) were conducted to 10 primary schools in the Alice town. Learners showed interest and were active participants. It was observed that learners could relate to some of the experiments conducted that occurred in their surroundings. Learners gained skills in observation, problem solving, independent investing skills and use of technology. Feedback forms were given to learners and educators before and after experiments were conducted. Educators assessed learners' performance before and after the experiments. Findings showed that a large number of learners were inspired to choose STEM careers. It is recommended that more practical work and experiments be done in foundation phase as learners showed better understanding of scientific concepts after these experiments. Educational excursions are also recommended so learners can relate what they learnt in class to real-life practices.

53. **Crossing the Digital Divide: E-Learning as a vehicle to mitigate digital divide effects in rural-based science schools of the Eastern Cape**

Phumzile Nomnga and Phumezo Kwinana
FOSST Discovery Centre

Digital Divide (DD), which refers to the existing gap between regions and demographics as a result of access or lack of to Information and Communication Technologies (ICTs), remains prevalent in society in spite of the endeavors made to reduce this reality. The continued difference in accessing ICTs seen over the past decades this gap has widened in society and the effects are severe is rural-based communities. The effects are also prevalent between schools, whereby some continue to enjoy access to science, engineering and technology (SET) e-learning means and others don't.

The study conducted in the Alice and Fort Beaufort science schools of the Eastern Cape reveals that rural-based science schools (RBSS) are more susceptible to the DD effects than urban-based schools owing to their socio-economic status amongst other factors. This research paper accounts on the mission established to mitigate DD effects in RBSS of the Eastern Cape through e-Learning implementation. The research project followed methodological triangulation research to develop an understanding of DD effects before and after e-Learning implementation and also to gather indicators on access to technology in the RBSS. The account provided in

this paper also provides expert guidance on how to implement e-Learning in poor rural areas in a cost-effective method. It is recommended that models of this nature be shared among science centres so as to enable many regions of our country to "cross" the digital divide in an effective way.

54. **From traditional laboratory to virtual space: Shaping the days of our lives to enhance laboratory experiment**

Mncedi Rani and Phumezo Kwinana
FOSST Discovery Centre

It is apparent that there is a dire shortage of traditional laboratory experiments especially in rural-based schools. This paper explores ways on how a traditional laboratory can be supplemented by virtual experiments in an effective and seamless manner. The internet access has enabled technology-based learning environments such as virtual space and other computer technologies to enhance teaching and learning. This initiative will enable schools with no or inadequate laboratory experiments to perform experiments to enhance learners' practical skills in science.

The focus of this study is to evaluate the effectiveness of virtual laboratory training and learning in comparison to practical laboratory learning using syllabus-based science experiments. The research was done to schools that have adequate experiments and to those that have inadequate or no experimental equipment. Learners with no experimental equipment were first exposed to virtual setup before they were subjected to do physical performance of experiments. Those that have access to good physical experimental setup were also exposed to virtual setup. Attributes like learning experimental procedures, generating experimental results, psychological effects, etc. were examined in both groups of students.

The study findings suggest that the use of virtual technologies are credible alternative to physical experiments as both methods can be used to prove theoretical knowledge and enhance scientific concepts. It can be concluded that the model is effective to help learners improve the level of learning science. This model is recommended to be adopted by schools that lack or have no laboratory equipment as a supplement teaching technology tool.

55. **Enhancing understanding of scientific concepts for STEM FET learners: The role of informal education by Science Centres**.

Nwabisa Takata
FOSST Discovery Centre

Informal education is commonly defined as learning that takes place outside of formal school settings. A few examples of informal education are activities like educational field trips, science centres instruction through exhibits and other helpful instruction that is not necessary syllabus-based, aquariums, museums etc. This paper presents a study that seeks to investigate the role of Science Centres in enhancing STEM FET-Learner's understanding of scientific concepts through informal education. Formal education virtually requires students to study in stipulated places and time which is restraining the freedom of location of studying. Also, formal education appoints a time to gather all students to study, which might not be appropriate for all leaners. The school system needs to be supplemented by informal education systems that cater for all types of learners (e.g. auditory, visual, kinaesthetic and multi-modal learners).

The study investigated the use Science Centre facilities to promote informal education. Learners were Learners were subjected through a pre-test before informal activities at the science centre were employed. The post-test was

conducted after learners were subjected informal learning activities like science and technology exhibits, Eureka educational software that delivers lessons in 2D and 3D modes. For experimental component, virtual lab, and exhibits relating to those concepts were used. Based on the post-test results it can be concluded that learners had a better understanding of the scientific concepts. The feedback forms confirm that some schools teach using one mode of delivery which does not necessarily cater for others.

Posters

1. **3d Viewers – an old-fashioned educational tool.**

Claire Flanagan
Moonshadow Mix

Many current space missions provide stunning photos in red/blue anaglyph format. Understanding how this works is an interesting cross-curricular activity involving the understanding of colour and an appreciation of why two eyes are useful.

2. **Robotics competition with a twist.**

Thami Mphokela and David Mavuso
Arcelormittal Science Centre, Sebokeng.

Afrobot is an amateur robotics tournament that was introduced to the country by the French Embassy and SciFest Africa. It aims to provide South African learners with an opportunity to get involved in a technical project within a supportive and entertaining environment. The purpose of Afrobot is to offer learners an entertaining and friendly platform to conduct a technical project. It is an opportunity for learners to get hands on experience, develop skills and know-how, and to demonstrate innovation and creativity as well as employ a strategic mindset and to promote fair-play. It encourages team members to use basic electronic components and household material to build a robot, thus making a tournament accessible to anyone. The tournament is open to all learners between the ages of 8 – 18 years old.

ArcelorMittal Sebokeng Science Centre first participated at the Scifest Africa science festival in Grahamstown in 2011. For 2011, six learners from the centre participated in the Afrobot competition. These two girls and four boys were selected from the surrounding disadvantaged schools in Sebokeng. Participating in such an event was a first for them and they took it in high strides.

The programme has now been introduced to more than 30 schools in the region and the results show growing interest from learners even at primary level. The use of robots in the classroom subconsciously introduces students to possible career paths they may not have ever considered. Engineering principles, such as electrical, mechanical, and chemical, as well as IT skills are required to successfully complete a robotic based project. This is important to ensure that the skilled worker shortage that exists, particularly in engineering, is addressed during the years when students are thinking about planning their careers. Robotics is a perfect way to show students that engineering and IT can be fun.

3. **Science made fun – Adding colour to a dull painting.**

Busisiwe Ngcobo, Sphelele Phiri, Sakhile Masango and Mfundo Ntuli
ArcelorMittal Science Centre, Newcastle

Every child loves colour, can the same be said with science? Focusing on early childhood development in science creates unforgettable learning experiences that will lead to unlocking children's curiosity and imagination and making the children aware of all the exciting opportunities that are available in the field of science. Edutainment is one of the most vital building blocks used to create a foundation that starts a child's journey into science.

4. **A comparative analysis of pure mathematics and maths literacy beyond matriculation phase: Impact on student career choices**

N. Ntozonke (Supervisor: Phumezo Kwinana)
FOSST Discovery Centre

Recently, there has been a long debate on the role, relevance and effect of maths literacy for post-matric career choices by nowadays students. Maths lit was introduced to help students that cannot cope with pure maths. It is a fact that over the past years, maths lit has been abused by most schools as a vehicle to accelerate pass rates at matric level without considering it consequences beyond matric. These poor subject combinations have had a huge impact on the career choices by students who have passed matric but do not have the correct combination for entry into the fields of their choice. The maths lit has its advantages though because looking at the current situation, there is no longer an option to take pure Maths on a Standard Grade level. Instead, only two mathematical subjects are offered: pure maths (which is on par with Higher Grade Maths) and Mathematical Literacy.

Research shows that there has been a gradual decrease in the uptake of pure maths in the previous years (from 58% in 2008 to 43% in 2013) and an increase in the number of students enrolling for maths literacy. The maths lit predicament is facing both the department of higher learning and basic education. The question from both departments is: are our students struggling in maths or are our teachers not credible on teaching maths? This study has investigated these effects qualitatively and results show that though maths lit is a good initiative, there has been an abuse of it to achieve ulterior motives by some schools. Recommendations are that the Department of Basic Education investigate the extent at which this is happening at schools and adjust its systemic processes.

5. **Linking Life, Natural and Earth Science**

Ulrich Oberprieler
National Zoological Gardens, Pretoria

The animal collection of a zoo presents unique opportunities to link the following sciences: Life, Natural and Earth Sciences. This presentation explores some examples of how this is done during science engagement programmes at the National Zoological Gardens of South Africa.

6. **Gardening for good!**

Singa Poswa
Nelson Mandela Bay Science Centre

The Eastern Cape is one of the poorest provinces in South Africa. With more than 7million people, poverty is one of the greatest impediments to development in the province; the scourge is both cause and consequence of other social ills such as crime, illness & disease amongst others. In 2011 Statistics South Africa reported that 10.2 million South Africans live in extreme poverty, of that 10.2 million, 1.5 million live in the Eastern Cape.

Having recognised poverty as a critical issue, the Uitenhage Despatch Development Initiative sought to address the problem in the Uitenhage-Despatch area as part of its Town Regeneration strategy through its Eco-hub Model. The Eco-hub Model seeks to develop skills in the local communities for self-dependency and the sustainable use of natural resources. This is done in partnership with the Eastern

Cape Department of Economic Development, Environmental Affairs and Tourism.

The Eco-hub Model focuses on four key arears:

- Nursery incubation, vegetable and medicinal plant production
- Recycling of waste
- Compost making
- Arts and culture

The Eco-hub Model is implemented in the communities two-fold; one as general community-based projects, the other as school-based projects. In schools, learners form management committees that ensure the sustainability of the school gardens. For the recycling component of the Eco-hub Model, the schools earn a profit through Waste Trade, by collecting waste and selling it to the company.

The focus of the presentation will be on the implementation of Eco-hub Model in schools, evaluating it as a means of driving sustainable development but also as an educational tool.

7. **First experience of being inside a science laboratory: a case study of three High schools**

A Kamenye and Lerato Molebatsi
North-West University (Mafikeng) Science Centre

The experiential value of hands-on activities in science education has long been recognized as a significant in engaging learners. North-West University (Mafikeng Science Center) assisted learners from (Tetlano secondary, Molelwane high and Boithaopo high) schools with their Life science and Physical science experiments who are studying grade 10-12. Learners who visit the Science Centre are mainly from rural area schools which lack laboratories and lab equipment to conduct their own experiments. Prior to the practical session, learners are divided into groups of five or three under the supervision of the Science Center personnel. Groups of learners are given relevant material needed to perform the experiment, and then the Science Centre personnel explains the procedure of the experiment before the groups can start. During the practical sessions, learners get a chance to explore our physics and chemistry laboratories before performing their experiments. After the explanations, the groups will start performing the experiment with assistance from the Science Centre personnel. After completion of the experiment, learners are given evaluation forms to give feedback. This program has revealed that most learners struggle to understand the method and to perform experiments on their own. This is because they are not used to performing experiments at their schools. They also fail to interpret the results. The findings revealed that 98% of the learners said that the experiment was beneficial to them, and it helped them to understand theory better. Majority of the learners (93%) indicated that science is not hard to learn however 88% stated that they are interested in pursuing their careers in science.

8. **Supplementary lessons to Grade 12 learners**

Chris McCartney and Luthando Adams
NMBST, Uitenhage

The Nelson Mandela Bay Science and Technology Centre (NMBSTC) offers various interventions to quintile 1- 3 schools in the Uitenhage District. One of these initiatives is to offer supplementary lessons to Grade 12 learners who failed the 2014 Mathematics, Physical Science or Natural Science papers, but qualified to write supplementary examinations. This intervention was initiated with the support of the Uitenhage District of the Department of Education. Initially 60 leaners

enrolled for extra lessons and many of these have written and passed the supplementary examinations. Others will still be writing. This paper presents the methodology that has been adopted as well as presenting the impact of the initiative. Some lessons that have been learnt will also be shared.

Workshops

1 **Bionics: Learning from Nature** (Thami Mangena, Sci-Bono Discovery Centre)

Duration: 60 to 90 mins

When a Swiss engineer by the name of George de Mestral was cleaning his dog of burrs, he had a great idea and realized how the hooks of the burrs clung to the dogs fur. From this biological example, he developed a hook and loop fastener called Velco. One of the first applications of Velco was in the aerospace industry as a space suit closure device. This workshop will explore the field of bionics through various interactive experiments using Festo Didactic Bionics kits. Bionics is the application of biological systems found in nature to study and design engineering systems and technology. Some examples of bionic applications that we will explore are structure stress patterns, fluidic muscles, Velcro and lotus effect paints.

2. **"Pimp your Hoop"** (Ginny Stone, SAASTEC) Duration: 1 hour
followed by

"Get-your-Hoop-on" (Everybody)
followed by

"Hoop-off heats" (Selected judges and learners) Duration : 45 miutes

First section of the workshop to be presented by Ginny Stone – thereafter it becomes an integral part of the conference owned by everybody.

This workshop will:

1. Promote teamwork (there will be only one hoop per SC / Group)
2. Require critical thinking skills and research (to find out the science behind keeping it up and health benefits).
3. Promote and require snappy communication skills.
4. Provide delegates with new ideas for communicating science in their own centres in an interesting and upbeat way.
5. Hooping skills can also be used in SC shows. *(Whilst delegates will not be expected to perform tricks and do fancy hooping work – this can easily be learned for added interest in SCs.)*
6. Provide an energy-filled fun competition between the science centres /groups.

- **One the first day of conference** a 1 hour workshop for all delegates - in teams of their own science centres. Each team makes a hula hoop and decorates it. Hoops are made from 25mm black irrigation piping and taped up with colourful tape. The same tape will be available for all hoop makers – how they use it will be up to them. Delegates will be able to determine the size of the hoop they make.
- **On the second day of conference** (either during conference or in the evening) a "hoop off" is held, whereby all teams have to hula hoop for a specified amount of time (say 3 minutes) without dropping their hoops. Anybody who drops their hoop is eliminated. This should continue until there are approximately 6 or 7 hula hoopers left on the floor. (Bearing in mind that delegates will only have had 1 day to practise hula hooping – this

should not take that long.

- **On the third day** – during conference (~1 hour needed) – there are the "Hoop-off-heats". Each of the 6 or 7 teams have 3 minutes to present: 1 minute to hula hoop; 1 minute to explain the science/physics behind keeping the hoop up – or an aspect thereof; 1 minute to explain the health benefits of hula hooping.

The judges for this part of the contest could be learners/educators from a local school. They would judge using score boards. Prizes will be awarded.

All the hoops will be donated to a local school or community centre (chosen by Lerato Molebatsi), along with comprehensive physics information of how the hoops work and the health benefits of hula hooping.

Outcomes of this workshop

1. SAASTEC delegates would all have the knowledge of how to make their own hula hoops for use in their centres. Hoops can be made in different sizes, thicknesses and weights.
2. These hoops are inexpensive easy to make items that can be used in workshops to explain various scientific concepts:
   - Upward force
   - torque
   - friction
   - centripetal force
   - gravity

   Fun workshops can be developed whereby learners try different sized hoops and see how much easier or harder it is to spin them.
3. Workshops for adults can also be developed whereby the physics is explained but the health benefits are underlined. These are multiple and varied – Hula hooping has been likened to Pilates in many instances.
   - Studies show that hooping burns visceral fat- the fat that is the hardest to get off the older you get, and also the most detrimental to heart health.
   - Hula hooping works as many as 30 of your body's muscles (including the heart)
   - It improves your spine's strength and flexibility.
   - It improves hand-eye co-ordination and motor skills.
   - The "H" Factor. Happiness. Apart from these amazing physical fitness benefits, it's easy to fall in love with hooping because of how it makes us feel: Happy. Besides the wonderful burst of endorphins you're likely to enjoy after a good bout of hooping, this activity can have other, more subtle positive effects on your psyche. After hooping we often feel like younger, stronger, more toned, more confident versions of ourselves. Essentially, Hooping, just like running, as a solitary or a shared activity, can be anything you need it to be, big or small: a tool you use to center yourself before or after a long day or a healthy activity you in which you take part with family and friends; an 8 minute-a-day activity with amazing results.

Delegates

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Tips for Chairing a Session Well

Make Contact
Contact your speakers before the conference to answer any questions they may have and to make sure they know when and where their presentation will take place.

Be Prepared
Familiarize yourself with the general topic of the session and read abstracts (and full papers if they are available) to familiarize yourself with the content of the individual presentations. If you think two speakers are in danger of covering the same issues contact them in advance to give them an opportunity to tailor their presentations.

Face-to-Face
Arrange to meet your speakers at the conference venue to ensure they know the time and venue of their presentation, and that they bring any problems or special requirements to the attention of the conference organizers.

Think and Plan
Plan the general format of your session, think about how to introduce the speakers and state that questions will be taken at the end of the session.

Introduce Session
Get the attention of the audience, introduce the topic of the session and present the format of the session.

Introduce the Speakers
Prepare some information to introduce each of the speakers. Keep the introductions short and accurate.

Timing
Monitor the timing of each speaker closely, speak up and remind them they have only 2-3 minutes of speaking-time left if they show no sign of concluding their presentation. 10 minutes for questions at the end of each session.

Discussion
Have a few questions ready in case the audience doesn't. If questions are too long, or complicated interrupt and suggest that the issue is discussed after the session.

Closing -
Conclude the session with a short summary of the content of the session, acknowledge the speakers and announce the next sessions.

The End
Before they leave the room, thank each of the speakers for their contribution.

Thank you for chairing the session.

Notes

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