



30th Annual Conference of the Southern African Association for Research in Mathematics, Science and Technology Education

18 –20 JANUARY 2022

Conference Theme:

Embracing Change and Transformation in a Technologically Enhanced Environment through Mathematics, Science and Technology Education (MSTE) Research

FULL CONFERENCE PROGRAMME



SAARMSTE

Southern African Association for Research in Mathematics, Science and Technology Education

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Hosted by a Consortium of Western Cape Institutions
Cape Peninsula University of Technology (CPUT), University of Cape Town (UCT),
University of the Western Cape (UWC), Stellenbosch University (SU),
African Institute for Mathematical Sciences Schools Enrichment Centre (AIMSSEC) & Primary Science Programme (PSP)

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SPONSORS

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NELSON MANDELA
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MESSAGE FROM THE PRESIDENT 2022

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It is my great pleasure to welcome all of you to the 2022 SAARMSTE Conference, hosted by a Western Cape Consortium of institutions comprising of Cape Peninsula University of Technology (CPUT), Stellenbosch University (SU), University of Cape Town (UCT), University of the Western Cape (UWC), African Institute for Mathematical Sciences Schools Enrichment Centre (AIMSSEC) and Primary Science Programme (PSP). It is the second year in which we are dealing with a virtual format, and all the opportunities and challenges that such formats offer. The theme of the Conference is particularly apt for the times we are in: *Embracing Change and Transformation in a Technologically Enhanced Environment through Mathematics, Science and Technology Education (MSTE) Research*. We have all learnt a lot in the last two years about technologically enhanced environments, but we have much more to learn, through a rigorous research lens, about what has been gained and what we have to attend to if we are to retain more of what make STEM teaching and learning joyful and constructive enterprises.

We are delighted to welcome regional and international experts to this conference including our plenary speakers: Prof Elizabeth Mavhunga from South Africa, Prof Nathalie Sinclair from Canada and Prof Dick Ng'ambi from South Africa. We also continue to welcome, encourage and support healthy numbers of emerging scholars – including those currently studying for Masters and PhD qualifications – to the conference. The latter group represent the future of SAARMSTE and it is a future that shines bright in the wake of the sterling work that the SAARMSTE Research Capacity Building Committee continues to do, supporting doctoral and early career post-doctoral scholars with writing for their PhDs and for publications. The Writing Clinics organised by the AJRMSTE Editorial Board are a second, important arm of this work of building the next generation of scholars.

In amidst these successes, the last year has also been a time of loss. The COVID-19 pandemic took our colleague and friend Prof Audrey Msimanga, the Chair of the SAARMSTE Research Capacity Building Committee and SAARMSTE President-Elect. Her passing leaves a void in many lives in the SAARMSTE community; we remember Audrey and others in the SAARMSTE family that we have lost in the course of the Covid pandemic with fond memories and with gratitude for all they added to our lives. My thanks also to the Research Capacity Building Committee for ensuring that the 2021 Research School continued, and in particular to Marissa Rollnick, a SAARMSTE stalwart, who stepped into leading the Committee at such a difficult time.

We also offer a huge thanks to Busisiwe Alant who is stepping down from her position as AJRMSTE Chief Editor after three years in this role. Under Busi's stewardship, AJRMSTE has steadily gone from strength to strength across the full range of journal indices, and the Editorial team continue to offer a supportive environment for those submitting papers. Sarah Bansilal, who is currently part of the Editorial team takes over the Chief Editor role in 2022.

My tenure as SAARMSTE President comes to an end at the 2022 Conference. I learned much from watching my immediate predecessors, Ken Ngcoza and Lyn Webb in this role – my sincere thanks to both of them. SAARMSTE has been, and will continue to be, an important institution in my personal growth as an academic. My best wishes to all existing and new office bearers and to SAARMSTE going forward! I know the future of SAARMSTE is bright in all of your very safe hands!

Professor Hamsa Venkat

SAARMSTE COMMITTEES 2021-2022

SAARMSTE EXECUTIVE COMMITTEE

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Acting Research Capacity Building Committee Chair:	Prof Marissa Rollnick	University of the Witwatersrand
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SAARMSTE LOCAL CONFERENCE ORGANISING COMMITTEE (LOC) – 2022

Conference Chair	Prof Chukunoye Ochonogor	CPUT
Conference Secretary	Dr Sharon McAuliffe	CPUT
Fundraising Chair	Dr Zorina Dharsey	PSP
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PROGRAMME COMMITTEE

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	Mr Frikkie George	UWC
	Dr Zena Scholtz	CPUT
	Dr Dale Taylor	UCT
	Dr Zorina Dharsey	PSP

SAARMSTE Secretariat Ms Carolyn Stevenson-Milln

PLENARY SPEAKERS



Professor Nathalie Sinclair – *Simon Fraser University, Canada*

Nathalie Sinclair is Distinguished University Professor at Simon Fraser University in the Faculty of Education. Her research areas include the philosophy and history of mathematics, as well as the role of technology in mathematics teaching and learning. She is the co-author of *Mathematics and the Body: Material Entanglements in the Classroom* and the founding editor of *Digital Experiences in Mathematics Education*.

Plenary title:

Moving mathematics

Using two examples from my own research, I will discuss how digital technologies can change the way we think in mathematics. I will focus specifically on the ways they change how we use our bodies and, in particular, how they provide structured ways of moving that enrich mathematical thinking. I will argue that these technologies are not ends in themselves, but that the new ways of thinking they give rise to can spill over into non-digital experiences both in classrooms and in everyday life. They move our thinking and thereby move mathematics.



Prof. Elizabeth Mavhunga

Science Education Division, University of the Witwatersrand, South Africa.

Professor Elizabeth Mavhunga is a teacher educator and an NRF-rated researcher in Science Education (Chemistry Education) based at the Wits School of Education, Wits University, South Africa. She teaches Chemistry content and methodology courses across undergraduate and postgraduate levels, and has held several positions of leadership within the Wits School including heading the School's research portfolio. Her research is embedded within her teaching practice, focussing on developing teacher knowledge in pre-service physical science teachers through the theoretical construct called Topic Specific Pedagogical Content knowledge (TSPCK). This is a theoretical construct that she, together with Professor Rollnick, elucidated in 2013. TSPCK has since been employed and cited widely locally and internationally, and its inclusion in the conceptualization of the latest consensus model of the PCK model (RCM of 2019) has been an endorsement of note. Of late, TSPCK's great contribution to the field is acknowledged as the exactly the emphasis on the relationship between teachers' PCK and the teaching situations of a content topic. Professor Mavhunga has recently extended her research into the digital realm, where she explores the porting of the TSPCK construct into developing teacher professional knowledge for teaching science in digital classroom settings. Her research work is driven by the need to fast-track the development of futuristic, agile and digital savvy science teachers who will deliver high quality science

lessons in both traditional and virtual classroom contexts. She leads a research team of post-Doctoral and PhD scholars pioneering research on science education with a digital outlook (SEDO). Professor Mavhunga is a recipient of several NRF research grants, and has received two prestigious research awards by the science education professional bodies: SAARMSTE and SACI. She has graduated many postgraduate students, and authored several book chapters and journal articles in accredited publications.

Plenary title:

Unlocking powerful teacher professional knowledge through PCK: an invitation to reflect.

Abstract

Development of teacher professional knowledge in South Africa is a complex matter, confounded by a mix of teacher resource impediments. Emerging lessons from previous teacher development initiatives point to a need for a better understanding of the structures embodied in instructional knowledge. Pedagogical Content Knowledge has proved to be an effective foundational basis to extract deep teacher knowledge structures about teaching science topics utilising a revised construct named Topic Specific Pedagogical Content Knowledge (TSPCK). In this lecture, I will share a knowledge structure that has enabled the development of teachers' capacity to transform the content knowledge of a topic into a format which is understandable to students at a given school level. I will further share on the lessons learned about the portability of this knowledge structure in propelling self-development of teacher knowledge in new and more difficult science topics for teaching in traditional settings. The insights acquired from the above experiences with traditional classroom settings, have been used to infer guiding principles to inform the shape and structure of the needed new digital-enabled teacher knowledge. I will then present a digital version of a conceptual framework entitled digital-TSPCK, for guiding the development of the teacher professional knowledge for digital transformation of content knowledge. In my presentation I argue for the need to retain and employ deep understanding of pedagogy vs. the 'how of technology', in driving the new directions of teacher knowledge as we enter an era of global digitalization of education.



Professor Dick Ng'ambi

Full Professor of Educational Technology, University of Cape Town

Plenary title:

Integrating indigenous games into teaching and learning – decolonise curricula, make learning fun and meaningful

Outline

While much focus on Africa highlights its arts, crafts, folklore, clothes, cuisines, music, and languages, there has been less attention paid to indigenous games. There is a deluge of children games in Africa, and the COVID-19 pandemic which has resulted in parents and children staying at home has brought into focus the pedagogical potential of indigenous games. There are 1.3 billion people in Africa and 400 million children from 3,000 tribes and each of these children play games. Playing games is every child's daily practice regardless of their socio-economic status or geographic location, rural or urban, literate or illiterate. Games covertly teaches cultural heritage, values, numeracy, creativity, critical thinking, design thinking and much more. It follows that games are educational as they directly address three domains of learning: cognitive (mental skills), affective (attitude or self), and psychomotor (manual or physical skills). I am leading an OERiGA (Open Educational Resource of indigenous Games in Africa) project which involves 22 collaborators and 10 African countries. The aim of the project is to systematically create an educational resource of indigenous games and advocate for games to enter the mainstream curricula as a teaching and learning resource, whereby decolonising the curricula while making learning with fun and meaningful. The project also seeks to empower young people

to design digital indigenous games and inspire a generation of citizen developers in the Fourth Industrial Revolution (4IR). I will present the OERiGA project, and preliminary findings on the potential of indigenous games in mathematics, science and technology Education.

WELCOME MESSAGE FROM THE CONFERENCE CHAIR – PROFESSOR C.E. OCHONOGOR

Good morning ladies and gentlemen. I am delighted on behalf of the Local Organizing Committee (LOC) to welcome everyone to the 2022 SAARMSTE Conference opening today Tuesday, 18 January 2022. It is great to note the high number of highly esteemed Mathematics, Science and Technology researchers and professionals from your various countries and provinces in attendance and participating in the virtual conference made possible by the Covid-19 harsh conditions.

I am specially honored to welcome the President, Professor Hamsa Venkat and the Executive Committee members of SAARMSTE for their concerted efforts in ensuring the achievement of the Association's professional goal of growing Mathematics, Science and Technology education research and practice; the Plenary Speakers at this Conference including Professor Nathalie Sinclair - Mathematics, Professor Elizabeth Mavhunga - Science, and Professor Dick Ng'ambi - Technology Education for generously accepting to share their wealth of research activities to guide the conference. I am also pleased to especially welcome the Vice-Chancellor of Cape Peninsula University of Technology, Cape Town, Professor Chris Nhlapo (represented by Professor Hay-Swemmer) as the Chief Host of the Conference in a consortium of Western Cape Institutions (Cape Peninsula University of Technology, Stellenbosch University, University of Cape Town, University of the Western Cape, African Institute for Mathematical Sciences Schools Enrichment, and Primary Science Programme). I welcome all the participants in their different strands who will be presenting and discussing the many well-researched papers received and accepted for the Conference and all our sponsors. The SAARMSTE Choir led by Professor Melissa Rollnick, the Conference MC, the sectional chairs and repertoires are equally welcomed as their functions will certainly add the needed spices to make the Conference great.

We are all here to participate in the 30th Conference of the Southern African Association for Research in Mathematics, Science and Technology Education. It is a Virtual Conference that runs from today, Tuesday 18 – Thursday 20 January 2022. The Conference theme is “Embracing Change and Transformation in Mathematics, Science and Technology Education (MSTE) Research”. It is my earnest expectation that the outcome of this Conference shall help to direct our search and acceptance of change and transformation in our noble professional practice.

I acknowledge the LOC Secretaries - Dr Sharon McAuliffe and Dr Zorina Dharsey; the Fundraising Chair – Mr Byron Abrahams; Programme Chair – Dr Keith Langenhoven; Logistics Chair – Mrs Wilna Du Plessis for effectively piloting the affairs of their sub-committees with great success. I also commend the relentless efforts with efficiency, of Ms Carolyn Stevenson-Milln of the SAARMSTE Secretariat for guiding and helping the LOC to put up this great Conference.

I must be quick to confirm to all the participants that we shall be having very exciting sessions in the three days of this Conference. Such sub-themes as Foundation Phase Mathematics, Science Curricular issues, Secondary/Tertiary Mathematics teaching and learning, Language issues, Mathematics and Science symposia precede the plenary speech of Professor Nathalie Sinclair from Simon Fraser University, Canada; and I request that you join us for: Cocktails with 'Memories' from past delegates; Presentation of Stimulator Programme and Virtual 'meet and chat' on the first day. Several sessions of presentations

shall take place before and after the plenary speech of Professor Elizabeth Mavhunga: Science Education, University of the Witwatersrand, South Africa on the second day that you cannot afford to miss. On the third and last day of the Conference is the plenary speech by Professor Dick Ng'ambi of the University of Cape Town with the title: "Integrating indigenous games into teaching and learning – decolonise curricula, make learning fun and meaningful", and many other exciting moments.

I hope you all enjoy every aspect of the 2022 SAARMSTE Conference with the inspirational presentations, discussions and virtual social interactions that the Conference offers.

Once again, you are all welcome!

Thank you.

Professor Chukunoye Enunuwe Ochonogor
Conference Chair

GUIDELINES FOR PAPER SUBMISSION AND PRESENTATION

Long paper: Maximum of 6000 words, including references, for a 30-minute pre-recorded, narrated presentation. Long papers are equivalent to journal publications utilising the same criteria as AJRMSTE articles and are reviewed accordingly. In accepting a long paper for presentation at the SAARMSTE conference, the Review Panel presumes:

- 1) The paper is original and has not been published elsewhere;
- 2) Permission will be granted by the author for the accepted long paper to be published in the accredited *Book of Proceedings*;
- 3) At least one of the authors will register and attend the conference to present the paper;
- 4) First authors will only present one long paper at each conference.

Long papers are fully peer reviewed and thus attract Department of Higher Education and Training subsidy.

Short paper: Maximum of 1500 words, including references, for a 20-minute pre-recorded and narrated presentation. Short papers should highlight preliminary findings and significance of the research. Short paper submissions could be the first draft of a journal article consisting of: abstract, introduction literature review, methodology, results and conclusions. Authors are encouraged to submit short papers for development of an article at the post conference workshop. After acceptance of the 1500 word short paper, authors may elect to develop their research further into a 3600 word paper which will NOT be reviewed but, after consultation with the editor, could appear in the electronic record of Research Papers in Mathematics, Science and Technology Education. Short papers are **not** eligible for DHET subsidy.

Snapshot paper: Maximum of 1500 words, including references, for a 10-minute pre-recorded and narrated presentation. Snapshot papers should be based on emerging research, not necessarily with results, but with a framework of: abstract, introduction, literature review, methodology and the way forward.

Symposium / panel paper: Maximum of 1500 words, including references, for a 90-minute pre-recorded and narrated team discussion around issues where different points of view, approaches, debates or analysis of the same problem are presented. The paper should contain details of each speaker's contribution and how these come together to create a forum for debate. This is not a forum for the presentation of multiple short papers. The emphasis is on exchange of ideas and discussion.

Short papers, snapshots, posters and symposia papers should appear in the 2021 electronic record of Research Papers in Mathematics, Science and Technology Education. These are not fully peer reviewed and thus do not attract Department of Higher Education and Training subsidy.

REVIEWING PROCESS - SAARMSTE LONG PAPERS 2022

All 6 000 – word long papers were reviewed by at least two external reviewers.

Reviewers were selected from the list of reviewers for the African Journal for Research in Mathematics, Science and Technology Education (AJRMSTE) published by Taylor & Francis. Other recognized researchers in the field of Mathematics, Science and Technology Education were also approached to be reviewers.

The reviewers' suggestions were considered by the members of the Review Panel. Where there was consensus, the reviewers' recommendations were accepted by the Review Panel. Where consensus was not reached, the Review Panel appointed at least one other reviewer and all reviews were taken into consideration before a decision was made.

In cases where papers were accepted with conditions, authors were guided to make changes in order to have their papers accepted, or provide a compelling argument for no further revision.

Long papers that were re-worked and re-submitted by authors underwent a final review and editing process before being published in the accredited Book of Proceedings.

30TH SAARMSTE CONFERENCE 2022 – PROGRAMME

Tuesday 18th January 2022

<https://mandela.zoom.us/j/5226222022>

Time: 08h30 – 9h30 OFFICIAL OPENING: MC - *Dr Sharon McAuliffe*.
 Welcome by *Professor Hay-Swemmer (ED:OVC)*, Cape Peninsula University of Technology (CPUT).
Guest speaker: Professor Judy Peters, Director: Strategic Initiatives and Partnerships.
 Title: Internationalising Higher Education - Diversity, transformation, and ‘post – pandemic’ trajectories.
 Introduction to Conference Programme sessions by *Professor Chukunoye Ochonogor* (LOC Chair)

	Mathematics by Theme	Science by Theme
Theme:	FOUNDATION PHASE MATHEMATICS	CURRICULUM ISSUES AND IMPLEMENTATION ISSUES
Link:	https://mandela.zoom.us/j/5226222022	https://mandela.zoom.us/j/2882992022
Chairs:	<i>Mellony Graven & Lawan Abdulhamid</i>	<i>Loyiso Jita & Fred Lubben</i>
Papers 9h30- 11h00	<p>Sally-Ann Robertson & Mellony Graven Mathematical meaning-making: it’s not just all talk LP-M022</p>	<p>Mary Nkuna & Eunice Nyamupangedengu Investigating the affordances and limitations of on-campus microteaching as work-integrated learning (WIL) for Post Graduate Certificate in Education (PGCE) students training to teach in Life Sciences in high school. SP-S066</p>
	<p>Roxanne Long & Mellony Graven Grade R teachers’ institutional identities proposed in policy and narrated in interviews of a teacher’s experiences LP-M023</p>	<p>Eunice Nyamupangedengu, M Mosabala & LY Mpaha What pre-service teachers learn about matter and materials: an investigation of first year science pre-service teachers’ experiences of a content course in which methods of teaching were integrated SP-S033</p>
	<p>Clemence Chikiwa & Taimi N Elifas Teaching number sense in the foundation phase in Kharas region, Namibia SP-M025</p>	<p>Sophia M Majara, Angela James & M Stears Teachers’ implementation of the Lesotho junior secondary science curriculum at systemic level in Lesotho SP-S070</p>
	<p>Wellington Hokonya, P Vale & M Graven Exploring the relationship between mathematics learner identities and learners’ participation in different landscapes of mathematical practice SP-M053</p>	<p>Christine Mundy A microscale redox experiment as a vehicle for curriculum transformation SN-S035</p>
	<p>Vuyokazi Mafilika & M Seoloane</p>	<p>Nishaal Bhaw & Jeanne Kriek</p>

	Working with zero in early grade mathematics - findings from Bala Wandé Grade 1 classes in the Eastern Cape SN-M051	A comparison of the cognitive complexity between the grade 8 science curricula of South Africa and Singapore in alignment with the TIMSS from 2007 to 2019 SP-S029
11h00-11h15 TAKE A BREAK – Coffee / Tea		
Theme:	SECONDARY/TERTIARY MATHEMATICS TEACHING & LEARNING	LANGUAGE / IKS AND SCIENCE COMMUNICATION
Link:	https://mandela.zoom.us/j/5226222022	https://mandela.zoom.us/j/2882992022
Chairs:	<i>Benita Nel & Million Chauraya</i>	<i>Angela Stott & Nadaraj Govender</i>
Papers 11h15- 12h45	Nwabisa Mbeki & MO Mbekwa Grade 9 learners' ways of working with algebraic fractions: errors and misconceptions LP-M001	Moleboheng Ramulumo & L E Mnguni Molecular biology students' attitudes towards mother tongue instruction and its effect on their interpretation of external representations used to explain MRNA translation SP-S017
	Edwin Sibanda & M France Machaba Grade 8 learners' misconceptions in surface area and volume relationships LP-M008	Shungu Mupfawa, Marissa Rollnick, K. Padayachee & Anastasia Buma An analysis of teachers' classroom discourse in basic genetics LP-S068
	Benjamin Tatira Analysing undergraduate students' schema development of multivariable limits LP-M046	Flavia Kigozi, S Dukhan, F. Otulaja & I Risenga Teachers' Integration of Indigenous Knowledge in the Teaching and Learning of Life Sciences and Physical Sciences in South African schools SP-S071
	Sarah Bansilal An investigation of the functioning of items in a Grade 9 mathematics national assessment tool SP-M049	Helena Cacador, Rafael Galupa, Betina Lopes, Mariana Alves, Susana Ambrósio, Olga Santos & Ana Raquel Simões Connecting scientists and students in African Portuguese-speaking countries via letter exchanges: the case of "Cartas com Ciência" SN-S036
	Lillias HN Mutambara & M Tsakeni In-service teacher's mental construction of linear independence concepts: a Zimbabwean case study SP-M019	
12h45 – 13h30 LUNCH TIME		

	13h30 MATHS SYMPOSIUM 1	13h30 SCIENCE SYMPOSIUM 2
Link:	https://mandela.zoom.us/j/5226222022	https://mandela.zoom.us/j/2882992022
Chairs:	Simphiwe Mlotshwa	Shalini Dukhan
13h30-15h00	S Mlotshwa, S Taylor, F Adam, I Sapire & H Venkat Early grade mathematics: the role of context, language, intervention and pedagogy to improve outcome SYM-M055	Shalini Dukhan, Monde Kazeni, Lydia Mavuru, Angela Stott & Nomfundo Radebe Establishment of a research-writing virtual Community of Practice to promote academic publication SYM-S030
15h00 – 15h15 COFFEE BREAK		
15h15 – 16h30	PLENARY SPEAKER: Professor Nathalie Sinclair: Simon Fraser University, Canada Title: Moving Mathematics	
Link:	https://mandela.zoom.us/j/5226222022	
Discussant:	Professor Sarah Bansilal, University of KwaZulu Natal, South Africa	
	Mathematics by Theme	Science by Theme
Theme:	ARTEFACTS AND REPRESENTATIONS IN MATHEMATICS TEACHING	TEACHING SCIENCE AT THE TERTIARY LEVEL
Link:	https://mandela.zoom.us/j/5226222022	https://mandela.zoom.us/j/2882992022
Chairs:	Anthony Essien & Fraser Gobede	Frackson Mumba & Emmanuel Mushayikwa
Papers: 16h30-18h00	Given Matengu & Marc Schäfer Revisiting geoboards to teach quadrilaterals within the Van Hiele teaching framework. LP-M014	Langanani Rakhunwana, M Potgieter, L. A. Pilcher & A Kritzinger Self-regulated learning strategies for first-year chemistry during Covid-19 SP-S013
	Fraser Gobede Multiple mediatory roles of artefacts in large classes: A Grade 1 teacher's orchestration of artefacts when introducing the concept of addition LP-M044	Marietjie Potgieter Systems thinking in chemistry education: An imperative for addressing sustainability challenges SP-S018

	<p>Ronald Griqua & Marc Schäfer An investigation into how the use of visualisation strategies enhances the teaching of number sense SP-M017</p>	<p>Micke Reynders, L.A. Pilcher & M. Potgieter The effectiveness of a systems thinking visualization tool for first-year chemistry SN-S037</p>
	<p>Tammy Booyesen, L. Westaway & P. Vale The use of visual images in multiplication and division in four early years' mathematics textbooks SP-M035</p>	<p>Shalini Dukhan The tides of change are at the horizon: Science identity among first-generation and traditional university students entering into first-year biology SP-S028</p>
	<p>Lorna Sako & T Ndamase Ten frames as a tool to support the development of number sense in Grade 1 students in the Eastern Cape province SN-M050</p>	<p>Sanjeev Naras, Doras Sibanda & Sebenzile Ngema Academic success at university rests in student selection criteria: Is it a case of matriculation points or mathematics scores? SP-S031</p>
	<p>Abongile Ngwabe & Marc Schafer Exploring the potential of how GeoGebra software can be used as a visual mediator between preservice teachers' mathematical pedagogical content knowledge and teaching proficiency SP-M038</p>	<p>Tholani Tshuma & Eunice Nyamupangedengu The identification of the dilemmas one faces when teaching science: A dilemma driven self-study inquiry involving the teaching of evolution LP-057</p>
		<p>TK Atlabachew & Jeanne Kriek Undergraduate physics students' variations in understanding the concept of nuclear binding energy SN-S034</p>
18h00-18h45	<p>Join us for: Cocktails with 'Memories' from past delegates; Presentation of Stimulator Programme and Virtual 'meet and chat' with MC Dr Zorina Dharsey</p>	
	<p>https://mandela.zoom.us/j/5226222022</p>	

Wednesday 19th January 2022

Time: 08h30 – 10h00

	Mathematics by Theme	Science by Theme
Theme:	PRIMARY MATHEMATICS	PRACTICAL AND COLLABORATIVE WORK IN SCIENCE
Link:	https://mandela.zoom.us/j/5226222022	https://mandela.zoom.us/j/2882992022
Chairs:	Sharon McAuliffe & Erna Lampen	Marietjie Potgieter & Bette Davidowitz
Papers: 08h30-10h00	Tarryn Lovemore, Sally-Ann Robertson & Mellony Graven Task design grappings in integrating music and fraction representations LP-M043	Christian Bob Nicol, E. Gakuba & G. Habinshuti Effects of inquiry-based experimentation on learning outcomes in Bong County, Liberia LP-S009
	Liveness Mwale An investigation of the teaching of standard units of length, capacity and mass in standard 4 in Malawi LP-M040	Valenkosini Majola & Lebala Kolobe Developing a context-relevant Instructional Strategy for teaching factors affecting equilibrium position and constant: balancing the teacher-researcher duality SN-S059
	Justina Longwe-Mandala The nature of examples and tasks and how mathematics teacher educators help pre-service teachers to learn the practice of selecting examples SP-M034	Alberto Boane Integration of Chemical Processes Resulting in Biogas Production in Laboratory Chemistry Classes in General Secondary Schools SP-S045
	Ben Shongwe & J. Molebale Exploring grade 3 students' written symbols of mathematical objects: The case of a teacher's experiences in a crisis situation SP-M039	Mpumelelo Gumede & L Kolobe Collaborative learning of key concepts in electric circuits by grade 11 learners using concept mapping SP-S061
	Nadia Swanepoel & K Luneta Supporting Grade 3 teachers' mathematics word problem solving instruction through PAR: Developing a professional development initiative SP-M013	Lintle Maraisane, Loyiso Jita & Thuthukile Jita Teaching "float and sink" concepts in Grade R classes in Lesotho SP-S049
	Clement Ayarebilla Ali & Sakina Acquah Knowledge and Context of Indigenous Ghanaian Languages Counting and Place Value SP-M012	

10h00 – 10h15 BREAK – Coffee / Tea

Theme:	TEACHER EDUCATION/PROFESSIONAL DEVELOPMENT in Mathematics	CONCEPTUAL TEACHING AND LEARNING	INTEGRATING ICT INTO THE CLASSROOM
Link:	https://mandela.zoom.us/j/5226222022	https://mandela.zoom.us/j/2882992022	https://mandela.zoom.us/j/4995992022
Chairs:	Craig Pournara & Patrick Barmby	Eunice Nyamupangedengu & Ernest Mazibe	Jeanne Kriek & Umesh Ramnarain
Papers: 10h15-11h45	Samukeliso Chikiwa & Mellony Graven Exploring the efficacy of the six-lens framework in developing pre-service mathematics teachers' reflective practice LP-M006	N. M. Puputla, Malefu Nthathakane & M Qhobela The Nature of High School Biology Learners' Genetic Engineering Misconceptions: A Case of one School in Lesotho SP-S039	Mamotena Mpetla, Samuel Jere & S Kaheru The effectiveness of computer simulation-based instruction for teaching chemical reaction rates LP-S024
	Benita Nel Continuous professional development through Video Stimulated Recall by Mathematics teachers SP-M027	Jayanthi SK Maharaj & N Govender Exploring Alternative Conceptions about Work held by Grade 12 learners in High Schools using Think Aloud Method and Variation Theory SP-S015	Mmapaseka M Stephen Using digital platforms to assist in the teaching and learning of physical science in South African schools SP-S065
	Maryke la Grange-Taylor & Angela Stott A case study of a mentorship programme to promote low-quintile South African Mathematics teachers' use of social capital SP-M018	Letisha Lalbahadur, S. Dukhan & K. Padayachee An exploration of first-year medical students' cell biology prior knowledge and its influence on subsequent conceptual understanding. SP-S019	Sakyiwaa Boateng, J.K. Alex, T. Sihele, V. Momoti & T. Tshuma Gamma tutor as an emerging pedagogical tool for the teaching and learning of physical sciences in South African schools SB-S053
	Carlos A Lauchande, L. F. Afo, A. C. Novela, C. M. Albino, A. Vidade, A. Uache & P. Siteo Entrance examination of Pedagogical University of Maputo- To what extent the exams results are valid and reliable? SP-MST001	L Kotoka & Jeanne Kriek Conceptual reasoning and Problem-solving Errors learners make when solving Stoichiometry problems. SP-S042	Ayodele Ogegbo & Umesh Ramnarain Teachers' experiences of teaching science with technology in Nigerian schools SN-S010
	Janice Petersen, Y. Slamdien & B. Nel An exploration of how video-stimulated recall can be used as a tool to enhance mathematics teacher professional development SP-M026	T Sihele, S Boateng, T Tshuma & V Momoti Uncovering a Presumptive Progression on Electricity and Magnetism: A guide to develop meaningful science teaching and learning SN-S054	Katlego Leshabane, C Coetzee & K Moodley Evaluation of a robotics intervention to enhance Newton's Second Law motion concepts LP-S027

	Frank K Nkrumah Exploring mathematics teacher educators' knowledge for teaching in pre-service teacher education: A multi-case study in Ghana SN-M036	Angela Stott South African Physical Sciences Teachers' Stoichiometry Calculation Errors and Epistemological Issues these Errors Expose SN-S020	
11h45-13h00	PLENARY SPEAKER: Professor Elizabeth Mavhunga: Science Education, University of the Witwatersrand, South Africa Title: Unlocking powerful teacher professional knowledge through PCK: an invitation to reflect		
https://mandela.zoom.us/j/5226222022			
Discussant	Dr Angela Stott, University of the Free State, South Africa		
13h00 – 13h30 LUNCH TIME			
	13h15 MATHS SYMPOSIUM 3	13h15 SCIENCE SYMPOSIUM 4	13h15 TECHNOLOGY SYMPOSIUM 5
Link:	https://mandela.zoom.us/j/5226222022	https://mandela.zoom.us/j/2882992022	https://mandela.zoom.us/j/4995992022
Chairs	<i>Craig Pournara</i>	<i>Eunice Nyamupangedengu</i>	<i>Umesh Ramnarain</i>
13h30 – 15h00	Craig Pournara, J Adler, S Takker, L Mwadzaangati, Ratnayake & N Planas A framework for promoting geometric reasoning: Rationale, constitutive elements and initial applications SYM-M041	Eunice Nyamupangedengu, HC Khoza, Anastasia Buma, Mary Nkuna & Nomzamo Xaba Same teaching videos and same object of the study but different theoretical lenses: Studies of a teacher educator's teaching by postgraduate students SYM-S043	Prof Umesh Ramnarain, S Ramaila, L Mavuru, T Dhurumraj, M Penn, Y Cai & K Rodil Issues and perspectives on Virtual and Augmented Reality in STEM education (VARSTEME) SYM-T008
15h00-15h15 Coffee Break			
Themes:	MATHEMATICS TEACHING & LEARNING in COVID TIMES/ USING TECHNOLOGY	ATTITUDES AND OTHER LEARNING VARIABLES	TECHNOLOGY PAPERS
Link:	https://mandela.zoom.us/j/5226222022	https://mandela.zoom.us/j/2882992022	https://mandela.zoom.us/j/4995992022
Chairs	<i>Karen Brodie & Jogymol Alex</i>	<i>Kenneth Ngcoza & Peter Hewson</i>	<i>Busiswe Alant & Reginald Govender</i>

Papers: 15h15- 16h30	Vasuthavan Govender Preparing learners for a Mathematics Olympiad paper during the COVID – 19 Pandemic: A small-scale study SP-M033	Sibomana Aimable, Claude Karegeya & John Sentongo Cooperative Learning on Students’ Knowledge Retention and Attitude in Chemistry LP-S001	Mokiti Janefeke International Robotics competitions influence on learners’ Science and Mathematics academic performance and their career prospects SP-T004
	C. A. Lauchande, L. F. Afo, A. C. Novela, C. M. Albino, A. B. Vidade & A. Uache Lucio COVID-19: The life of families and children’s learning during the school closure SP-M002	William R. Veal, Anastasia Buma & Doras Sibanda Creativity in African Science Education SP-S052	Vojo George Fasino, Nadaraj Govender & P Kumar Teaching and Learning Mathematical Modelling in Antenna Theory and Design Course in Engineering Education SP-T006
	Shemunyenge T. Hamukwaya Teaching mathematics in the era of COVID-19: a case of a Namibian grade 3 mathematics teacher SP-M029	Lereko Mohafa & M Qhobela Exploring learner’s self-efficacy in online classes participation and information-seeking as a bench-mark for their online-learning- readiness: case of Biology and physical science classes SP-S023	Simon Albin Online learning during Covid – 19: experiences of students relying on smartphones. SP-T003
	Simphiwe Mlotshwa, Karen Brodie & Renuka Vithal The calculator: A forgotten key technology for mathematics learning and performance SP-M015	Edwin Byusa, Edwige Kampire & Adrian Rwekaza Mwesigye Effect of Activity-Based Teaching Technique and Teachers’ Views on Students’ Levels of Engagement in Rwandan Chemistry Class SP-S067	
	FM Adelabu, AH Ngwabe, NV Mbeki, B Tatira & Jogymol Alex Creation of innovative teaching spaces with Gamma Tutor: a techno-blended model for rural mathematics SN-M037	Belinda vd Westhuizen, C. Harillal & G. Ekol Investigating personality types and academic performance of Bed first year students across science and mathematics subjects. SN-S062	

Time: 16h30 – 18h00

SAARMSTE Annual General Meeting (AGM)

<https://mandela.zoom.us/j/5226222022>

Thursday 20th January 2022			
<i>Time: 08h30 – 10h00</i>			
Theme:	MATHS SYMPOSIUM 6	SCIENCE SYMPOSIUM 7	SCIENCE/TECHNOLOGY SYMPOSIUM 8
Link:	https://mandela.zoom.us/j/5226222022	https://mandela.zoom.us/j/2882992022	https://mandela.zoom.us/j/4995992022
Chairs:	Hamsa Venkat	Nadaraj Govender	Elizabeth Mavhunga
Papers: 08h30 - 10h00	Hamsa Venkat, M. Graven, S. Morrison, P. Vale, M. Askew, L. Bowie, L. Westaway, S. Chikiwa, W. Hlokonya, M. Chetty, D. Mathebe & the South African Provincial Foundation Phase Mathematics Co-ordinators Discussant: Anil Kanjee Going National with the Mental Starters Assessment Project 2021: Model, Outcomes and Provincial Foundation Phase Maths Co-ordinators' experiences SYM-M020	Nadaraj Govender, Ronicka Mudaly, Fawzia Bibi Narod, Doras Sibanda, Tamirirofa Chirikure, Shakeel Atchia, Asheena Singh-Pillay, Lebala Kolobe, Angela James, Ravhee Bholah, & Bhekisisa Maxwell Thabethe STEM Education for the 21st Century: Unpacking Conceptions of STEM Education and Insights from the Global South - The Context of SA and Mauritius SYM-S069	Elizabeth Mavhunga, B Ndlovu, S Khulu, D van der Merwe, F Zondi & Stephen Malcolm Re-calibrating research and practice in science teacher education in a technological environment SYM-S022
<i>Time: 09h45 – 10h00 Coffee Break</i>			
Theme:	MATHEMATICAL LEARNING	ASSESSMENT	
Link:	https://mandela.zoom.us/j/5226222022	https://mandela.zoom.us/j/2882992022	
Chairs:	Ingrid Sapire & Lisnet Mazwangayi	Marissa Rollnick & Washington Dudu	
Papers: 10h00 – 11h15	Robert Wakhata, Dr. Mutarutinya & Dr Balimuttajjo Relationship between Students' Conceptual Knowledge and Procedural Knowledge of Solving Linear Programming Tasks LP-M031	Halalisani Mngomezulu, Thasmai Dhurumraj & Sam Ramaila Embedding formative assessment in classroom practice: Physical Science teachers' perspectives LP-S007	
	Cecilia Mmeta & Arne Jakobsen An Investigation on Whether Teaching Using a Problem-Solving Approach Affect Student's Attitude Towards Learning and Performance in Mathematics SP-M016	Brigitte Solomon & E. Nyamupangedengu An investigation of grade four learners' poor performance in Natural Science and Technology class assessments SN-S064	

	Clemence Chikiwa & I. Shimakeleni Multilingual learners' language practices during outdoor learning of measurement in a grade 9 class school, Oshana region, Namibia. SP-M024	Lebala Kolobe Teaching Chemical Equilibrium in the High Stakes Examination Era: Experienced Teachers' perspectives in one South African Metropolitan SN-S056
	Satoshi Kusaka Metacognitive strategies for Rwandan primary school students solving mathematical word problems SN-M009	Mamohato Makhechane & M Qhobela Physical Science teachers' knowledge of learners: A case of Lesotho teachers SP-S050
	Sihlobosenkosi Mpfu & Permie Isaac Double instructions in Grade 1 student activities – findings from Bala Wande Eastern Cape schools SN-M052	
11h30 – 12h45	PLENARY SPEAKER: Professor Dick Ng'ambi, University of Cape Town Title: Integrating indigenous games into teaching and learning – decolonise curricula, make learning fun and meaningful	
Link:	https://mandela.zoom.us/j/5226222022	
Discussant	Dr Raymond Moodley, Institute of Artificial Intelligence, De Montfort University, UK	
	12h45- 13h15 LUNCH	
	Mathematics by Theme	Science by Theme
Theme:	TEACHER KNOWLEDGE/TEACHER EDUCATION	TPACK AND EXPERIENCES WITH ICT
Link:	https://mandela.zoom.us/j/5226222022	https://mandela.zoom.us/j/2882992022
Chair:	Nicky Roberts & Qetelo Moloi	Elizabeth Mavhunga & Martin Braund
Papers: 13h15-14h45	Charles Smith, Cyril Julie, Benita Nel & Faaiz Gierdien Mathematics Teachers' preferences regarding continuous professional development activities LP-M007	Macheli Mofolo, Sikeme Raphoka & Sechaba Koma Relating Pre-service teachers' Technological Pedagogical Knowledge and their intentions to teach science with ICT SP-S002

	Qetolo Molo Using the RASCH model to construct measures for assessing mathematical acting and thinking in initial teacher education SP-M054	Dennis Luchembe Distance Students' Experiences of Using WhatsApp to Learn Physics Education LP-S008
	Janne Fanskanger, M Kazima, N Helgevold & A Jakobsen The planning research lessons as a tool for changing views on mathematics teaching SP-M005	
	Viren Raamdhaney Mathematics teacher knowledge and practice in Johannesburg secondary schools SN-M032	
	Kayla Willemse, T. Venketsamy & Nadia Swanepoel Support teachers need to assist learners experiencing mathematical learning difficulties LP-M003	
14h45 – 15h00 BREAK – Coffee / Tea		
Theme:	CURRICULUM/ASSESSMENT/PEDAGOGIC IDENTITY	PCK
Link:	https://mandela.zoom.us/j/5226222022	https://mandela.zoom.us/j/2882992022
Chairs:	Sarah Bansilal & Patrick Barmby	Fred Lubben & Kennedy Chan
Papers: 15h00 – 16h45	Sarah Bansilal Second chance assessments: intervention to promote equity or lower assessment standards SP-M048 SP-M048	K. Samuel, Washington Dudu & M.J. Sebatana Exploring Natural Sciences teachers' classroom pedagogical competencies in the teaching (and learning) of Particulate Nature of Matter LP-S038
	Maboi Mphunyane, T. Jita & M. Tsakeni Reciprocity between teachers' professional identities and their classroom practices: Cases of mathematics teachers in Lesotho SP-M030	B. P. Ndlovu & Stephan Malcolm Retention of Measured Improvement in Pre-service Teachers' Knowledge for Teaching Stoichiometry One Year Topic Specific PCK Based Intervention SN-S055
	Chileshe Busaka, S R Kitta & O Umgiraneza The integration of soft skills in secondary school Mathematics in Zambia, Rwanda and Kenya: A comparative review of literature SP-M004	Marissa Rollnick & Stephen Malcolm A review of the topic specific PCK of teaching videos on chemical equilibrium SP-S051

	<p>Suryakumari Rajah & R Naidoo Re-imagining the teaching of geometry: a pilot study of a multi-dimensional integral approach SN-M045</p>	<p>Olutosin Solomon Akinyemi & Elizabeth Mavhunga The place of learner views in examining Pre-Service Teachers' enacted topic specific pedagogical content knowledge LP-S058</p>
	<p>Demi Edwards & P Vale An analysis of rational number word problem types within intermediate phase South African textbooks SP-M042</p>	<p>Maphole Marake, L. C. Jita & M. Tsakeni The knowledge base used by science teachers to teach force concepts in Grade 11 classrooms SP-S040</p>
		<p>Doras Sibanda Post graduate pre-service teachers' topic specific pedagogical content knowledge of the particulate nature of matter SP-S032</p>
	<p>GALA EVENT – Awards; President handover; Conference 2023 presentation; Choral Recital and celebration 16h45 – 17h45</p>	
Link:	<p>https://mandela.zoom.us/j/5226222022</p>	

CONFERENCE PARTICIPANTS 2022

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Dr	Tony	Essien	University of the Witwatersrand
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Discipline: SCIENCE

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Prof	Nadaraj	Govender	University of KwaZulu Natal
Prof	Peter	Hewson	Wisconsin
Prof	Loyiso	Jita	University Free State
Prof	Jeanne	Kriek	University of South Africa
Prof	Fred	Lubben	University of York, UK
Prof	Elizabeth	Mavhunga	University of the Witwatersrand
Dr	Ernest	Mazibe	University of South Africa
Prof	Frackson	Mumba	University of Virginia
Prof	Kenneth	Ngcoza	Rhodes University
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Prof	Marietjie	Potgieter	University of Pretoria
Prof	Umesh	Ramnarain	University of Johannesburg
Prof	Marissa	Rollnick	University of the Witwatersrand
Dr	Angela	Stott	University Free State
Prof	Bette	Davidowitz	University of Cape Town

Dr	Emmanuel	Mushayikwa	University of the Witwatersrand
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Discipline: TECHNOLOGY

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Mr	Reginald	Govender	University of KwaZulu Natal